ISSN: 3149-7144 (Print)
ISSN: 3149-7152 (Online)

HIMALAYAN WHITEHOUSE INTERNATION COLLEGE

NEXUS

Volume1 Issue 1 May, 2026

Journal of Interdisciplinary Engineering, Technology and Management (JIETM)



Published by
Himalayan Whitehouse Internation College
Kathmandu, Nepal

ISSN: 3149-7144 (Print)
ISSN: 3149-7152 (Online)

HIMALAYAN WHITEHOUSE INTERNATION COLLEGE

NEXUS

Volume 1 Issue 1 May, 2026

Journal of Interdisciplinary Engineering, Technology and Management (JIETM)

Editor in Chief:
Prof. Dr. Yadav Raj Koirala

Managing Editors:
Er. Roshan Paudel
Er. Manoj Subedi

Editors:
Er. Bimal Sharma
Mr. Dilip Bhattarai
Er. Mukesh Shrestha
Mr. Sudip Sigdel
Mr. Prakash Adhikari

Advisory Board
Prof. Dr. Prem Raj Pant
Prof. Dr. Raja Ram Pradhananga
Prof. Dr. Subarna Shakya
Prof. Dr. Vishnu Prasad Pandey
Er. Laxman Pokharel
Mr. Anil Adhikari

Published by
Himalayan Whitehouse Internation College
Kathmandu, Nepal

Purpose of the Journal

The Nexus: Journal of Interdisciplinary Engineering, Technology and Management (JIETM), published by Himalayan Whitehouse International College, aims to provide a platform for disseminating knowledge across diverse domains of engineering, technology, and management, promoting interdisciplinary research and innovation.

These Author Guidelines set out the requirements all manuscripts must meet before submission. Adherence to these guidelines is mandatory; manuscripts that do not conform will be returned to authors without review.

Focus Area and Thematic Topics

JIETM welcomes submissions on, but not limited to, the following themes:

- Civil, Computer, Electronics & Mechanical Engineering
- Information Technology
- Artificial Intelligence & Data Science
- Bio-Technology
- Architecture, Urban Planning & Design
- Sustainable Development, Environment & Climate Resilience
- Business Management & Entrepreneurship
- Economics, Finance & Public Policy
- Marketing, Human Resource & Organizational Behavior
- Operations & Supply Chain Management
- Engineering Education, Innovation & Policy

Chief Editor's Message

I am very happy to welcome everyone, in their capacity as a reader, researcher, reviewer, or academic partner, to the inaugural issue of Nexus: Journal of Interdisciplinary Engineering, Technology and Management (JIETM), published by Himalayan Whitehouse International College. The purpose of this journal is to provide a meaningful platform for disseminating ideas from the fields of engineering, technology, management, and related disciplines, and to promote collaboration to develop practical solutions through research and innovation that address the issues facing our society today.

The title Nexus demonstrates that we connect and work together. Given the complexity and rapid changes of these days, many of the most significant questions cannot be addressed in a single area of study. The journal's objective is to support research that is both academically rigorous and socially relevant by providing a platform for interdisciplinary dialogue through its publication process. This first issue of the journal is an important milestone for this organization and for the larger academic community. This issue contains 10 research articles covering topics such as precision medicine, antimicrobial resistance, engineering analysis, hydroponic agriculture, digital transformation, organizational behavior, finance, and higher education. All of the researchers who contributed to this issue come from different disciplines and use different methods; however, they all have one thing in common: advancing knowledge through careful inquiry and evidence-based research.

One of the significant advantages of this theme is how well it fits the Nepalese context, as all published studies provide insights into the challenges and opportunities that Nepal's hospitals, industries, educational institutions, farms, and businesses face. At the same time, these studies are part of larger conversations about science, technology, or management at the regional and global level. The Journal believes that there is significant value in high-quality research originating in developing economies for both local development and international scholarship. The Editorial Board is dedicated to ensuring that all articles featured in their journals are of high quality and meet the highest ethical and peer-review standards. Each manuscript published in this issue underwent a thorough evaluation to assess its originality, methodological rigor, and scholarly relevance; therefore, we believe that strong academic publishing is based on principles of integrity, transparency, and continual improvement, which will guide future issues of the Journal.

This inaugural issue could not have been successful without much dedication and hard work from many people. I want to express my deep appreciation to all of the authors who submitted their research to us, to the reviewers who provided invaluable constructive comments on the manuscripts, and to the editorial and technical staff who made it possible for us to publish this issue. Together, these individuals have created an excellent foundation on which this journal will continue to grow in credibility and success.

As we look forward, we invite scholars, practitioners, students, and policy-makers to join us as readers, contributors, and collaborators in our efforts at Nexus: JIETM. We actively seek research across disciplines that addresses new challenges and provides both practical and theoretical insights into society. Our goal is that this journal will eventually become a well-respected venue for scholarly discourse and innovation through continued collaboration and academic exchange.

On behalf of the Editorial Board, thank you for being part of our important beginning; we are excited about building a vibrant and inclusive community of researchers together!

Prof. Dr. Yadav Raj Koirala
Chief Editor

Table of Contents

S.N.	Title	Writer Name	Page No.
1.	Hydroponic Farming of Leafy Vegetables: A Soil-less Approach to Sustainable Cultivation	*Anjina Kafle, Anup Chaudhary, Shambhu Prasad Dhital, Roshan Pajiyar, Ganesh K.C*	1-9
2.	Multi-Omics Approaches to Biomarker Discovery: Integration of Genomics, Proteomics, And Metabolomics for Precision Medicine — A Comprehensive Review	*Sandeep Thapa, Santosh Khanal, Govardhan Joshi, Dilip Bhattarai*	10-16
3.	Antibiotic Resistance Patterns of Uropathogens Isolated from Patients with Urinary Tract Infections at Kathmandu Medical College, a Tertiary Care Hospital in Nepal	*Anup Chaudhary, Suresh Joshi, Anjina Kafle, Ganesh K.C, Himadri Thapa*	17-27
4.	Dividend Distribution and Stock Price of Nepalese Commercial Banks	*Bhim Kumar Thapa, Ramesh Rasik Paudel, Rajesh Kumar Chaulagain*	28-37
5.	Factors Shaping MBA Students' Enrollment in Foreign-Affiliated Colleges	*Sunetra Pradhanang, Suresh Panthi, Avinash Shrestha*	38-47
6.	Workplace Ostracism and Turnover Intentions: A Moderated Mediation Model of Organizational Commitment and Emotional Intelligence in the Hospitality Industry	*Madan Dhungana, Anisha Shrestha*	48-61
7.	Green Human Resources Management and Employee Engagement in Nepalese Commercial Banks	*Nabin Kanujiya*	62-70
8.	Design, Modelling and Fatigue Life Analysis of a 450 Kg LPG Cylinder	*Swikrit Dahal, Sanjeev Maharjan*	71-81
9.	Emotional Intelligence and Employee Performance in Nepalese Commercial Banks	*Bikram Kumar Shrestha*	82-89
10.	Digital Transformation Adoption Among SMEs in Developing Economies: Evidence from Nawalparasi District, Nepal	*Kanhaiya Gupta*	90-98
Authors' Guidelines			99-103

Hydroponic Farming of Leafy Vegetables: A Soil-less Approach to Sustainable Cultivation

Anjina Kafle[1*], Anup Chaudhary[2], Shambhu Prasad Dhital[3], Roshan Pajiyar[4], Ganesh K.C[5]

[1]Himalayan White House International College, Putalisadak, Nepal, Email:anjina7kafle@gmail.com, https://orcid.org/0009-0008-6991-6400

[2]Himalayan White House International College, Putalisadak, Nepal, Email: anupchaudhary110@gmail.com, https://orcid.org/0009-0007-7193-5128

[3]Himalayan White House International College, Putalisadak, Nepal, Email: shapradhi@gmail.com, https://orcid.org/0009-0007-7475-4541

[4]Himalayan White House International College, Putalisadak, Nepal, Email: pajiyarroshan648@gmail.com, https://orcid.org /0009-0003-1492-4060

[5]Himalayan White House International College, Putalisadak, Nepal, Email: ganeshkc183@gmail.com, https://orcid.org/0009-0004-7943-4043

Volume 1, Issue no. 1, May 2026
Received Date: March 2, 2026
Revised Date: April 1, 2026
Accepted Date: May 2, 2026
ISSN: 3149-7144 (Print)
ISSN: 3149-7152 (Online)

Abstract

Background: Hydroponics, a soilless cultivation technique, has emerged as a sustainable alternative to traditional agriculture. With increasing urbanization, limited arable land, and climate variability, hydroponics offers efficient resource use and consistent crop production. Leafy vegetables are particularly responsive to hydroponic systems, making them ideal for evaluating productivity and nutritional outcomes.

Purpose: The purpose of the present research was to assess the growth performance, yield, and adaptability of selected crops, mustard greens, radish greens, Swiss chard, strawberries, and long beans, cultivated in a hydroponic vertical pipe system. The study aimed to determine crop suitability, nutrient uptake patterns, and overall system productivity.

Research Methodology: Four Horizontal pipes were established, each containing a different crop group. Pipe 1 contained mustard greens, Pipe 2 radish greens, Pipe 3 Swiss chard, and Pipe 4 a mixed system of strawberries and long beans. Growth parameters, including leaf expansion, stem strength, chlorophyll intensity, biomass accumulation, and flowering, were monitored. Observations were recorded systematically to evaluate crop performance under uniform nutrient solution and controlled environmental conditions.

Results Mustard greens showed rapid vegetative growth and produced the highest biomass among leafy crops. Radish greens demonstrated moderate growth, with high chlorophyll intensity and adaptability. Swiss chard produced the largest leaf area and highest leaf quality, making it visually and nutritionally optimal. Strawberries established strong root systems and flowered early, while long beans displayed vigorous vine elongation and required support structures. Overall, the horizontal hydroponic system supported robust development across all crop groups.

Conclusions: The study confirms that leafy vegetables such as mustard greens and Swiss chard are highly suitable for hydroponic vertical systems, while radish greens provide resilience under varying conditions. The successful establishment of strawberries and long beans highlights the versatility of hydroponics for mixed cropping strategies.

Implication: These findings underscore hydroponics as a sustainable, resource-efficient farming method capable of addressing food security challenges. Future applications include scaling vertical systems for urban agriculture, integrating automation and Internet of Things technologies, and expanding crop diversity to enhance productivity and resilience in both urban and rural contexts.

Keywords: Hydroponics, Soil-less cultivation, Leafy vegetables, Vertical farming, Nutrient uptake, and Sustainable agriculture

1. Introduction

The use of nutrient-enriched water solutions to cultivate plants without soil is known as hydroponics, and it has emerged as a key component of contemporary agricultural innovation (Thapa et al., 2024). The promise of this soilless method to address urgent issues, including dwindling arable land, water shortages, and the need for sustainable food production in both urban and rural environments, is increasingly recognized (Velazquez-Gonzalez et al., 2022a). Compared to conventional agricultural methods, hydroponics improves crop yields and quality by precisely controlling nutrients, pH, and environmental variables, thereby eliminating soil as the primary growth medium (Shareef et al., 2024; Velazquez-Gonzalez et al., 2022a). The effective delivery of vital nutrients directly to plant roots, often via methods such as nutrient film technique (NFT), deep water culture (DWC), and aeroponics, is the foundation of hydroponics. Hydroponics is a highly regulated and durable production method, as these systems not only maximize plant growth but also reduce the prevalence of soil-borne diseases and pests (Korsa et al., 2025). Because of their short growth cycles and high demand in international markets, leafy plants like lettuce, spinach, and kale are especially well-suited to hydroponic systems. Research has shown that, compared with soil-based farming, hydroponically grown leafy greens frequently produce higher yields and better nutritional quality (Chhetri et al., 2022). Additionally, hydroponics is essential to achieving sustainability objectives. Hydroponic systems are extremely resource-efficient, as they can use up to 90% less water and 60% less fertilizer than conventional agriculture (Regmi et al., 2024). In areas where water is scarce and the climate is unpredictable, this efficiency is especially important. Additionally, by enabling year-round production under controlled conditions, hydroponics reduces reliance on natural cycles. It lowers the risk of crop failure from extreme weather events, aligning with global food security objectives (Zee, 2024).

Perhaps the most prospective application of hydroponics is agriculture in urban areas. With rooftop gardens, vertical farms, and containerized systems, hydroponic farming offers a modular alternative for growing fresh vegetables in cities amid rapid urbanization and land scarcity. These developments improve local food security and resilience while also shortening the distance that food must travel (Ghimire et al., 2023a). Technological breakthroughs have further boosted the global popularity of hydroponics. Growing crops in hydroponics is now more effective and flexible, thanks to the combination of automation, robots, and IoT-enabled monitoring systems that have enhanced ventilation, nutrient delivery, and climate control. Advances in artificial intelligence (AI) now enable early disease diagnosis, optimal resource utilization, and predictive modeling of plant growth, all of which increase production and profitability (Dennison et al., 2025).

Emerging food systems, especially alien agriculture, are expected to rely heavily on hydroponics. The viability of hydroponic systems on space missions, where soil is unavailable, and resource efficiency is crucial, has been shown by research conducted by the National Aeronautics and Space Administration and other organizations. Hydroponics demonstrates its adaptability to support sustained food production for astronauts and prospective settlements on Mars (Srivastava et al., 2024).

The application of hydroponics as a soil-less cultivation technique, particularly for green crops, is the main emphasis of this study. The main focus is on understanding the fundamentals of hydroponic cultivation, including system designs such as the nutrient film technique (NFT). The study identifies crops that respond well to hydroponic systems because of their short growth cycles and high market demand, focusing on green vegetables such as lettuce, spinach, mustard, and strawberries.

2. Review of Literature

a. Principles of Hydroponics Farming

The foundation of hydroponics is soil-less cultivation, in which water solutions directly supply vital nutrients to plants. Unlike traditional farming, hydroponics provides precise control over nutrient concentrations, pH levels, and oxygen delivery, maximizing plant growth and reducing unpredictability from soil conditions. Research highlights that hydroponics is a reliable method for consistent crop production, as it improves nutrient uptake efficiency and reduces the risk of soil-borne diseases (Choi et al., 2025; Nikolov et al., 2023).

b. System Designs in Hydroponics

Through many successful system designs that apply soilless farming principles, hydroponic farming has evolved. Aeroponics, Ebb and Flow systems, Deep Water Culture (DWC), and Nutrient Film Technique (NFT) are some of the most popular.

i. Wick system

One of the most basic types of hydroponic farming, the wick system is popular for indoor and small-scale farming. Because it requires no electricity or pumps, this passive hydroponic method is affordable and accessible to novices. This device uses capillary action to move the nutrient solution from a reservoir to the plant root zone via a wick made of absorbent material like cotton or nylon. The fertilizer solution's constant flow ensures the growing medium stays moist and plants receive a consistent supply of water and vital nutrients. The efficiency of wick hydroponic systems for crop production has been assessed in several studies.

(Rajendran et al., 2024) examined how wick quantity and orientation affected seed potato growth in a hydroponic system. According to their research, vertical wick layouts were more effective in transporting water and nutrients than horizontal ones. Higher tuber yield, greater plant vigor, and improved root development were all demonstrated by plants cultivated with optimal wick designs. The study also showed that wick hydroponic systems, which require less electricity and upkeep, can support sustainable crop production. These results demonstrate the promise of wick-based hydroponic systems as a workable alternative for controlled-environment production, urban agriculture, and small-scale farming, especially in areas with limited access to sophisticated hydroponic infrastructure.

ii. Drip system

The drip hydroponic method works especially well for growing crops such as tomatoes and peppers. In these systems, a nutrient solution is delivered directly to the plant roots through pipes and hoses. The flow of the solution is carefully controlled to ensure the right amount reaches the plants at the right time. The solution is delivered at set intervals, allowing precise control over how many nutrients the plants receive. In closed-loop systems, any excess solution not used by the plants is collected and returned to the storage tank for reuse. This makes the system very efficient and helps save water. Overall, this method creates a controlled environment that supports healthy plant growth while using resources wisely (Rajendran et al., 2024; Sambo et al., 2019).

iii. Nutrient Film Theory System

The Nutrient Film Technique (NFT) involves keeping a thin layer of nutrient solution, usually just a few millimeters thick, at the bottom of a deep tank. This method allows the lower part of the plant roots to be in contact with the nutrient film, ensuring they receive sufficient water and nutrients. In contrast, the upper part of the roots remains exposed to air, which helps oxygenate and supports healthy root growth. First, the plants grow roots that reach the nutrient film and then spread out horizontally, helping them absorb more nutrients. The roots are not completely covered in water but are constantly or periodically washed by a flowing nutrient solution that moves through a series of pipes. This flow exposes the root surfaces to air, which improves aeration. A pump continuously checks and circulates the nutrient solution, which is then returned to a storage tank by gravity for reuse, making the system efficient. While NFT uses less nutrient solution than floating root systems, it requires additional energy and equipment to function properly. This system is especially well-suited for plants that require well-oxygenated roots, such as tomatoes and peppers, and provides a controlled environment that supports healthy growth (Korsa et al., 2025; Velazquez-Gonzalez et al., 2022).

iv. Aeroponics

Tubers and root vegetables are well-suited to aeroponic cultivation. In this method, the plant's roots hang in the air and receive nutrients through regular misting by a sprinkler system. The main benefit of this approach is that it does not require a separate aeration system, as oxygen is included in the nutrient

spray. By allowing roots to remain in the air while receiving nutrients via gentle misting, aeroponics supports strong root growth and improved nutrient uptake, making it a suitable method for growing tubers and root crops (Velazquez-Gonzalez et al., 2022b).

c. Leafy Vegetable in a Hydroponic System

Because of their short growth cycles and strong market demand, green crops are especially well-suited to hydroponic production. Compared with soil-based agriculture, crops such as lettuce, spinach, kale, and basil flourish in NFT and DWC systems, yielding higher yields and better nutritional quality. According to research, hydroponically cultivated leafy greens often exhibit higher survival rates and faster growth in controlled environments (Ekka, 2024). Additionally, hydroponics enables the year-round production of leafy vegetables, ensuring a consistent supply of fresh produce in both urban and rural areas (Shareef et al., 2024).

i. Advantages and Challenges of the Hydroponics System

Water savings of up to 90%, reduced pesticide use, and space efficiency in urban settings are just a few of the benefits of hydroponics. Additionally, by reducing fertilizer consumption and facilitating output in non-arable areas, it promotes sustainable agriculture (Regmi et al., 2024). There are still issues, though, such as high setup costs, the need for technological expertise, and reliance on power for lighting and pumps, which might restrict accessibility. Crop health can be rapidly jeopardized by system malfunctions such as pump malfunctions or nutrient imbalances, highlighting the necessity of effective management techniques (Gurung et al., 2024).

d. Global Application and the prospect

Hydroponics has been used worldwide in a variety of settings, from urban rooftop gardens in North America to commercial vertical farms in Asia and Europe. By facilitating domestic production and lowering dependency on imports, it promotes food security (Ghimire et al., 2023). The scalability and effectiveness of hydroponics are increasing thanks to technological advancements like IoT sensors, AI monitoring, and robotics (Dennison et al., 2025). With NASA and other organizations investigating its potential for space missions, hydroponics is expected to play a role in future extraterrestrial agriculture (Srivastava et al., 2024).

3. Methodology

a. System Design and Construction

Four 100-mm-diameter PVC pipes were arranged in a multi-tier horizontal configuration, supported by a metal frame, to create a Nutrient Film Technique (NFT) hydroponic system. There were uniformly spaced holes in each PVC channel for positioning net pots. PVC elbows were used to connect the channels sequentially, allowing the nutrient solution to flow by gravity from the highest to the lowest.

The main source of nutrients was an elevated nutrient reservoir tank. At the system's base was a nutrient-collection tank labeled. A continuous recirculating loop was created by a submersible pump placed inside the collection tank, which pumped the nutrient solution back to the raised reservoir via flexible tubing (Fig 1).



Figure 1 : *Hydroponics System Design*

b. Nutrient Solution Preparation

In accordance with recommended concentrations for leafy crops, a standard hydroponic fertilizer solution containing essential macronutrients and micronutrients was prepared. The pH of the solution was maintained between 5.5 and 6.5, while the electrical conductivity (EC) was maintained between 1.2 and 1.8 mS/cm. Every day, portable meters were used to measure pH and EC. Every 10 to 15 days, the entire reservoir was replenished with a fresh fertilizer solution to account for evaporation and plant uptake.

c. Seedling Preparation and Transplanting

To guarantee consistent germination and root development, seedlings were first grown in cocopeat. Seedlings were moved into net pots with cocopeat once they had two or three real leaves. The lower part of the roots was then kept in contact with the flowing nutrient film by inserting the net pots into the openings in the PVC tubes.

d. Operation of the Hydroponics System

The system operated on a continuous flow principle. The submersible pump fed the nutritional solution from the collection tank to the top PVC channel, from which it flowed downward through each channel by gravity. To ensure that the root zone always had access to nutrients and oxygen, a thin layer of nutrient solution (about 2–3 mm thick) was applied along the base of each channel. The recirculation cycle was completed when the solution reached the collection tank.

To ensure proper flow, identify leaks, and prevent blockages in the channels and tubes, daily checks were conducted.

e. Environmental condition

The hydroponic system was set up inside a greenhouse that had a green shade net covering it. This semi-controlled setting helped regulate ventilation, temperature, and light intensity. In addition to shielding the system from rain, dust, and external pollutants, the shade net reduced exposure to direct sunlight and minimized heat buildup. Throughout the cultivation phase, temperature and overall plant health were tracked.

f. Maintenance and Data observation

Checking water levels, cleaning algae-prone areas, and ensuring the pump and connections were operating properly were all part of routine maintenance. Before adding a new solution, the collection tank and nutrient reservoir were cleaned. Visual observations of leaf growth, color, and vigor were used to track plant development. Throughout the culture phase, observations were made about root development, nutrient deficits, and system performance.

4. Results

All four crop groups were grown using the hydroponic horizontal pipe system: mustard greens (Raya) in Pipe 1, radish greens in Pipe 2, Swiss chard in Pipe 3, and a mixed cultivation of long beans and strawberries in Pipe 4. The variable growth performance of the crops suggests that they differ in their adaptation to the hydroponic environment. The system supported physiological activities, including photosynthesis and nutrient uptake, by continuously circulating nutrients.

a. Growth performance Across the pipe

Over the course of the trial, mustard greens grown in Pipe 1 showed rapid vegetative growth. Plants reached an average height of about 19-20 cm and produced 9-12 leaves per plant at 25 days after transplanting (day after transplanting). The favorable growing conditions and effective nutrient assimilation in the hydroponic system are demonstrated by the average fresh biomass of 43.5 g per plant.

Additionally, the radish greens cultivated in Pipe 2 showed steady vegetative growth. Plants reached an average height of 17-18 cm and produced roughly 10-11 leaves per plant at harvest (25 days after transplanting). The average fresh biomass per plant was found to be between 45 g, indicating adequate nutrient consumption and plant growth.

Among the leafy vegetables assessed in this study, Swiss chard grown in Pipe 3 showed the greatest vegetative development. At 25 days after transplanting, the average plant height was 24-25 cm, and each plant produced 13-14 leaves. The average fresh biomass per plant was approximately 58 g, indicating improved vegetative performance, likely due to the plant's greater leaf surface area and more effective utilization of available nutrients.

The fruiting crops grown in Pipe 4 showed relatively restricted growth under the experimental conditions, in contrast to the green vegetables. Early in their lives, long bean plants showed little vegetative development. Within 25 days after transplanting, each plant barely produced two to four leaves, and there was very little vine elongation. Additionally, no pod formation was observed during the trial period, indicating that the hydroponic conditions used in this investigation were not ideal for long-term bean growth.

Table 1: Growth performance of crops cultivated in the hydroponic horizontal pipe system

Crop	Pipe No.	Observation Period (Days)	Average Height / Vine Length	Leaves per Plant
Mustard greens (Raya)	Pipe 1	25	19-20 cm	12
Radish greens	Pipe 2	25	17-18 cm	11
Swiss chard	Pipe 3	25	24-25 cm	14
Long bean	Pipe 4	20-25	4-5 cm	2-4
Strawberry	Pipe 4	30-40	-	-

The comparative growth performance of five crops grown in a hydroponic horizontal pipe system is shown in Figure 2. After 25 days of culture, Swiss chard reached an average height of 24.5 cm, the highest vegetative growth among the assessed species. With mean heights of 19.5 cm and 17.5 cm, respectively, mustard and radish greens both showed significant growth. Long bean plants, on the other hand, showed little early-stage development; over the 25-day observation period, their average vine length was only 4.5 cm. During the 30-40-day cultivation period, strawberry plants showed no discernible growth, indicating a lack of adaptation to the hydroponic conditions used in this system. The hydroponic horizontal pipe layout is particularly conducive to leafy vegetable growth, as evidenced by significant differences in plant height among the investigated crops. This is probably because leafy vegetables have shorter growth cycles and require less structural support than fruiting crops.

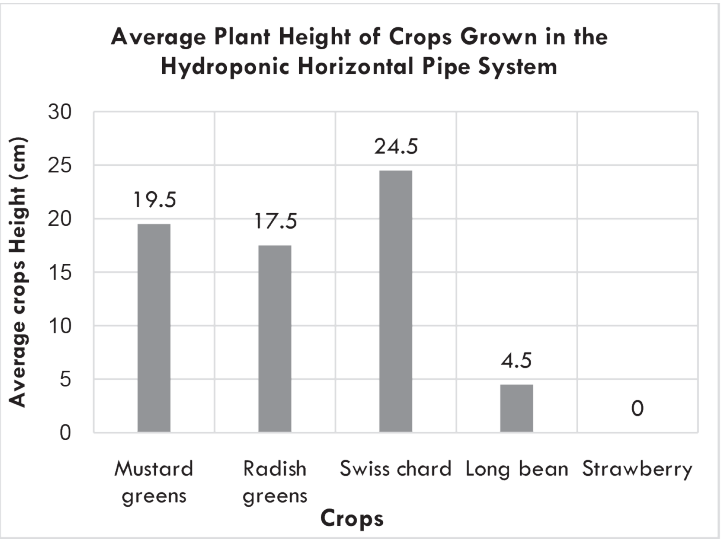


Figure 2 : *Growth performance of crops cultivated in a hydroponic horizontal pipe system*

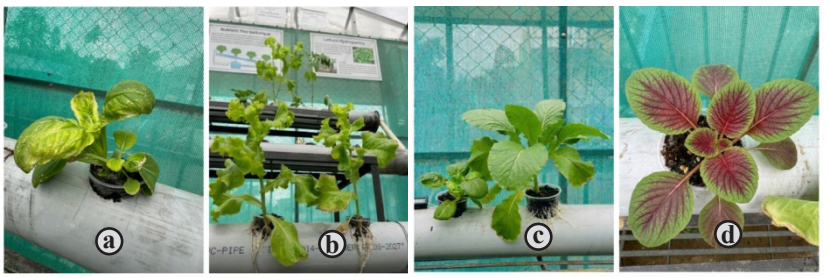


Figure 3 *: Representative growth stages of crops cultivated in the hydroponic horizontal pipe system*

(a) Young mustard plant showing early vegetative development;
(b) Swiss chard exhibiting vigorous leaf growth and characteristic pigmentation;
(c) Mature mustard greens demonstrating expanded leaf development;
(d) Radish greens grown under hydroponic conditions with moderate vegetative growth

5. Discussion

The hydroponic vertical pipe system demonstrated strong adaptability across diverse crop groups, with growth performance varying according to species and nutrient uptake patterns.

Mustard greens (Pipe 1) showed rapid vegetative growth and produced the highest biomass among leafy crops. This result is consistent with findings that hydroponic mustard greens can yield up to 10 times more per square foot than traditional soil farming, due to precise nutrient delivery and controlled environments (Rochester Hydroponics, 2024; Agri Farming, 2024). Their uniform height and broad leaf expansion highlight their suitability for vertical hydroponic systems.

Radish greens (Pipe 2) exhibited moderate growth, with thicker leaves and stronger stems, and showed high chlorophyll intensity. Hydroponic radishes are known for rapid germination and adaptability, with success rates of up to 80% under controlled nutrient conditions (Hydrobuilder Learning Center, 2024; Henry's Hydroponics, 2024). The adaptability observed here reinforces radish greens' potential in vertical hydroponic farming.

Swiss chard (Pipe 3) produced the largest leaf area and highest leaf quality, with glossy leaves and minimal nutrient stress. Hydroponic Swiss chard has been reported to achieve superior nutrient absorption, higher yields, and reduced water usage compared to soil cultivation (Gardening Tips, 2024; Rochester Hydroponics, 2024). These findings confirm Swiss chard's reliability as a visually and nutritionally optimal crop in vertical systems.

The **mixed-crop system (Pipe 4) highlighted the versatility of hydroponics**. Strawberries established strong root systems and flowered early, consistent with studies showing that hydroponic strawberries thrive in nutrient-rich water solutions and enable year-round production (Hydroponic Systems EU, 2023). Long beans demonstrated vigorous vine elongation and responded well to nutrient cycling, aligning with reports that hydroponic beans achieve high yields and require structural support for optimal growth (Agri Farming, 2024).

Overall, the results confirm that leafy vegetables such as mustard greens and Swiss chard are highly suited to hydroponic vertical systems, while radish greens demonstrate resilience and adaptability. The successful establishment of strawberries and long beans underscores the potential of hydroponics for mixed cropping strategies, expanding beyond leafy vegetables to include fruiting and vining crops.

6. Conclusion

The study emphasizes the effectiveness of hydroponic horizontal pipe systems for a variety of crop types. Mustard greens produced the most biomass and showed quick vegetative growth, demonstrating their feasibility for cultivation without soil. Despite growing more slowly, radish greens demonstrated adaptation and resilience with robust stems and high chlorophyll intensity. Swiss chard produces huge, glossy leaves with no nutrient stress, making it the most aesthetically pleasing leafy crop. Long beans showed significant vine elongation and responsiveness to nitrogen cycling, while strawberries established robust root systems and

flowered early, further demonstrating the adaptability of hydroponics. The majority of the findings indicate that while radish greens offer flexibility across a variety of settings, leafy plants such as Swiss chard and mustard greens are especially well-suited to hydroponic systems. The ability of hydroponics to diversify production beyond leafy vegetables is demonstrated by the effective integration of fruiting and vining crops. This study supports hydroponics as a flexible, resource-efficient, and sustainable farming technique that can encourage creative agricultural practices in both urban and rural settings and address issues related to food security.

7. Limitation and Direction of Study

This study has several shortcomings despite the encouraging outcomes. First, the horizontal pipe system was tested on a small scale, which may not accurately reflect the challenges encountered in commercial hydroponics at larger scales.

Second, insights into crop performance across varying conditions were limited because environmental factors, including temperature, humidity, and light intensity, were controlled rather than varied.

Third, all crop groups used the same nutrient solution, which might not have maximized development for species with different nutrient needs. Furthermore, Pipe4's mixed-cropping method created resource competition, making it challenging to separate the performance of long beans and strawberries.

Lastly, long-term productivity and sustainability were not investigated because the study period was restricted to early growth and initial yield data.

To assess the commercial viability and economic sustainability of hydroponic vertical systems, further study should focus on scaling them up. A deeper understanding of crop resilience and adaptability would be possible through comparative trials conducted under various environmental conditions. To optimize production and quality, customized fertilizer formulas for individual crops, especially in mixed systems, should be investigated. Long-term research is required to evaluate system longevity, nutrient cycling efficiency, and continuing productivity. Incorporating cutting-edge technologies such as automated nutrient delivery, AI-driven monitoring, and Internet of Things sensors could improve accuracy and reduce labor costs. Lastly, investigating hydroponics for a variety of crop types, such as fruit plants, legumes, and medicinal herbs, would expand its use and improve food security worldwide.

7. Acknowledgment

We sincerely thank our supervisor, Mr. Shambhu Prasad Dhital, for his constant guidance, insightful advice, and steadfast support throughout this project. His support and knowledgeable counsel were crucial in determining the course and caliber of this research. Additionally, I am grateful to the Department of Biotechnology and Microbiology at Himalayan White House International College for providing the required resources and a nurturing learning atmosphere. I want to express my gratitude to all of the faculty members for their helpful advice and support during the writing and experimentation process.

I would also like to thank my classmates and coworkers for their assistance with data collecting, plant development tracking, and hydroponic system setup.

8. Conflict of interest

The authors declare that there is no conflict of interest regarding the publication of this research article.

References

Agri Farming. (2024, September 2). *Growing mustard greens hydroponically – Without soil*. https://www.agrifarming.in/growing-mustard-greens-hydroponically-without-soil

Agri Farming. (2024, September 2). *Hydroponic beans farming – Yield, pH, nutrients*. https://www.agrifarming.in/hydroponic-beans-farming-yield-ph-nutrients

Chhetri, S., Dulal, S., Subba, S., & Gurung, K. (2022). Effect of different growing media on the growth and yield of leafy vegetables in a nutrient film technique hydroponic system. *Archives of Agriculture and Environmental Science, 7*(1), 12–19.

Choi, I., Cho, H., Haque, A. M., Bouain, N., Brandizzi, F., & Rouached, H. (2025). A scalable hydroponic system for precise nutrient and stress studies in plants. *Current Protocols, 5*(7). https://doi.org/10.1002/cpz1.70182

Dennison, M. S., Kumar, P. S., Wamyil, F., Meji, M. A., & Ganapathy, T. (2025). The role of automation and robotics in transforming hydroponics and aquaponics on a large scale. *Discover Sustainability, 6*(1), 105.

Ekka, A. (2024). A comparative study of growth parameters for leafy vegetables cultivated in soil and hydroponic systems. *International Journal of Agriculture and Environmental Research, 10*(5), 709–721.

Gardening Tips. (2024). *Growing Swiss chard hydroponically – A full guide*. https://gardeningtips.in/growing-swiss-chard-hydroponically-a-full-guide

Ghimire, A., Dahal, M., & Karki, R. (2023). Hydroponics: An innovative approach to urban agriculture. *Nepalese Journal of Agricultural Sciences, 25*, 89–98.

Gurung, L., Rawal, J. S., Puspa, R. C., Joshi, G. R., & Mandal, A. (2024). Vertical farming in urban agriculture: Opportunities, challenges, and future directions. *Big Data Agriculture, 6*, 89–95.

Henry's Hydroponics. (2024, January 1). *Growing radishes hydroponically for success*. https://henrys-hydroponics.com/blog/how-to-grow-radishes-hydroponically/

Hydrobuilder Learning Center. (2024). *How to grow hydroponic radish.* https://learn.hydrobuilder.com/hydroponic-radish/

Hydroponic Systems EU. (2023, December 28). *Complete guide to hydroponic strawberry farming.* https://hydroponicsystems.eu/guide-of-hydroponic-strawberry-farming/

IGWorks. (2024). *Growing hydroponic mustard greens*. https://igworks.com/blogs/growing-guides/growing-hydroponic-mustard-greens

Korsa, G., Ayele, A., Haile, S., & Alemu, D. (2025). Hydroponic farming: Innovative solutions for sustainable and modern cultivation techniques. Hydroponic Farming – A Modern Agriculture Technique.

Nikolov, N. V., Atanasov, A. Z., Evstatiev, B. I., Vladut, V. N., & Biris, S. S. (2023). Design of a small-scale hydroponic system for indoor farming of leafy vegetables. *Agriculture (Switzerland), 13*(6). https://doi.org/10.3390/agriculture13061191

Rajendran, S., Domalachenpa, T., Arora, H., Li, P., Sharma, A., & Rajauria, G. (2024). Hydroponics: Exploring innovative sustainable technologies and applications across crop production, with emphasis on potato mini-tuber cultivation. *Heliyon, 10*(5). https://doi.org/10.1016/j.heliyon.2024.e26823

Regmi, A., Rueda-Kunz, D., Liu, H., Trevino, J., Kathi, S., & Simpson, C. (2024). Comparing resource use efficiencies in hydroponic and aeroponic production systems. *Technology in Horticulture, 4*(1). https://doi.org/10.48130/tihort-0024-0002

Rochester Hydroponics. (2024, August 21). *Grow hydroponic Swiss chard successfully*. https://rochesterhydroponics.net/hydroponic-swiss-chard/

Rochester Hydroponics. (2024, August 25). *Grow hydroponic mustard greens efficiently.* https://rochesterhydroponics.net/hydroponic-mustard-greens/

Sambo, P., Nicoletto, C., Giro, A., Pii, Y., Valentinuzzi, F., Mimmo, T., Lugli, P., Orzes, G., Mazzetto, F., Astolfi, S., Terzano, R., & Cesco, S. (2019). Hydroponic solutions for soilless production systems: Issues and opportunities in a smart agriculture perspective. *Frontiers in Plant Science, 10*. https://doi.org/10.3389/fpls.2019.00923

Shareef, U., Rehman, A. U., & Ahmad, R. (2024). A systematic literature review on parameter optimization for smart hydroponic systems. *AI (Switzerland), 5*(3), 1517–1533. https://doi.org/10.3390/ai5030073

Srivastava, S., Haldar, S., Rana, A. S., Prakash Gairola, S., Yadav, S., & Lipidharan, K. (n.d.). *Hydroponic: A study of space farming*. https://www.ijfmr.com

Thapa, B., Bhandari, P., Acharya, Y., & Phuyal, S. (2024). Application of a hydroponic system. *KEC Journal of Science and Engineering, 8*(1).

Velázquez-González, R. S., García-García, A. L., Ventura-Zapata, E., Barceinas-Sánchez, J. D. O., & Sosa-Savedra, J. C. (2022). A review on hydroponics and the technologies associated with medium- and small-scale operations. *Agriculture, 12*(5), 646.

Zee, C (2024). *Providing food security through hydroponic systems.*

Multi-Omics Approaches to Biomarker Discovery: Integration of Genomics, Proteomics, And Metabolomics for Precision Medicine - A Comprehensive Review

Sandeep Thapa[1*], Santosh Khanal[2], Govardhan Joshi[3], Dilip Bhattarai[4]

[1]Kathmandu Center for Genomics and Research Laboratory, Lalitpur, Nepal, Email:sandeep@cils.org.np, https://orcid.org/0000-0002-0543-0398

[2]Kathmandu Center for Genomics and Research Laboratory, Lalitpur, Nepal, Email:ask.san@gmail.com, https://orcid.org/0000-0001-7738-352X

[3]Kathmandu Center for Genomics and Research Laboratory, Lalitpur, Nepal, Email:gobu2001@gmail.com, https://orcid.org/0000-0003-3819-2303

[4]Department of Biotechnology, Himalayan WhiteHouse International College, Kathmandu, Nepal, Email: dilip.bhattarai11@gmail.com, https://orcid.org/0009-0008-7991-0360

Abstract

The advent of high-throughput molecular profiling technologies has revolutionized biomedical research, allowing scientists to explore complex biological systems at multiple levels:genomic, proteomic, and metabolomic. These combined "multi-omics" approaches are proving instrumental in identifying reliable biomarkers essential for the success of precision medicine. This review explores the current landscape of multi-omics integration, from technological advances to computational frameworks, and delves into their real-world applications in disease diagnostics and prognostics. We discuss how integrating diverse datasets enhances clinical insights and outline the challenges in standardization, data harmonization, and clinical translation. Emerging tools, including artificial intelligence, are highlighted for their potential to manage complexity and propel discoveries from the lab to the clinic.

Keywords:Computational frameworks, Genomics, Multi-omics integration, Precision medicine, Proteomics

Volume 1, Issue no. 1, May 2026
Received Date: March 4, 2026
Revised Date: April 3, 2026
Accepted Date: May 3, 2026
ISSN: 3149-7144 (Print)
ISSN: 3149-7152 (Online)

1. Introduction

Precision medicine is changing the way we treat people by using their unique genetic information to guide healthcare decisions. At the heart of this approach lies the identification of biomarkers, which are also known as biological indicators that can inform disease risk, progression,therapeutic response, or emerging approaches to disease treatment (Banappagoudar et al., 2023).

Historically, biomarker research has leaned heavily on single-layer omics data, such as genomics or proteomics. However, these isolated views often fall short of capturing the intricate web of biological interactions that underpin complex diseases. (Thiele et al., 2024; Wu & Xie, 2025). As a solution, multi-omics approaches—integrating genomic (DNA), proteomic (proteins), and metabolomic (metabolites) data—offer a more holistic picture of human biology. (Luo et al., 2024).

This review presents a comprehensive look at how multi-omics data integration is transforming biomarker discovery, addressing both methodological developments and real-world clinical applications.

1.1 Objectives

- To explore foundational principles and recent advances in genomics, proteomics, and metabolomics related to biomarker identification
- To evaluate computational strategies for combining diverse omics data
- To illustrate how multi-omics has been successfully applied in disease research
- To discuss barriers to implementation and propose future directions

2. Genomic Insights into Disease Signatures

Genomics provides a foundational layer in molecular medicine, revealing DNA-level variations such as single-nucleotide polymorphisms (SNPs), insertions, deletions, and structural changes (Splus, 2001). Techniques such as whole-genome sequencing (WGS), whole-exome sequencing (WES), and genome-wide association studies (GWAS) have uncovered numerous genetic associations with diseases (Dehghan & Salehi, 2023; Tan et al., 2024).

For example, mutations in the tumor protein p53 (TP53) gene, breast cancer susceptibility genes 1 and 2 (*BRCA1/2*), and Kirsten rat sarcoma virus oncogene homolog (*KRAS*) are established biomarkers in oncology. However, genetic information alone often fails to fully account for phenotypic variability, as gene expression is influenced by epigenetics, environmental exposures, and regulatory networks—highlighting the need for a multidimensional molecular approach. (Kim et al., 2023; Singh et al., 2025)

3. Proteomics: Linking Genes to Function

Proteomics focuses on the proteins that carry out the biological instructions encoded in DNA. Unlike genomics, which is relatively static, proteomics provides dynamic insights into protein expression, post-translational modifications, and interactions under various physiological or pathological conditions. (Dogiparthi et al., 2025; Qoronfleh, 2025).

Advancements in mass spectrometry (MS)—such as tandem MS, isobaric tagging (iTRAQ, TMT), and data-independent acquisition (DIA)—have made it possible to conduct large-scale protein profiling with high precision. Clinically, protein biomarkers like prostate-specific antigen (PSA) and tau proteins have become key tools in diagnosing prostate cancer and Alzheimer's disease, respectively. (Fröhlich et al., 2024; Moulder et al., 2018).

By combining proteomic and genomic data, researchers can better understand the downstream effects of genetic variants and identify potential therapeutic targets.

4. Metabolomics: The Final Layer of Molecular Information

Metabolomics captures the small-molecule byproducts of cellular activity, providing a snapshot of an organism's physiological state. Techniques such as nuclear magnetic resonance (NMR) and mass spectrometry

(coupled with chromatography methods like LC-MS and GC-MS) enable detailed metabolite profiling. (Koek et al., 2011; Nafie et al., 2025).

Alterations in metabolic pathways often occur early in disease development, making metabolites valuable biomarkers. For instance, elevated branched-chain amino acids have been linked to insulin resistance, while lipidomic changes can signal cardiovascular risks. Because metabolites are downstream of genomic and proteomic regulation, they offer a near-phenotypic readout that is highly responsive to both internal and external influences. (Cheng et al., 2017).

5. Integrating Multi-Omics Data

5.1 Challenges in Integration

Combining diverse omics datasets presents several hurdles:

- Variability in data formats and measurement scales
- Inconsistent sample sizes and missing values
- Batch effects introduced by different experimental protocols
- High dimensionality and low sample-to-variable ratios

5.2 Strategies for Data Integration

- **Early Integration**: Raw datasets are merged at the outset. While comprehensive, this method risks overfitting due to dimensional complexity.
- **Intermediate Integration**: Key features are extracted independently from each omics layer before merging, improving interpretability.
- **Late Integration**: Predictive models are built separately on each data type and then combined, often using ensemble learning.

5.3 Computational Approaches

- **Statistical Models**: Techniques like Canonical Correlation Analysis (CCA), Partial Least Squares (PLS), and Multi-Omics Factor Analysis (MOFA) identify correlations across data layers (Athieniti & Spyrou, 2023).
- **Network-Based Tools**: Protein interaction networks and gene regulatory maps contextualize data within known biological pathways.
- **Machine Learning**: Algorithms like random forests and support vector machines uncover complex, non-linear relationships.
- **Deep Learning**: Neural networks, including autoencoders and graph neural networks (GNNs), can model intricate, high-dimensional data structures.

Multi-omics biomarker discovery follows a sequential process that includes biological sample collection, generation of omics data, data integration, and analysis for clinical interpretation. The overall workflow of this process is shown in Figure 1. Common computational methods used for integrating multi-omics data, along with their typical applications, are listed in Table 1.

6. Real-World Applications in Disease Research

6.1 Oncology

Cancer has been at the forefront of multi-omics research. The Cancer Genome Atlas (TCGA) integrated genomics, epigenomics, transcriptomics, and proteomics to redefine tumor classification and identify therapeutic targets. In breast cancer, multi-omics integration of PAM50 gene expression panels with proteomic and metabolomic profiles has refined subtype characterization and predicted drug resistance.

In Nepal, where breast and cervical cancers are among the leading causes of female morbidity and mortality, multi-omics can provide localized molecular insights to improve early detection and treatment

strategies. Additionally, hepatocellular carcinoma (HCC), linked to hepatitis B and C infections endemic in South Asia, has benefited from multi-omics analyses revealing metabolic reprogramming and immune microenvironment alterations, informing biomarker-driven therapies. (Cai et al., 2022).

6.2 Metabolic Disorders

Type 2 diabetes mellitus (T2DM) and metabolic syndrome are major public health concerns in Nepal and globally. Multi-omics integration has uncovered complex interactions among genetic predisposition (e.g., variants in TCF7L2), proteomic alterations in insulin signaling pathways, and metabolomic signatures, such as branched-chain amino acids, that predict insulin resistance and progression to diabetes. (Bazzazzadehgan et al., 2025).

Recent studies incorporating environmental factors, such as pesticide exposure common in rural Nepalese farming communities, have revealed gene-environment-metabolite networks that influence metabolic disease risk, highlighting the value of multi-omics in public health interventions. (Bugingo et al., 2025; Kafle et al., 2021).

6.3 Neurological Diseases

Neurodegenerative diseases, including Alzheimer's and Parkinson's, pose significant challenges due to their multifactorial etiology. Multi-omics studies have mapped networks involving genetic risk loci (APOE, SNCA), proteomic biomarkers (tau, alpha-synuclein), and metabolomic alterations linked to mitochondrial dysfunction and oxidative stress. (Bazzazzadehgan et al., 2025; Cocoş& Popescu, 2024).

Psychiatric disorders like schizophrenia and bipolar disorder are being explored through multi-omics lenses to identify biomarkers predictive of treatment response and disease trajectory. Such approaches are nascent but promising, particularly in LMIC contexts where mental health resources are limited. (Dhieb & Bastaki, 2025).

6.4 Infectious Diseases

Nepal's burden of infectious diseases like tuberculosis (TB), dengue, and COVID-19 highlights the urgent need for precise diagnostics and prognostics. Multi-omics integration has revealed host-pathogen interaction signatures—such as combined transcriptomic and metabolomic profiles distinguishing latent from active TB.

Proteomic identification of viral and host proteins during dengue infection has informed vaccine development and the identification of disease severity markers. The COVID-19 pandemic accelerated the global adoption of multi-omics applications, enabling the identification of immune and metabolic biomarkers predictive of severe disease and long COVID syndromes. (Agamah et al., 2024; Han et al., 2019).

6.5 cardiovascular diseases (CVD)

CVD remains the leading cause of mortality worldwide, including Nepal. Multi-omics approaches integrating genomics (e.g., variants at the 9p21 locus), proteomics (inflammatory and coagulation factors), and metabolomics (lipidomics) have advanced the understanding of atherosclerosis, heart failure, and hypertension. (Zhan et al., 2023).

Biomarkers derived from multi-omics data facilitate risk stratification and personalized therapy, including prediction of statin responsiveness, which is crucial for optimizing resource allocation in healthcare systems with limited capacity.

7. Outlook and Challenges: Implementing Multi-Omics in LMICs

7.1 Data Standardization and Sharing

The absence of uniform data generation and analysis protocols remains a major bottleneck. Adopting international standards such as Minimum Information About a Microarray Experiment. (MIAME)For microarray data, FAIR principles for data sharing are critical. Developing Nepal-specific repositories and encouraging open-access policies will enhance reproducibility and foster regional collaborations.

7.2 Infrastructure and Capacity Building

Robust computational infrastructure and trained personnel are prerequisites for multi-omics research. Nepal faces challenges, including limited high-performance computing resources and bioinformatics expertise. Strategic investments in cloud computing, regional data centers, and interdisciplinary training programs are imperative to build sustainable capabilities.

7.3 Ethical, Legal, and Social Implications (ELSI)

Given the sensitivity of omics data, especially genomics, rigorous ethical frameworks must safeguard participant privacy, ensure informed consent, and promote equitable benefit sharing. Cultural considerations unique to Nepal's diverse ethnic groups require tailored engagement strategies to build trust and avoid exploitation.

7.4 Cost and Clinical Translation

Translating multi-omics biomarkers into routine clinical practice demands cost-effective assays and a clear demonstration of clinical utility. Partnerships with government health agencies, international funders, and local stakeholders will be essential for developing accessible diagnostics tailored to Nepal's healthcare system.

7.5 Future Directions: Emerging Omics and Technologies

Expanding to transcriptomics, epigenomics, microbiomics, and single-cell analyses will deepen biological understanding. Additionally, leveraging wearable sensors, liquid biopsies, and AI-driven predictive models can revolutionize real-time disease monitoring and precision medicine delivery in resource-limited settings.

8. Conclusion

The integration of multi-omics data marks a transformative step toward unraveling complex disease mechanisms and advancing precision medicine globally. While high-resource settings continue to drive methodological innovation, it is critical to adapt these advances to the needs and constraints of LMICs such as Nepal. Addressing infrastructural, ethical, and socio-cultural challenges through capacity building, collaborative networks, and inclusive research policies will ensure that the benefits of multi-omics reach diverse populations and contribute meaningfully to global health equity.

Figure and Table

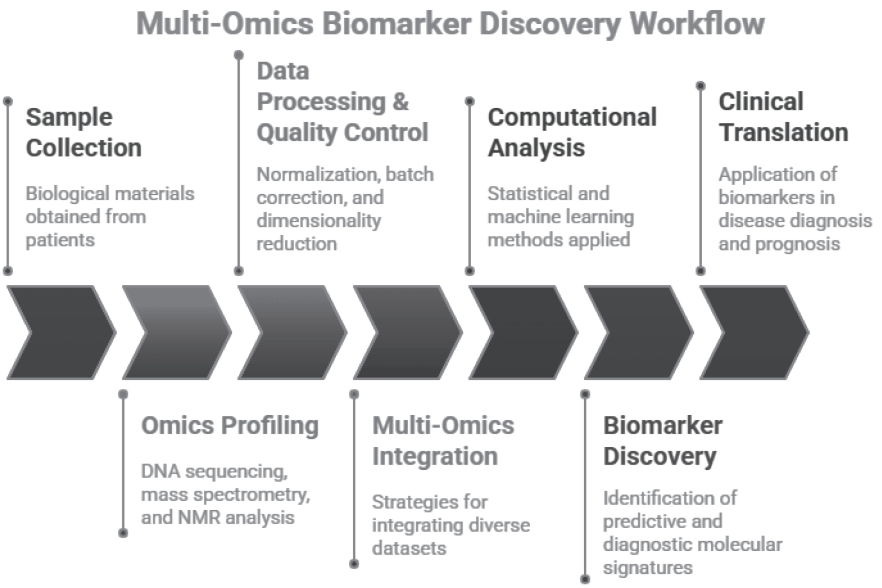


Figure 1: *Workflow of multi-omics biomarker discovery, from sample collection to clinical application.*

Table 1: *Overview of common multi-omics integration tools and their applications.*

Tool/Method	Type	Description	Application Example
MOFA	Statistical	Latent factor modeling across omics layers	Cancer subtype classification
Random Forest	Machine Learning	Non-linear classification of multi-omics data	Diabetes biomarker prediction
Graph Neural Networks	Deep Learning	Network-based integration of omics data	Integrated biomarker discovery in cancer

Acknowledgement

The authors would like to acknowledge all colleagues for their steering support and encouragement during the preparation of this manuscript, as well as for their insightful discussions and constructive feedback.

Conflict of Interest

The authors declare no conflict of interest.

References

Agamah, F. E., Ederveen, T. H. A., Skelton, M., Martin, D. P., Chimusa, E. R., & 't Hoen, P. A. C. (2024). Network-based Multi-omics Disease–Drug Associations Reveal Drug Repurposing Candidates for Covid-19 Disease Phases. *Drug Repurposing*, *1*(1), 1–22. https://doi.org/10.58647/drugrepo.24.1.0007

Athieniti, E., & Spyrou, G. M. (2023). A guide to multi-omics data collection and integration for translational medicine. *Computational and Structural Biotechnology Journal*, *21*, 134–149. https://doi.org/10.1016/j.csbj.2022.11.050

Banappagoudar, S. B., Santhosh, S. U., Thangam, M. M. N., David, S., & Shamili, G. S. (2023). The Advantages of Precision Medicine over Traditional Medicine in Improving Public Health Outcomes. *Journal for ReAttach Therapy and Developmental Diversities*, *6*(5), 272–277.

Bazzazzadehgan, S., Shariat-Madar, Z., & Mahdi, F. (2025). Distinct Roles of Common Genetic Variants and Their Contributions to Diabetes: MODY and Uncontrolled T2DM. *Biomolecules*, *15*(3), 1–40. https://doi.org/10.3390/biom15030414

Bugingo, C., Infantino, A., Okello, P., Pérez-hernández, O., & Petrovi, K. (2025). From Morphology to Multi-Omics: A New Age of Fusarium Research. *Preprints*, 0–48.

Cai, Z., Poulos, R. C., Liu, J., & Zhong, Q. (2022). Machine learning for multi-omics data integration in cancer. *IScience*, *25*(2), 103798. https://doi.org/10.1016/j.isci.2022.103798

Cheng, S., Shah, S. H., Corwin, E. J., Fiehn, O., Fitzgerald, R. L., Gerszten, R. E., Illig, T., Rhee, E. P., Srinivas, P. R., Wang, T. J., & Jain, M. (2017). Potential Impact and Study Considerations of Metabolomics in Cardiovascular Health and Disease: A Scientific Statement from the American Heart Association. *Circulation: Cardiovascular Genetics*, *10*(2), 1–13. https://doi.org/10.1161/HCG.0000000000000032

Cocoș, R., & Popescu, B. O. (2024). Scrutinizing neurodegenerative diseases: decoding the complex genetic architectures through a multi-omics lens. *Human Genomics*, *18*(1). https://doi.org/10.1186/s40246-024-00704-7

Dehghan, R., & Salehi, M. (2023). Whole Exome Sequencing and Whole Genome Sequencing for Investigation of the Genetic Basis of Obesity: A Rapid Review. *Bahrain Medical Bulletin*, *45*(2), 1492–1497.

Dhieb, D., & Bastaki, K. (2025). Pharmaco-Multiomics: A New Frontier in Precision Psychiatry. *International Journal of Molecular Sciences*, *26*(3). https://doi.org/10.3390/ijms26031082

Dogiparthi, L. K., Bukke, S. P. N., Thalluri, C., Thalamanchi, B., Vidya, K. P., Sree, G. N., Tatiparthi, H., Uppicherla, D., & Thummaginjala, K. P. (2025). The role of genomics and proteomics in drug discovery and its application in pharmacy. In *Discover Applied Sciences* (Vol. 7, Issue 6). Springer International Publishing. https://doi.org/10.1007/s42452-025-07155-2

Fröhlich, K., Fahrner, M., Brombacher, E., Seredynska, A., Maldacker, M., Kreutz, C., Schmidt, A., & Schilling, O. (2024). Data-Independent Acquisition: A Milestone and Prospect in Clinical Mass Spectrometry–Based Proteomics. *Molecular and Cellular Proteomics*, *23*(8), 100800. https://doi.org/10.1016/j.mcpro.2024.100800

Han, L., Ao, X., Lin, S., Guan, S., Zheng, L., Han, X., & Ye, H. (2019). Quantitative Comparative Proteomics Reveal Biomarkers for Dengue Disease Severity. *Frontiers in Microbiology*, *10*(December), 1–11. https://doi.org/10.3389/fmicb.2019.02836

Kafle, S., Vaidya, A., Pradhan, B., Jørs, E., & Onta, S. (2021). Factors associated with the practice of chemical pesticide use and acute poisoning among farmers in Chitwan district, Nepal. *International Journal of Environmental Research and Public Health*, *18*(8). https://doi.org/10.3390/ijerph18084194

Kim, J., Jeong, K., Jun, H., Kim, K., Bae, J. M., Song, M. G., Yi, H., Park, S., Woo, G. un, Lee, D. W., Kim, T. Y., Lee, K. H., & Im, S. A. (2023). Mutations of TP53 and genes related to homologous recombination repair in breast cancer with germline BRCA1/2 mutations. *Human Genomics*, *17*(1), 1–10. https://doi.org/10.1186/s40246-022-00447-3

Koek, M. M., Jellema, R. H., van der Greef, J., Tas, A. C., & Hankemeier, T. (2011). Quantitative metabolomics based on gas chromatography mass spectrometry: Status and perspectives. *Metabolomics*, *7*(3), 307–328. https://doi.org/10.1007/s11306-010-0254-3

Luo, Y., Zhao, C., & Chen, F. (2024). Multiomics Research: Principles and Challenges in Integrated Analysis. *BioDesign Research*, *6*, 59. https://doi.org/10.34133/bdr.0059

Molder, R., Bhosale, S. D., Goodlett, D. R., & Lahesmaa, R. (2018). Analysis of the plasma proteome using iTRAQ and TMT-based isobaric labeling. *Mass Spectrometry Reviews*, *37*(5), 583–606. https://doi.org/10.1002/mas.21550

Nafie, M. S., Abu-Elsaoud, A. M., & Diab, M. K. (2025). A comprehensive review on computational metabolomics: Advancing multiscale analysis through in-silico approaches. *Computational and Structural Biotechnology Journal*, *27*(March), 3191–3215. https://doi.org/10.1016/j.csbj.2025.07.016

Qoronfleh, M. W. (2025). Precision Medicine and the Human Proteome in Disease, Diagnostics and Translation: Current Status and Future Prospects. *Biomedicines*, *13*(5). https://doi.org/10.3390/biomedicines13051130

Singh, S. R., Bhaskar, R., Ghosh, S., Yarlagadda, B., Singh, K. K., Verma, P., Sengupta, S., Mladenov, M., Hadzi-Petrushev, N., Stojchevski, R., Sinha, J. K., & Avtanski, D. (2025). Exploring the Genetic Orchestra of Cancer: The Interplay Between Oncogenes and Tumor-Suppressor Genes. *Cancers*, *17*(7). https://doi.org/10.3390/cancers17071082

Splus, S. (2001). R 2001 9. *Change*, 1–35.

Tan, J. K., Awuah, W. A., Ahluwalia, A., Sanker, V., Ben-Jaafar, A., Tenkorang, P. O., Aderinto, N., Mehta, A., Darko, K., Shah, M. H., Roy, S., Abdul-Rahman, T., & Atallah, O. (2024). Genes to therapy: a comprehensive literature review of whole-exome sequencing in neurology and neurosurgery. *European Journal of Medical Research*, *29*(1), 538. https://doi.org/10.1186/s40001-024-02063-4

Thiele, M., Villesen, I. F., Niu, L., Johansen, S., Sulek, K., Nishijima, S., Espen, L. Van, Keller, M., Israelsen, M., Suvitaival, T., Zawadzki, A. de, Juel, H. B., Brol, M. J., Stinson, S. E., Huang, Y., Silva, M. C. A., Kuhn, M., Anastasiadou, E., Leeming, D. J., … Melberg, H. O. (2024). Opportunities and barriers in omics-based biomarker discovery for steatotic liver diseases. *Journal of Hepatology*, *81*(2), 345–359. https://doi.org/10.1016/j.jhep.2024.03.035

Wu, Y., & Xie, L. (2025). AI-driven multi-omics integration for multi-scale predictive modeling of genotype-environment-phenotype relationships. *Computational and Structural Biotechnology Journal*, *27*(January), 265–277. https://doi.org/10.1016/j.csbj.2024.12.030

Zhan, C., Tang, T., Wu, E., Zhang, Y., He, M., Wu, R., Bi, C., Wang, J., Zhang, Y., & Shen, B. (2023). From multi-omics approaches to personalized medicine in myocardial infarction. *Frontiers in Cardiovascular Medicine*, *10*(October), 1–30. https://doi.org/10.3389/fcvm.2023.1250340

Antibiotic Resistance Patterns of Uropathogens Isolated from Patients with Urinary Tract Infections at Kathmandu Medical College, a Tertiary Care Hospital in Nepal

Anup Chaudhary[1*], Suresh Joshi[2], Anjina Kafle[3], Ganesh K.C[4], Himadri Thapa[5]

[1]Himalayan White House International College, Putalisadak, Nepal, Email: anupchaudhary110@gmail.com, https://orcid.org/0009-0007-7193-5128

[2]Himalayan White House International College, Putalisadak, Nepal, Email: suresjoshi.biotech@gmail.com, https://orcid.org/0009-0004-7356-0997

[3]Himalayan White House International College, Putalisadak, Nepal, Email: anjina7kafle@gmail.com, https://orcid.org/0009-0008-6991-6400

[4]Himalayan White House International College, Putalisadak, Nepal, Email: ganeshkc183@gmail.com, https://orcid.org/0009-0004-7943-4043

[5]Himalayan White House International College, Putalisadak, Nepal, Email: biotechimadri09@gmail.com, https://orcid.org/0009-0004-6526-7838

Volume 1, Issue no. 1, May 2026
Received Date: March 6, 2026
Revised Date: April 5, 2026
Accepted Date: May 4, 2026
ISSN: 3149-7144 (Print)
ISSN: 3149-7152 (Online)

Abstract

Urinary tract infection (UTI) is one of the most common bacterial infections globally, with increasing prevalence and rising antimicrobial resistance posing major challenges in clinical settings. Nepal continues to report a significant burden of UTIs, particularly among females and individuals of reproductive age. The purpose of the present research was to ascertain the urinary pathogenic bacterial profiles, antimicrobial susceptibility patterns, prevalence, and demographic distribution of patients suspected of having UTIs at Kathmandu Medical College Public Limited. A total of 151 urine samples were collected from patients with UTI symptoms. Samples were sent to the Microbiology Laboratory at Himalayan White House International College, where they were cultured, identified, and tested for antibiotic susceptibility using conventional microbiological techniques.

Significant bacterial growth was found in 51 (33.77%) of the 151 samples examined. Males showed a lower prevalence (21.57%) than females (40%). The age group of 21 to 30 years old had the largest number of UTI cases. The most common pathogen was Escherichia coli (33.33%), followed by Pseudomonas aeruginosa (17.64%) and Klebsiella pneumoniae (13.70%). The isolates showed high resistance to ceftazidime and cefaclor, while the highest susceptibility was observed to amikacin and piperacillin-tazobactam. Notably, multidrug resistance was identified in 66.7% of uropathogenic isolates, including E. coli, Klebsiella spp., and Pseudomonas spp. showing the highest prevalence. The study shows that UTIs are common, especially among young adult women. The predominance of E. coli and high-level resistance to widely used antibiotics underscore the importance of routine culture and sensitivity testing for successful treatment. These results highlight the critical need in Nepali healthcare settings for improved antimicrobial stewardship, regular monitoring of resistance trends, and ongoing updates to empiric therapy recommendations. Controlling the rising incidence of UTIs and preventing the development of resistant uropathogens also depend on incorporating routine culture-based diagnosis, encouraging doctors to use antibiotics sensibly, and raising public awareness of the dangers of self-medication. For doctors, microbiologists, and public health policymakers, this study offers up-to-date, hospital-based data on UTI prevalence and resistance rates in Kathmandu.

Keywords- *AMR, Antimicrobial resistance, E. coli, Multidrug resistance, Nepal, Urinary tract infection, Uropathogens, and UTI*

1. Introduction

Urine is generally sterile or contains only a small number of microorganisms unlikely to cause infection in a healthy person (Mancuso et al., 2023). UTIs, or urinary tract infections, are common in both community settings and medical facilities. They are among the most prevalent bacterial infections (Swamy et al., 2020). A significant proportion of adult women, estimated between 40% and 50%, experience at least one urinary tract infection during their lifetime, making UTIs a major health concern in this population. The likelihood of developing a UTI increases steadily with age, with prevalence rising by about 5% every decade. Furthermore, pregnancy further elevates susceptibility, contributing to roughly a 7% increase in UTI risk due to physiological and hormonal changes that favor bacterial colonization and infection (Shaifali et al., 2012). Gram-negative bacterial pathogens are mostly responsible for urinary tract infections, with *Escherichia coli (E. coli)* being the most common culprit. Because of its strong adhesion mechanisms and ability to colonize the urinary tract, this organism alone is thought to account for 65–90% of UTIs. *Proteus mirabilis*, *Staphylococcus saprophyticus*, *Staphylococcus epidermidis,* and *Klebsiella pneumoniae* are additional prominent uropathogens that account for a smaller but noteworthy percentage of infections. Furthermore, *Pseudomonas* species are frequently associated with infections in patients undergoing long-term catheterization or with impaired urinary drainage, whereas they are less common in typical UTIs (Sedhain et al., 2019; Shaifali et al., 2012).

Confirming the diagnosis of a urinary tract infection requires routine urine analysis, microscopic examination, urine culture, and pertinent biochemical assays (Sedhain et al., 2019). Urinary tract infections have been observed to affect between 23% and 37% of patients in general hospitals in Nepal (Shakya et al., 2021). Antibiotic-resistant uropathogens have spread more quickly due to the abuse of broad-spectrum antibiotics, whether through self-medication or improper empirical treatment given in clinics and emergency rooms (Calzada et al., 2022). AMR, or antimicrobial resistance, is a fast-expanding global issue, especially in low- and middle-income nations. Among the microbial groupings exhibiting some of the highest levels of resistance are uropathogens in particular (Raj KC et al., 2023; Shakya et al., 2021). These rising resistance patterns highlight the urgent need for continuous surveillance and updated antimicrobial guidelines to ensure effective management of UTIs (Lee et al., 2018).

The purpose of this study was to thoroughly evaluate the prevalence, demographic trends, microbiological diversity, and antibiotic resistance profiles of uropathogenic bacteria isolated from patients at Kathmandu Medical College Public Limited in Kathmandu with urinary tract infection symptoms.

2. Review of Literature

Urinary tract infection (UTI) is a frequently encountered clinical condition in both general and gynecological medical practices. It ranks among the most prevalent infections observed in outpatient clinics and among hospitalized patients (Shaifali et al., 2012). UTIs can result from several underlying causes. These causes are generally grouped into three categories: behavioral factors (like poor hygiene or sexual activity), urologic factors (such as urinary tract obstructions or catheter use), and biological/genetic factors (including inherited traits or anatomical differences that increase susceptibility). Each category influences the likelihood of infection in different ways (Sedhain et al., 2019). Urinary tract infections (UTIs) are most commonly caused by bacterial pathogens, the most common of which is *Escherichia coli (E. coli)*. Between 70 and 90 percent of simple UTIs are caused by *E. coli* because of its ability to stick to uroepithelial cells via specific virulence factors, including hemolysins and fimbriae (P and type 1 fimbriae) (Sedhain et al., 2019). Other Gram-negative bacteria, in addition to *E. coli*, are important, especially in nosocomial or complicated UTIs. These include *Enterobacter* species*, Citrobacter* species*, Pseudomonas aeruginosa, Proteus mirabilis*, and *Klebsiella pneumoniae*. These infections often have mechanisms of antibiotic resistance and are associated with underlying comorbidities or catheter use (Usman Anjum et al., 2016). Gram-positive bacteria can also be involved, albeit less frequently. Notable examples are *Enterococcus faecalis* and *Staphylococcus saprophyticus*, which are commonly isolated in community-acquired infections, particularly in sexually active females (Kaur & Kaur, 2021; Raj KC et al., 2023).

The classification of urinary tract infections (UTIs) can be based on several criteria, including anatomical location, clinical symptoms, complications, and recurrence. Uncomplicated urinary tract infections (UTIs) generally occur in otherwise healthy individuals without structural or neurological abnormalities of the urinary tract. These infections are categorized into lower UTIs (such as cystitis) and upper UTIs (such as pyelonephritis). Some factors can increase the risk of developing cystitis, including being female, having a history of UTIs, engaging in sexual activity, the presence of vaginal infections, diabetes, and obesity (Flores-Mireles et al., 2015). Complicated urinary tract infections (UTIs) are characterized by conditions that impair the urinary tract or the body's natural defenses. These include urinary obstruction, retention due to neurological disorders, immunosuppression, kidney failure, renal transplants, pregnancy, and foreign objects such as urinary stones, indwelling catheters, or other drainage devices (Mareş et al., 2024).

Numerous host, behavioral, and clinical factors might impact urinary tract infections (UTIs). While anatomical or functional problems such as vesicoureteral reflux, nephrolithiasis, urinary obstruction, and neurogenic bladder predispose to urinary stasis and bacterial colonization, female sex, shorter urethral length, pregnancy, and postmenopausal hormonal changes also increase susceptibility to urinary stasis and bacterial colonization. The risk is further increased by behavioral factors such as frequent sexual activity, extended urine retention, poor perineal hygiene, and inadequate hydration. Host defenses are further weakened by comorbid conditions such as diabetes mellitus, immunosuppression, and chronic renal disease. Indwelling urinary catheters, frequent urinary instrumentation, recent urological procedures, and prior antibiotic exposure all play major roles in the development and recurrence of UTIs in hospital settings, especially when multidrug-resistant uropathogens are involved (Swamy et al., 2020).

3. Methodology

a. Ethical Approval

The Institutional Review Committee (IRC) of Kathmandu Medical College in Kathmandu, Nepal, granted ethical permission for this investigation. The Declaration of Helsinki was followed in conducting the study. Before collecting a urine sample, each subject gave their informed consent. All information was anonymized prior to analysis, and patient anonymity was scrupulously upheld.

b. Study Design

A cross-sectional, laboratory-based study was conducted among patients attending Kathmandu Medical College Public Limited in Sinamangal, Kathmandu, Nepal. Patients clinically suspected of urinary tract infection (UTI) by attending clinicians were referred to the microbiology laboratory for confirmation. All eligible urine samples received from January 2025 to February 2025 were consecutively included. A total of 151 midstream urine samples were processed. Demographic information, clinical characteristics, and relevant patient history were recorded using a structured form.

c. Study Environment

The tertiary care facility at Kathmandu Medical College Public Limited is situated in Kathmandu, Bagmati Province. Patients from both urban and rural locations can receive a wide range of outpatient, inpatient, surgical, and diagnostic services from the hospital. Urine samples were collected from Kathmandu Medical College Public Limited and sent to the Microbiology Laboratory at Himalayan White House International College for culture, biochemical identification, and antibiotic susceptibility testing.

d. Study Population and Sampling Technique

Patients who were clinically recommended to have a urine culture and who presented with symptoms suggestive of a UTI were included. Urine samples from midstream clean catches that satisfied the quality standards were enrolled one after the other. Samples that were not properly labeled or collected, as well as those that lacked demographic information, were not included.

e. Collection of Specimens

In sterile, wide-mouthed, leak-proof receptacles already filled with boric acid, participants were instructed

to collect 10-20 mL of clean-catch midstream urine (CC-MSU). Samples were quickly sent to the microbiology lab after being labeled with the patient's details, date, and time.

f. Macroscopic, Chemical, and Microscopic Examination

The color, clarity, and appearance of urine samples were assessed. Standard methods were used to conduct chemical analyses for protein, glucose, and pH. Ten milliliters of urine were centrifuged at 3000 rpm for 10 minutes to evaluate the sediment for WBCs, RBCs, and epithelial cells at 40X magnification.

g. Culture and Bacterial Isolation

Using a semi-quantitative streaking method, a loopful of urine was inoculated onto MacConkey and blood agar plates. For 24-48 hours, plates were aerobically incubated at 37°C. Significant growths of $\geq 10^5$ colony-forming units (CFU)/mL underwent further processing.

h. Identification of Isolates

Bacterial isolates were identified based on colony morphology, Gram staining, and biochemical tests. Pure cultures were prepared on nutrient agar before performing catalase, oxidase, IMViC tests, motility, gas production, and hydrogen sulfide tests.

i. Antibiotic Susceptibility Testing

The Kirby-Bauer disk diffusion method was used to test antibiotic susceptibility on Mueller-Hinton agar in accordance with CLSI standards (2023). The McFarland turbidity of bacterial suspensions was set at 0.5. Inhibition zones were determined and classified as sensitive, intermediate, or resistant after plates were incubated at 37°C for 18 to 24 hours.

j. Multidrug Resistance Analysis

Multidrug resistance (MDR) analysis was performed using antibiotic susceptibility data from 51 uropathogenic isolates. Isolates were classified as multidrug-resistant if resistance to at least one antimicrobial agent in three or more antibiotic classes was observed. Resistance patterns across various antimicrobial classes were analyzed to determine the distribution of MDR among Gram-negative and Gram-positive bacteria.

k. Quality Control

Laboratory equipment, including incubators, refrigerators, and autoclaves, was routinely monitored. Media sterility was checked using control plates. Reagents and antibiotic discs were inspected for expiry and

l. Data Analysis

Data were analyzed using Microsoft Excel 2019 and GraphPad Prism 10.0. Statistical significance was determined using the chi-square test and Fisher's exact test, with $p < 0.05$ considered significant.

4. Results

a. Urine culture outcomes

During the study period, 151 urine samples were analyzed. 51 (33.77%) of the samples revealed considerable bacterial growth, confirming a urinary tract infection, while 100 (66.23%) showed no growth. While 40 out of 100 female participants (40%) were culture positive, 11 out of 51 male participants (21.57%) tested positive, suggesting a higher prevalence of UTIs among females.

b. Distribution of Significant Bacteriuria by Gender

Of the 51 samples that tested positive on culture, 11 (21.57%) were from male patients and 40 (78.43%) from female patients. Within their respective gender categories, 21.57% of males and 40% of females had significant bacteriuria of $\geq 10^5$ colony-forming units (CFU)/mL. Gender and UTI prevalence were significantly correlated with the higher incidence of UTIs among females ($\chi^2 = 4.34$, $P = 0.037 < 0.05$). This demonstrates that women are more prone to urinary tract infections due to physiological and anatomical variables (Table 1).

Table 1: *Distribution of Significant Bacteriuria by Gender*

Gender	Significant Bacteriuria (Count)	No Growth (Count)	Total (Count)	% With-in Gender (Significant Bacteriuria)	% Within Gender (No Growth)	% Within Gender (Total)
Male	11	40	51	21.57%	78.43%	100.0%
Female	40	60	100	40.00%	60.00%	100.0%
Total	51	100	151	33.77%	66.23%	100.0%

c. Bacterial Growth Cross-Age Group

The 21–30 age group had the greatest number of infections (12 cases, 23.53%) among the culture-positive cases (n = 51), followed by the 31–40 age group (9 cases, 17.65%). The age groups of 11–20 and 41–50 showed very little development (2 cases each, 3.92%). Patients aged 0-10 and 71-80 did not exhibit any bacterial growth. In every age group, most cases were female, except in the 61–70 age group, where males had a slightly higher incidence (Table 2).

Table 2 : *Bacterial Growth Cross-Age Group*

Age Group	Male (Count)	Female (Count)	Total (Count)	Percent of (Male)	Percent of (Female)	Percent of Total (Overall)
0–10	0	0	0	0.00%	0.00%	0.00%
11–20	0	1	1	0.00%	2.50%	2.00%
21–30	2	10	12	3.92%	25.00%	23.53%
31–40	2	7	9	3.92%	17.50%	17.65%
41–50	2	5	7	3.92%	12.50%	13.73%
51–60	1	5	6	1.96%	12.50%	11.76%
61–70	2	1	3	3.92%	2.50%	5.88%
71–80	0	0	0	0.00%	0.00%	0.00%
Total	11	40	51	21.57%	78.43%	100.00%

d. Prevalence of Bacterial Isolates

Escherichia coli emerged as the predominant uropathogen, responsible for 33.33% of infections. This was followed by *Pseudomonas aeruginosa* (17.64%), *Klebsiella pneumoniae,* and *Shigella spp.* (both 13.70%). Other isolates included *Enterobacter spp*. (7.80%), *Proteus spp*. (7.80%), and *Enterococcus spp*. (5.88%). This distribution reflects a diverse range of uropathogens with varying pathogenic potential (Table 3).

Table 3 : *Prevalence of Bacterial Isolates*

Bacteria	Total Isolates	Prevalence (%)
Escherichia coli	17	33.33%
Pseudomonas aeruginosa	9	17.64%
Klebsiella pneumoniae	7	13.70%
Shigella spp.	7	13.70%
Enterobacter spp.	4	7.80%
Proteus spp.	4	7.80%
Enterococcus spp.	3	5.88%
Total	**51**	**100%**

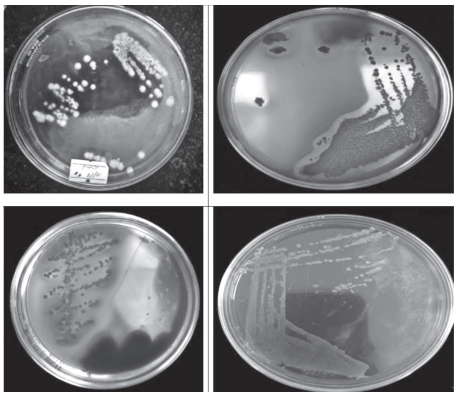


Figure 1: illustrates the distribution of uropathogenic bacteria isolated from culture-positive urine samples. *Escherichia coli* was the dominant pathogen, accounting for 33.33% of total isolates. This was followed by *Pseudomonas aeruginosa* (17.64%) and *Klebsiella pneumoniae* (13.70%). Other organisms such as *Shigella spp.*, *Enterobacter spp.*, *Proteus spp.*, and *Enterococcus spp.* were isolated in smaller proportions, indicating a diverse etiological profile of UTIs

e. Antibiotic Susceptibility Pattern

The antibiotic susceptibility profile of the uropathogenic isolates revealed varied resistance patterns across the tested agents. Notably, Amikacin (A) and Piperacillin-Tazobactam (D) exhibited the highest efficacy, with susceptibility rates of 70.0% in *E. coli*, 75.0% in *Pseudomonas spp.*, and 66.7% across *Klebsiella spp.*, *Enterobacter spp.*, *Shigella spp.*, and *Proteus* spp. Conversely, Ceftazidime (B) and Cefaclor (H) demonstrated the lowest effectiveness, with *Enterobacter spp.*, *Proteus spp.*, and *Enterococcus spp.* showing 100% resistance to Ceftazidime, and *Enterococcus spp, and showing* complete resistance to Cefaclor as well.

Shigella spp. and *Enterococcus spp.* were among the most resistant pathogens, with *Enterococcus* showing 0% sensitivity to Ceftazidime (B), Nalidixic Acid (C), and Cefaclor. Chloramphenicol (E) and Neomycin (F) exhibited moderate effectiveness across most isolates, while Streptomycin (G) maintained a consistent susceptibility rate of 60-70% in the majority of Gram-negative isolates(Table 4)

Table 4: *Antibiotic susceptibility profiles of E. coli, Klebsiella, Pseudomonas, Enterobacter, Shigella, Proteus, and Enterococcus isolates from urinary tract infections*

Code	*E. coli* S/R (%)	*Klebsiella* spp. S/R (%)	*Pseudomonas* spp. S/R (%)	*Enterobacter* spp. S/R (%)	*Shigella* spp. S/R (%)	*Proteus* spp. S/R (%)	*Enterococcus* spp. S/R (%)
A	70.0/30.0	66.7 / 33.3	75.0 / 25.0	66.7 / 33.3	66.7 / 33.3	66.7 / 33.3	33.3 / 66.7
B	15.0/85.0	33.3 / 66.7	20.0 / 80.0	0.0 / 100.0	16.7 / 83.3	0.0 / 100.0	0.0 / 100.0
C	60.0/40.0	66.7 / 33.3	60.0 / 40.0	50.0 / 50.0	16.7 / 83.3	0.0 / 100.0	0.0 / 100.0
D	50.0/50.0	66.7 / 33.3	70.0 / 30.0	66.7 / 33.3	50.0 / 50.0	66.7 / 33.3	33.3 / 66.7
E	40.0/60.0	50.0 / 50.0	50.0 / 50.0	33.3 / 66.7	33.3 / 66.7	33.3 / 66.7	66.7 / 33.3
F	60.0/40.0	66.7 / 33.3	60.0 / 40.0	50.0 / 50.0	66.7 / 33.3	66.7 / 33.3	33.3 / 66.7
G	60.0/40.0	66.7 / 33.3	70.0 / 30.0	66.7 / 33.3	66.7 / 33.3	66.7 / 33.3	33.3 / 66.7
H	30.0/70.0	50.0 / 50.0	30.0 / 70.0	33.3 / 66.7	16.7 / 83.3	50.0 / 50.0	0.0 / 100.0

f. Multidrug resistance patterns of Uropathogens

A total of 51 uropathogenic isolates were evaluated for multidrug resistance (MDR), defined as resistance to at least one antibiotic in three or more different classes. Out of these, 34 isolates (66.7%) were classified as MDR, indicating a high prevalence of multidrug resistance among the urinary pathogens analyzed.

Among the Gram-negative isolates, MDR was most frequently observed in *Escherichia coli*, with 13 out of 17 isolates (76.5%) resistant to multiple antibiotic classes. *Klebsiella* spp. exhibited MDR in 5 out of 7 isolates (71.4%), while *Pseudomonas* spp. had 6 of 9 isolates (66.7%) showing multidrug resistance. *Shigella* spp. and *Enterobacter* spp. demonstrated moderate MDR prevalence, with 4/7 (57.1%) and 2/4 (50.0%) isolates classified as MDR, respectively. Among Gram-positive isolates, *Enterococcus* spp. showed a lower MDR rate, with only 1 out of 3 isolates (33.3%) exhibiting multidrug resistance.

The MDR patterns were predominantly associated with resistance to β-lactams, aminoglycosides, and fluoroquinolones, indicating that commonly used first-line antibiotics may be ineffective against a substantial portion of these uropathogens.

Table 5: MDR distribution by species

Bacterial species	No. of Isolates	No. of MDR isolates	MDR %
E.coli	17	13	76.5
***Pseudomonas* spp.**	9	6	66.7
***Klebsiella* spp.**	7	5	71.4
***Shigella* spp.**	7	4	57.1
***Enterobacter* spp.**	4	2	50.0
***Proteus* spp.**	4	3	75.0
***Enterococcus* spp.**	3	1	33.3
Total	51	34	66.7

g. Urine Microscopy and Pus Cell Distribution

There was a strong correlation between UTI positivity and higher pus cell counts. The 3-5 (35.29%) and 6-8 (25.49%) pus cells/HPF categories accounted for the bulk of culture-positive samples, whereas the 0-2, 9-

-11, and 12-14 groups showed fewer cases. This pattern highlights the significance of pyuria as a supportive signal for UTI, as it is typically associated with a higher likelihood of bacterial growth.

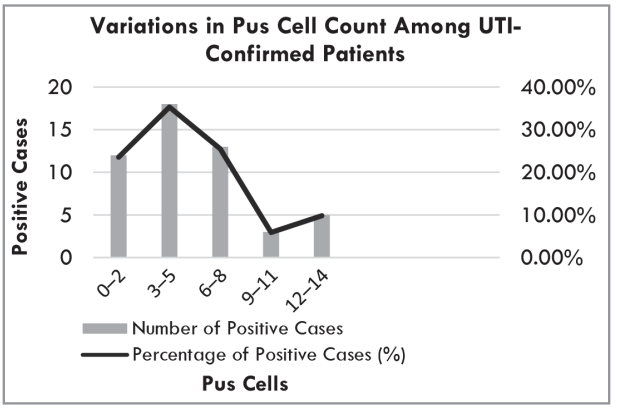


Figure 2 shows the distribution of pus cells per high-power field (HPF) in culture-positive urine samples. Most positive samples were associated with pus cell counts of 3–5/HPF (35.29%) and 6–8/HPF (25.49%). Fewer positive cultures were observed in samples with very low (0–2/HPF) or very high (>9/HPF) pus cell counts. This finding indicates that moderate pyuria is more commonly associated with significant bacteriuria, supporting the diagnostic value of urine microscopy.

h. Association between smoking status and urinary tract infection

A total of 151 participants were included in the study. The prevalence of urinary tract infection (UTI) was evaluated in relation to selected lifestyle factors. Smoking status was analyzed as a lifestyle factor to assess its association with UTI prevalence. Among 48 smokers, 37 (77.1%) were diagnosed with UTI, while 11 (22.9%) were UTI-negative. In contrast, among 103 non-smokers, 40 (38.8%) had a UTI and 63 (61.2%) did not.

Fisher's exact test demonstrated no statistically significant association between smoking status and the occurrence of UTI ($p = 0.12$)

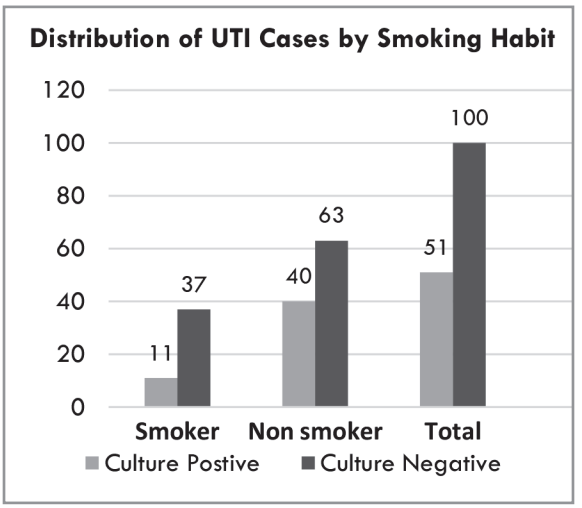


Figure 4 Presents the distribution of UTI cases based on smoking habits. Among smokers, 22.92% had significant bacteriuria, whereas 38.83% of non-smokers were culture-positive. Statistical analysis revealed no significant association between smoking and UTI occurrence (P = 0.12), indicating that smoking did not significantly influence UTI prevalence in the study population.

5. Discussion

The prevalence of urinary tract infections (UTIs) in the current study was 33.77%, which aligns with earlier reports from Nepal and other South Asian countries, where prevalence ranged from 23% to 37% (Kaur & Kaur, 2021). This indicates that UTIs remain a major public health concern in both hospital and community settings.

Demographic analysis revealed a significantly higher infection rate among females (40%) than among males (21.57%). This disparity is largely due to anatomical and hormonal factors that make females more susceptible to bacterial colonization, a trend well-documented worldwide (Chu & Lowder, 2018). Age-specific analysis showed that individuals aged 21-30 had the highest prevalence, reflecting patterns observed in South Asia and likely influenced by increased sexual activity, reproductive health factors, and lifestyle behaviors during this period (Foxman, 2014).

Microbiological examination demonstrated that *Escherichia coli* was the predominant pathogen, consistent with global observations, where *E. coli* remains the leading cause of UTIs due to virulence factors such as adhesins, fimbriae, and biofilm formation (Flores-Mireles et al., 2015). Less common pathogens, including *Pseudomonas aeruginosa* and *Shigella* spp., were also identified. Their presence may indicate hospital-acquired infections or environmental contamination, highlighting the need for stringent infection control practices (Ronald, 2002).

Antimicrobial susceptibility testing revealed that amikacin and piperacillin-tazobactam retained high efficacy, whereas older-generation antibiotics such as ceftazidime and nalidixic acid showed significant resistance. This

pattern reflects global trends of increasing antimicrobial resistance and underscores the necessity of judicious antibiotic use, frequent surveillance, and updating treatment guidelines based on regional resistance profiles (Yıldırım et al., 2025; Esposito et al., 2022; Mlugu et al., 2023; Raj KC et al., 2023). The rise of multidrug-resistant organisms presents a significant public health threat, emphasizing the importance of antimicrobial stewardship programs. The high prevalence of multidrug resistance observed in this study aligns with reports from other regions, where uropathogenic bacteria show widespread resistance to multiple antibiotic classes, significantly limiting effective treatment options and underscoring the urgent need for antimicrobial stewardship. Similar studies have documented MDR rates exceeding 65% among uropathogens and highlighted resistance to firstline agents such as βlactams and fluoroquinolones, necessitating reevaluation of empirical therapy protocols. These findings emphasize the importance of regular surveillance and optimized antibiotic policies to contain the spread of MDR organisms (Chowdhury et al., 2024).

Lifestyle factors such as smoking did not show a significant correlation with UTI incidence, consistent with previous studies suggesting that smoking may not directly influence UTI occurrence (Rabaeus et al., 2013). Other factors that can contribute to UTIs include poor hygiene, diabetes, urinary catheterization, pregnancy, and prior history of UTIs, all of which can increase susceptibility to infection.

Interestingly, although a substantial correlation was observed between pyuria (presence of pus cells in urine) and UTI, high pyuria levels did not always correspond to culture positivity. This discrepancy may be explained by sterile inflammation, prior antibiotic use suppressing bacterial growth, fastidious organisms not detected on routine culture, or contamination during sample collection (Chu & Lowder, 2018). Therefore, while pyuria is a useful early diagnostic marker, it should be interpreted alongside clinical findings and culture results to ensure an accurate diagnosis.

6. Conclusion

This study provides insight into the prevalence, etiological agents, and patterns of antibiotic resistance in urinary tract infections among patients at Kathmandu Medical College Public Limited. The overall prevalence was found to be 33.77%, with females, especially those in the reproductive age groups, having much higher rates of UTIs. *Escherichia coli*, *Klebsiella pneumoniae, Pseudomonas aeruginosa,* and *Shigella* species remained the most common uropathogens, indicating a wide range of bacterial agents that cause UTIs. Amikacin and Piperacillin-Tazobactam demonstrated the highest efficacy across key isolates, whereas the antibiotic susceptibility study revealed substantial resistance to frequently administered antibiotics, including Ceftazidime, Cefaclor, and Nalidixic Acid. These results underscore the need for evidence-based, pathogen-specific treatment approaches and highlight the growing problem of antibiotic resistance.

All things considered, this study emphasizes the importance of routine urine culture and sensitivity testing for accurate diagnosis and appropriate antibiotic selection. To reduce the prevalence of UTIs and stop the spread of antibiotic resistance in Nepal, ongoing surveillance, prudent antibiotic use, and public health education are crucial.

7. Limitation and Direction of Study

Due to its small sample size and concentration on a single tertiary care facility, this study may not accurately reflect Nepal's overall population. Advanced molecular approaches to identify resistance genes were not used; instead, laboratory tests were limited to culture and biochemical identification. The observed patterns of infection and resistance may have been influenced by insufficient evaluation of clinical data, including comorbidities, prior antibiotic exposure, and specific lifestyle factors. To increase generalizability, larger and more varied patient populations from various healthcare facilities should be included in future research. The mechanisms of antibiotic resistance could be better understood by incorporating molecular diagnostic techniques. Furthermore, assessing clinical, behavioral, and environmental risk variables may help identify predictors of UTI occurrence and guide more focused prevention and management strategies.

8. Acknowledgment

The urine samples needed for this investigation were provided by Kathmandu Medical College Public Hospital, for which the authors are truly grateful. We also thank the Department of Biotechnology at Himalayan White House International College for providing access to the microbiology lab and for assisting with the experimental procedures. We would especially like to express our gratitude to all the professors and lab personnel whose advice and technical support were crucial to the accomplishment of this study.

9. Conflict Of Interest

The authors declare that they have no competing financial or personal interests that could have influenced the work presented in this manuscript. The research was supported through a shared funding arrangement, with 50% of the financial resources provided by Himalayan White House International College and 50% contributed by the authors. Himalayan White House International College also supplied the laboratory materials and facilities required for the study. The funding sources had no involvement in the study design, data acquisition, analysis, interpretation, or the writing of the manuscript.

References

Calzada, F. C., Aguilera-Correa, J. J., González, J. C., Moreno, J. E., Biosca, D. R., & Pérez-Tanoira, R. (2022). Urinary Tract Infection and Antimicrobial Susceptibility of Bacterial Isolates in Saint Joseph Kitgum Hospital, Kitgum, Uganda. *Antibiotics*, *11*(4). https://doi.org/10.3390/antibiotics11040504

Chowdhury, S. S., Tahsin, P., Xu, Y., Mosaddek, A. S. M., Muhamadali, H., & Goodacre, R. (2024). Trends in Antimicrobial Resistance of Uropathogens Isolated from Urinary Tract Infections in a Tertiary Care Hospital in Dhaka, Bangladesh. *Antibiotics*, *13*(10), 925. https://doi.org/ 10.3390/antibiotics13100925

Chu, C. M., & Lowder, J. L. (2018). Diagnosis and treatment of urinary tract infections across age groups. *American Journal of Obstetrics and Gynecology*, *219*(1), 40–51.

Esposito, S., Biasucci, G., Pasini, A., Predieri, B., Vergine, G., Crisafi, A., Malaventura, C., Casadio, L., Sella, M., Pierantoni, L., Gatti, C., Paglialonga, L., Sodini, C., La Scola, C., Bernardi, L., Autore, G., Canto, G. D., Argentiero, A., Cantatore, S., … Iughetti, L. (2022). Antibiotic Resistance in Pediatric Febrile Urinary Tract Infections. In *Journal of Global Antimicrobial Resistance* (Vol. 29, pp. 499–506). Elsevier Ltd. https://doi.org/10.1016/j. jgar.2021.11.003

Flores-Mireles, A. L., Walker, J. N., Caparon, M., & Hultgren, S. J. (2015). Urinary tract infections: Epidemiology, mechanisms of infection and treatment options. In *Nature Reviews Microbiology* (Vol. 13, Issue 5, pp. 269–284). Nature Publishing Group. https://doi.org/10.1038/ nrmicro3432

Foxman, B. (2014). Urinary tract infection syndromes: occurrence, recurrence, bacteriology, risk factors, and disease burden. *Infectious Disease Clinics*, *28*(1), 1–13.

Ganesh, R., Shrestha, D., Bhattachan, B., & Rai, G. (2019). Epidemiology of urinary tract infection and antimicrobial resistance in a pediatric hospital in Nepal. *BMC Infectious Diseases*, *19*(1). https://doi.org/10.1186/s12879-019-3997-0

Kaur, R., & Kaur, R. (2021). Symptoms, risk factors, diagnosis, and treatment of urinary tract infections. In *Postgraduate Medical Journal* (Vol. 97, Issue 1154, pp. 803–812). BMJ Publishing Group. https://doi.org/10.1136/postgradmedj-2020-139090

Lee, D. S., Lee, S. J., Choe, H. S., & Giacobbe, D. R. (2018). Community-Acquired Urinary Tract Infection by Escherichia coli in the Era of Antibiotic Resistance. In *BioMed Research International* (Vol. 2018). Hindawi Limited. https://doi.org/10.1155/2018/7656752

Mancuso, G., Midiri, A., Gerace, E., Marra, M., Zummo, S., & Biondo, C. (2023). Urinary Tract Infections: The Current Scenario and Future Prospects. In *Pathogens* (Vol. 12, Issue 4). MDPI. https://doi.org/10.3390/pathogens12040623

Mareş, C., Petca, R. C., Popescu, R. I., Petca, A., Mulțescu, R., Bulai, C. A., Ene, C. V., Geavlete, P. A., Geavlete, B. F., & Jinga, V. (2024). Update on Urinary Tract Infection Antibiotic Resistance—A Retrospective Study in Females in Conjunction with Clinical Data. *Life*, *14*(1). https://doi.org/10.3390/life14010106

Mlugu, E. M., Mohamedi, J. A., Sangeda, R. Z., & Mwambete, K. D. (2023). Prevalence of urinary tract infection and antimicrobial resistance patterns of uropathogenic biofilm-forming capacity among outpatients in Morogoro, Tanzania: a cross-sectional study. *BMC Infectious Diseases*, *23*(1). https://doi.org/10.1186/s12879-023-08641-x

Rabaeus, M., Salen, P., & de Lorgeril, M. (2013). Is it smoking or related lifestyle variables that increase metabolic syndrome risk? *BMC Medicine*, *11*(1), 196.

Raj KC, S., Timilsina, B., Gupta, R., Prasad Upadhyay, H., Adhikari, A., & Dhakal, R. (2023). Urinary Tract Infection, Bacteriologica,l Profile and its Antibiotic Susceptibility in a Tertiary Center. *Nepal Medical Journal*, *5*(2), 44–49. https://doi.org/10.37080/nmj.146

Ronald, A. (2002). The etiology of urinary tract infection: traditional and emerging pathogens. *The American Journal of Medicine*, *113*(1), 14–19.

Sedhain, A., Sapkota, A., & Shrestha, B. (2019). Antibiotic sensitivity pattern in urinary tract infection among adults in the central part of Nepal. *Journal of Chitwan Medical College*, *9*(4), 18–23. https://doi.org/10.3126/jcmc.v9i4.26894

Shaifali, I., Gupta, U., Mahmood, S. E., & Ahmed, J. (2012). Antibiotic susceptibility patterns of urinary pathogens in female outpatients. *North American Journal of Medical Sciences*, *4*(4), 163–169. https://doi.org/10.4103/1947-2714.94940

Shakya, S., Edwards, J., Gupte, H. A., Shrestha, S., Shakya, B. M., Parajuli, K., Kattel, H. P., Shrestha, P. S., Ghimire, R., & Thekkur, P. (2021). High multidrug resistance in urinary tract infections in a tertiary hospital, Kathmandu, Nepal. *Public Health Action*, *11*(1), 24–31. https://doi.org/10.5588/pha.21.0035

Swamy, M. V., Faraz, M. A. A., Mendem, S., Shubham, P., & Vinyas, M. (2020). Urinary Tract Infections: A Comprehensive Review. *International Journal of Current Microbiology and Applied Sciences*, *9*(7), 773–786. https://doi.org/10.20546/ijcmas.2020.907.089

Usman Anjum, Dr. M., Safdar Khan, Dr. M., Shahid, Dr. A. R., & Humayun Shah, Dr. S. (2016). URINARY TRACT INFECTIONS; ETIOLOGICAL PROFILE AND ANTIMICROBIAL SUSCEPTIBILITY PATTERNS OF UROPATHOGENS. *The Professional Medical Journal*, *23*(01), 10–14. https://doi.org/10.17957/tpmj/16.3044

Yıldırım, Ç., Sarı, S., Parmaksızoğlu Aydın, A. M., Kilinç Toker, A., Turunç Özdemir, A., Erdem Kıvrak, E., Mermer, S., Kahraman, H., Soysal, O., & Yıldırım, H. Ç. (2025). Extended-Spectrum Beta-Lactamase Production and Carbapenem Resistance in Elderly Urinary Tract Infection Patients: A Multicenter Retrospective Study from Turkey. *Antibiotics*, *14*(7), 719.

Dividend Distribution and Stock Price of Nepalese Commercial Banks

Bhim Kumar Thapa[1], Ramesh Rasik Paudel*[2], Rajesh Kumar Chaulagain[3]

[1]*Asst. Professor, Public Youth Campus, FOM, TU, Email: bhim.thapa@pyc.tu.edu.np, https://orcid.org/0009-0001-6982-0483*

[2]*Asst. Professor, Public Youth Campus, FOM, TU Email: ramesh.poudel@pyc.tu.edu.np, https://orcid.org/0009-0005-1807-8249*

[3]*Faculty, Shanker Dev Campus, FOM, TU, Email: rajesh.chaulagain@sdc.tu.edu.np, https://orcid.org/0009-0005-5493-1809*

Volume 1, Issue no. 1, May 2026
Received Date: March 7, 2026
Revised Date: April 6, 2026
Accepted Date: May 5, 2026
ISSN: 3149-7144 (Print)
ISSN: 3149-7152 (Online)

Abstract

This study investigates the impact of dividend payout ratio and dividend yield on the market price of shares (MPS) of Nepalese commercial banks. It aims to provide insights into how dividend practices and organizational scale influence market valuation in the Nepalese financial sector. A descriptive and explanatory research design was adopted under a quantitative approach with a positivist philosophy. The population comprised all 19 commercial banks listed on the Nepal Stock Exchange (NEPSE) over the ten years from 2015 to 2024. A census approach yielded 190 observations, of which 179 were retained after outlier diagnostics using standardized deleted residuals, Cook's distance, and leverage values. Secondary data were collected from commercial banks' annual reports and the NEPSE website. Data analysis was conducted using IBM SPSS Statistics, employing descriptive statistics, correlation, and multiple regression.

The results show that the dividend payout ratio has a positive and significant effect on share price, consistent with dividend relevance theory. Conversely, dividend yield has a negative and significant impact, indicating that higher yields may signal weaker growth prospects. Firm size, measured by total assets, also negatively influences share price, suggesting a valuation discount for larger banks. Collectively, the predictors explain 49.5% of the variance in share price. The findings guide investors in assessing dividend distributions and managers in balancing shareholder returns with retained earnings. Policymakers should enhance transparency and efficiency to address valuation disparities among larger banks.

This study contributes empirical evidence from Nepal, an emerging-market context, by combining dividend distribution and firm size to explain share price behavior.

Keywords: Dividend payout ratio; Dividend yield ratio; Firm size; Market price of a share

1. Introduction

Market price of a share (MPS) is used to show the value that investors place on a company's stock and is also an important indicator of financial results, investor perception, and their expectations about the company (Damodaran, 2012). Among the numerous variables affecting the share price, the dividend policy is an important determinant, as it reflects the firm's profitability, stability, and growth prospects (Bhattacharya, 1979; Gordon, 1959). Cash dividends paid to shareholders may improve investor confidence and, in turn, generate long-term investment, which can boost the market price of shares. The dividend payout ratio and the dividend yield are widely applied to measure the dividend policy. Empirical evidence indicates a positive and significant correlation between such ratios and share prices for commercial banks in Nepal across different business environments (Kandel & Timilsina, 2024; Joshi et al., 2024). Besides the dividend policy, the size of the firm, usually gauged by total assets or market capitalization, is also a key determinant of the share price. Compared with smaller ones, larger ones imply greater financial stability, reduced risk, and higher growth, which attract consumers (Ramadhani et al., 2024). The interaction between the effects of dividends and firm size on share prices is of extreme significance in Nepal, where commercial banks dominate the stock market and have a strong impact on the financial market. The study of such effects can provide useful insights for investors, managers, and policymakers on valuing shares, making investment decisions, and assessing market efficiency. To this end, this paper aims to address the following research question: How do dividends and firm size affect the market price of shares of the Nepalese commercial banks? The objectives are to study the correlation between the dividend payout ratio and share price, test the role of dividend yield on share price, study the impact of firm size on share price, and analyze the overall impact of dividend metrics and firm size on share price in Nepal's commercial banks.

2. Review of Literature

A firm’s market price of share (MPS) is theoretically anchored in discounted cash-flow logic, where dividends are a key cash return to equity holders; hence, a higher and more stable dividend payout ratio (DPR) can raise perceived cash-flow certainty and valuation under the Gordon framework and dividend-smoothing behavior (Gordon, 1959; Lintner, 1956). Beyond pure valuation mechanics, dividend policy may convey private information: managers use dividend changes as credible signals about sustainable earnings, so a higher DP Ratio can reduce information asymmetry and support higher prices when markets view the signal as costly to mimic (Bhattacharya, 1979). Still, classic irrelevance arguments remind us that in frictionless markets, the per-share payout should not affect the price, so any positive relation arises from taxes, clientele, signaling, or investor demand (Miller & Modigliani, 1961; Litzenberger & Ramaswamy, 1979; Baker & Wurgler, 2004). DY Ratio embeds the market’s required return—holding expected dividends constant; a lower required return raises the price and lowers the observed yield, while unusually high yields may reflect risk discounting (Gordon, 1959; Damodaran, 2012). Firm size (total assets) influences MPS via risk, liquidity, and information channels: larger firms tend to enjoy better disclosure, broader investor recognition, and lower trading frictions, which lower expected returns and support higher valuations for given cash flows (Merton, 1987; Amihud & Mendelson, 1986).

Empirical Review and Hypothesis Development

Market Price of a Share

Ramadhani et al. (2024) found that firm size and dividend yield significantly influence stock prices in Indonesia’s pharmaceutical sector. In Nepal, Kandel and Timilsina (2024) reported dividend per share (DPS) as the strongest predictor of share price, with earnings per share (EPS) also significant, while Joshi et al. (2024) confirmed positive effects of DPS, EPS, and P/E ratio. Conversely, Pandey et al. (2024) observed that EPS and P/E dominate, whereas DPS and book value have minimal impact, showing context-specific differences. Dahal et al. (2024) investigate even more general determinants of share prices in the Nepalese market, likely including size and dividend ratios. On the whole, there is evidence that dividends and firm size are important in most situations, whereas earnings and valuation ratios remain important as well. Although the payout policy

influences how investors view a company, the main underlying factors driving share prices across widely varying contexts are profitability and valuation measures. Payout policies can only have secondary effects.

Dividend Payout Ratio (DP Ratio)

The dividend payout ratio (DPR) is defined as DPS / EPS or total dividends / net income over a period of time. There is generally a positive relationship between DPR and the market price of a share (MPS), but this relationship varies by context. For instance, a study on Pakistan's stock market found that higher DPR significantly increases share prices, supporting dividend relevance theories (Munir et al., 2024). Similarly, South Asian evidence indicates that companies that pay higher dividends attract investors and exhibit better price performance, consistent with signaling and clientele effects (Arshad et al., 2021). Nonetheless, a study conducted by the Dar es Salaam Stock Exchange found that local tax systems, investor preferences, and growth opportunities may offset the effects on dividends (Msonde, 2021). Indian data on large-cap stock companies also partially support the notion that dividend policy variables, including DPR, have a significant effect on stock prices; however, this effect is sensitive to model specifications and control variables, including EPS and the retention ratio. The larger cross-market syntheses also suggest that, although DPR is generally positively related to share prices, the relationship is weaker when fundamentals such as profitability, leverage, and firm size are considered, indicating the problem of endogeneity and reverse causality (Pertiwi & Wiagustini, 2020). In general, there are indications that DPR may be a significant determinant of market prices by channeling signaling and investor preference information, but with a highly context-dependent effect and subject to methodological problems.

- **H_1:** Dividend payout ratio significantly impacts the market price of a share

Dividend Yield Ratio

The dividend yield ratio (DYR), which is the annual dividend per share divided by the current price per share, indicates the income investors will receive relative to the stock's price. There is mixed evidence in the literature of the influence of dividend yield on the market price of a share (MPS) through empirical studies. Ramadhani et al. (2024) studied Indonesian pharmaceutical firms and found a positive, significant correlation between dividend yield and share price, indicating that high dividend yields increase investor confidence and demand. Equally, Kandel and Timilsina (2024) have noted that dividend yield, in addition to dividend per share, is a powerful predictor of stock prices in Nepal's banking industry. This trend was validated by Joshi et al. (2024), who observed that dividend-related variables, such as yield, are important in valuing commercial bank shares. Nevertheless, the study by Pandey et al. (2024) indicates that, although EPS and P/E ratios prevail, dividend yield has a low or insignificant impact on price, suggesting that fundamental earnings can outweigh payout ratios in certain markets. Also, as noted in cross-market research, such as Arshad et al. (2021), the effect of dividend yield varies by context, being more pronounced in markets where investors value cash-flow consistency. Generally, there is evidence that dividend yield tends to have a positive correlation with stock price by the signaling hypothesis and the theory of income preference. However, its impact on stock price is not consistent across investor behavior, tax regimes, and firm profitability.

- **H_2:** The dividend yield ratio significantly impacts the market price of a share

Firm size

The size of the firm, as frequently measured by total assets or market capitalization, is often thought to be a principal determinant of the market price of a share (MPS), since larger firms tend to indicate greater stability and reduced investment risk. Ramadhani et al. (2024) observed that firm size has a positive and significant impact on stock prices among drug firms in Indonesia, suggesting that investors associate size with growth prospects and financial capability. Similarly, Kandel and Timilsina (2024) reported that in Nepal's banking sector, larger firms tend to command higher share prices, supporting the argument that size enhances investor confidence. In contrast, the team of Pandey et al. (2024) noted that firm size did not significantly add to the

explanatory power of earnings and valuation ratios and was therefore of limited usefulness in predicting these factors in specific circumstances. In their findings, Joshi et al. (2024) reported a mild relationship between stock prices and size, suggesting that the effect of profits may supersede structural signals such as size on market prices. Moreover, the results of Dahal et al. (2024) indicated that although firm size can be considered a determinant of stock price, it is usually surrogated by other factors, such as leverage and dividend policy. On the whole, although most evidence suggests a positive relationship between firm size and share price, the extent of this influence varies across markets and industries.

- **H_3: Firm size significantly impacts the market price of a share**

3. Research Methodology

This paper used a descriptive and explanatory research design to address the research objectives. A descriptive design was used to summarize and present the data. In contrast, the experimental design, an experiment on the ot, her hand, tested the cause-and-effect relationships between dividend policy, firm size, and market price per share (MPS). A quantitative research method was chosen because the study relied on quantitative data and statistical evaluation to test the hypotheses, and the positivist philosophy was used, as it presupposes that reality is observable and measurable (Creswell & Creswell, 2018; Saunders et al., 2019). The study population comprised all 19 commercial banks listed on the Nepal Stock Exchange (NEPSE). Since the population was manageable in size, a census approach was used, covering 10 fiscal years from 2015 to 2024, yielding 190 bank-year observations. However, after applying regression diagnostics to identify outliers and influential cases, 11 observations were excluded, leaving 179 valid cases for analysis.

The study relied exclusively on secondary data collected from the official websites of commercial banks (annual reports and dividend disclosures) and the NEPSE website (historical share prices and corporate action records). The dependent variable was the market price per share (MPS), which was converted to the natural logarithm (lnMPS) to address skewness. The independent variables denoting dividend policy were the dividend payout ratio (DP ratio), defined as cash dividends per share divided by earnings per share, and the dividend yield (DY ratio), defined as cash dividends per share divided by the market price per share. Firm size, used as a control variable, was measured as the natural logarithm of total assets (lnTA).

The analysis was done using IBM SPSS Statistics. This began with descriptive statistics, including the mean, minimum, maximum, and standard deviation, and then correlations were computed to assess the magnitude and direction of associations among the variables. A multiple regression was then used to test the concentrated effects of dividend policy and firm size on share price, with the model's topology evaluated using R, R2, adjusted R2, and ANOVA. Regression assumptions were carefully examined to verify the soundness of the results. Tests of normality of residuals were conducted using histograms and parallel lines in normal probability plots, and scatterplots were used to test linearity and homoscedasticity. The impact of multicollinearity was assessed using the Variance Inflation Factor (VIF), which was below 10 in all cases, indicating no danger of multicollinearity (Hair et al., 2019). Standardized deleted residuals threshold value = +/-(3), Cook's distance cut-off value = 1.0, and centered leverage values benchmark = 2(k+1)/n were used to diagnose outliers and influential observations. Those that exceeded these limits were removed, leaving only 179 cases in the final analysis (Field, 2018; Hair et al., 2019).

4. Results

Statistical techniques for descriptive analysis involve summarizing raw statistics and organizing concepts into meaningful patterns using measures such as the mean, median, standard deviation, frequency, and percentage (Gravetter & Wallnau, 2017). It can help researchers get a picture of the overall trends, distributions, and variability of the data without drawing inferences or making forecasts (Saunders, Lewis, & Thornhill, 2019).

Table 1: *Descriptive Statistics*

Variables		Minimum	Maximum	Mean	Std. Deviation
MPS	Rs	153.70	3600.00	529.24	488.18
DP Ratio	%	0.00	296.59	64.45	40.91
DY Ratio	%	0.00	9.16	3.35	2.02
TA	Rs	37374510826.00	557019891105.00	167585441056.01	98499380835.16
Valid N 179					

Table 1 presents the descriptive statistics for the study variables, including the minimum, maximum, mean, and standard deviation. There was significant variance in the market price per share (MPS), ranging from Rs 153.70 to Rs 3,600.00 (M = 529.24, SD = 488.18). Dividend payout (DP) ratio was ranging between 0.00% and 296.59% (M = 64.45, SD = 40.91), and dividend yield (DY) was between 0.00% and 9.16% (M = 3.35, SD = 2.02). There were significant differences in firm size, with total assets (TA) ranging from 37,374,510,826.00 to 557,019,891,105.00 (M = 167,585,441,056.01, SD = 98499,380,835.16). The standard deviations of MPS, DP ratio, and TA are high, indicating wide variation in these variables and implying large differences in market valuation, dividend policies, and asset bases among the firms. This kind of variation can affect the regression results, and they need to be interpreted more clearly. Data transformation or other robust statistical methods could be used to reduce the effect of extreme numbers. On 179 valid observations, all the variables were grounded.

Correlation Analysis

Table 2: ***Correlations***

	lnMPS	DPRatio	DYRatio	lnTA
lnMPS	1			
DPRatio	.472**	1		
DYRatio	-0.018	.693**	1	
lnTA	-.371**	-.305**	-.165*	1
** p<.01				
* p<.05				

The correlation analysis showed that ln MPS had a positive and significant relationship with the DP ratio (r = .47, p < .01), indicating that companies with a high dividend payout are likely to have a high market price per share. On the other hand, the relationship between lnMPS and lnTA was negative and significant (r = -.37, p = .01), indicating that larger firms, in terms of total assets, are associated with a decline in market price per share. The correlation between lnMPS and the dividend yield proportion was not significant, and the value was negative (r = -.). 02, p > .05, meaning that dividend yield value does not seem to be a significant factor of share price in this sample. The fact that diligent dividend behavior is positively correlated with share prices also suggests that dividend policies may shape investors' perceptions of firm value, in line with dividend relevance theory. The negative correlation between firm size (lnTA) and share price could, however, be due, yet again, to market underpricing of larger firms or to variations in capital structure strategies between larger and smaller firms. The lack of a meaningful relationship between dividend yield and share price indicates that yield itself might not be the key factor influencing investors' decisions, and thus the payout level; instead, the percentage of yield becomes crucial in determining price action in the market.

Regression Analysis

Table 3: ***Model Summary***

R	R Square	Adjusted R Square	Std. Error of the Estimate
.703	0.495	0.486	0.39685
a Predictors: (Constant), lnTA, DYRatio,DPRatio			
b Dependent Variable: lnMPS			

According to the model summary, the predictors rs, DP ratio, DY ratio, and lnTA accounted for a significant percentage of the variance in lnMPS. The findings revealed an R value of 0.70, indicating a strong positive relationship between the predictor set and the dependent variable. The value of R 2 was 0.50, indicating that about 49.5 percent of the variance in lnMPS was accounted for by the predictors, with an adjusted R 2 of 0.49, indicating the number of predictors in the model. The standard error of the estimate was 0.40, indicating the average distance between the observed and predicted lnMPS values. The relatively high R-squared indicates that dividend policy variables (DP ratio, DY ratio) and firm size (lnTA) explain almost half of the variability in share prices. Nevertheless, the remaining half of the variance is unexplained, and one might suggest that other financial, market, or behavioral characteristics may also affect lnMPS and warrant consideration in future studies.

Table 4: *ANOVA*

	Sum of Squares	df	Mean Square	F	Sig.
Regression	26.977	3	8.992	57.098	.000
Residual	27.56	175	0.157		
Total	54.537	178			
a Dependent Variable: lnMPS					
b Predictors: (Constant), lnTA, DY Ratio, DP Ratio					

The results of the ANOVA showed that the regression model was statistically significant, $F(3, 175) = 57.10$, $p < .001$. This shows that the three pr, which included the DP ratio, DY ratio, and lnTA, collectively accounted for a considerable amount of variance in lnMPS. The fact that the regression sum of squares (26.98) is slightly smaller than the residual sum of squares (27.56) is another indication that the model explains almost half of the change in the dependent variable. The very large F-statistic indicates that the model provides an effective general fit to the data, supporting the inclusion of measures of dividend policy and firm size as significant predictors of market price per share. Although this model is important, the unexplained variance (27.56) suggests that other financial, market, or behavioral factors not incorporated into it could also be very important in determining share price performance.

Table 5 : Coefficients

	Unstandardized Coefficients		Standardized Coefficients			Collinearity Statistics	Hypotheses
	B	Std. Error	Beta	t	Sig.	VIF	
(Constant)	11.116	1.384		8.035	.000		
DP Ratio	0.012	0.001	0.853	11.015	.000	2.075	H_1: Supported
DY Ratio	-0.178	0.021	-0.645	-8.635	.000	1.934	H_2: Supported
lnTA	-0.205	0.053	-0.217	-3.844	.000	1.108	H_3: Supported

Table 5 indicates that the regression coefficients were all statistically significant, indicating that the three predictors, DP ratio, DY ratio, and ln TA, had significant effects on ln MPS. The positive and significant impact

of the DP ratio was B = 0.012, t(175) = 11.02, p = .001, indicating that ln MPS improved by 0.012 units with the other variables held constant. This means that companies with higher dividend payouts are associated with higher per-share market prices, thereby validating H1. The effect of DY ratio was not only negative but also significant, B = -0.178, t(175) = -8.64, p = .001, so an increase in dividend yield by 1 unit will cause a negative change in lnMPS of -0.178. It implies that although the yield percentage is high, firms are likely to have low share prices, thereby validating H2. The size of firms (lnTA) was also significantly negative, B = -0.205, t(175) = -3.84, p = .001, indicating that a 1-unit increase in firm size (lnTA) reduced lnMPS by 0.205 units. This implies that large companies will have lower per-share valuations than smaller companies, thereby substantiating H3. All predictors had a Variance Inflation Factor (VIF) between 1.108 and 2.075, which is well below 10, indicating no multicollinearity. The positive impact of the DP ratio reveals the significance of dividend payout policies in amplifying investor confidence and share price growth, a finding supported by dividend relevance theory. Conversely, the negative impact of the DY ratio suggests that higher yields may signal weaker growth prospects or lower retained earnings, leading to reduced share prices. Similarly, the inverse correlation between firm size and share price suggests that larger firms are at risk of valuation discounts due to lower growth prospects or market inefficiency. Taken together, these results indicate that dividend policies and firm size are significant determinants of market-based valuation, albeit on opposite scales.

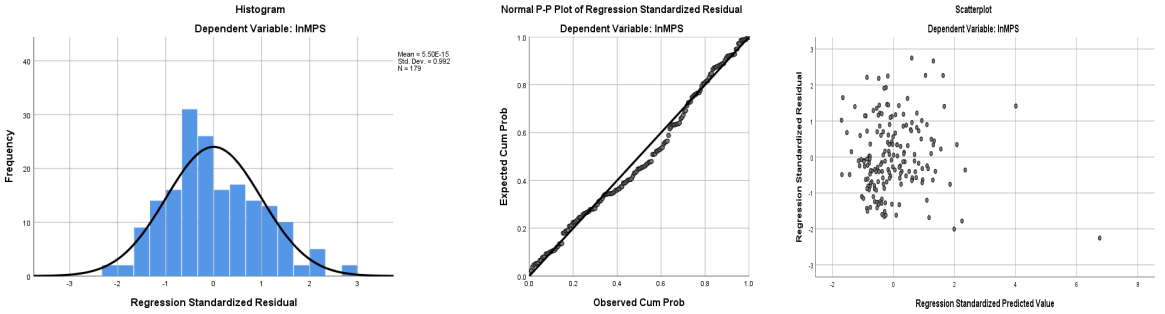
Table 6: *Residuals Statistics*

	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	5.3434	8.6326	6.005	0.3893	179
Std. Predicted Value	-1.699	6.75	0	1	179
Standard Error of Predicted Value	0.03	0.226	0.056	0.021	179
Adjusted Predicted Value	5.3266	9.0593	6.0075	0.40525	179
Residual	-0.8941	1.09104	0	0.39349	179
Std. Residual	-2.253	2.749	0	0.992	179
Stud. Residual	-2.738	2.761	-0.003	1.009	179
Deleted Residual	-1.3208	1.10012	-0.00252	0.40837	179
Stud. Deleted Residual	-2.791	2.815	-0.002	1.015	179
Mahal. Distance	0.05	56.511	2.983	4.69	179
Cook's Distance	0	0.895	0.01	0.067	179
Centered Leverage Value	0	0.317	0.017	0.026	179
a Dependent Variable: lnMPS					

Table 6 presents the still residuals, which are indicative of outliers, influential cases, and a possible breach of regression assumptions. The studentized deleted residuals range from -2.791 to 2.815, which falls within the acceptable limits of -3.0 to +3.0 (Field, 2018), indicating no extreme outliers in the dataset. A value greater than 3 or less than -3 would normally indicate cases with unusually large residuals that over-influence the model. Cook's distance values range from 0 to 0.895, well below the common cut-off value of 1.0 suggested by Hair et al. (2019) and Field (2018). Cook's distance measures the influence of each observation on the regression coefficients; values greater than 1 may indicate that an observation has a disproportionate influence on the model fit. The absence of such cases here suggests that no single observation is unduly affecting the regression results. The centered leverage values range from 0.000 to 0.317, remaining below the recommended threshold of [numerator , 2 open paren cap K plus 1 close paren end numerator , over n or, as a simpler rule of thumb, below 0.5 (Hair et al., 2019). Leverage measures how far an observation's predictor values are from the mean predictor values; higher leverage values indicate potential influence on the regression line. In this case,

leverage values remain within acceptable limits, suggesting that predictor combinations for individual cases do not exert excessive influence. Taken together, the diagnostics from studentized deleted residuals, Cook's distance, and leverage values indicate that the regression model does not suffer from problematic outliers or influential cases, and the normality assumption for residuals is not violated to a degree that would threaten the validity of the model.

Normality Distribution



Normality in regression analysis assumes that the residuals of the regression in the study are normally distributed, since this underpins hypothesis testing of regression coefficients and the validity of standard errors, confidence intervals, and p-values (Field, 2018; Hair et al., 2019). Analysis of the regression diagnostics shows that this assumption was not grossly violated. The standardized residuals histogram shows a roughly bell-shaped, symmetric distribution with a mean of zero, indicating that the data are not highly non-normal. Normal P-P also supports this, as most points closely match the straight line representing the cumulative probability of the normal distribution. There is also no significant deviation of the standardized residuals from the predicted values in the scatterplot, indicating that the data approached normality. Taken together, the findings indicate that the data obtained are sufficient to validate the normality assumption for the regression residuals; hence, inferences can be based on this assumption.

5. Discussion

The results indicate that the dividend payout ratio has a positive and significant effect on the market price of shares (B = 0.012, p < .001), supporting the hypothesis that higher dividend payouts are associated with higher share prices. This observation is consistent with the dividend relevance theory (Gordon, 1959; Lintner, 1956), which posits that dividends are positive signals of a firm's profitability and prospects, thereby enhancing investor confidence. This outcome is supported by empirical evidence: Kandel and Timilsina (2024) found that Nepalese commercial banks with higher dividend payouts had higher stock prices, and Joshi et al. (2024) reported a similar positive association in the Nepalese banking sector. Another study by Ramadhani et al. (2024) indicated that dividend payouts also had a positive impact on the share prices of Indonesian companies. Importantly, although higher dividend payouts will increase investment, this effect may be offset by firm earnings, expansion potential, and market liquidity, implying that the impact may not be observed across the sample of firms (Bhattacharya, 1979). The dividend yield ratio hurt the share price (B = 0.178, p = .001). This implies that the high dividend yield, even though it signals cash returns, will be low due to low retained earnings and limited growth opportunities, thereby decreasing the market price per share. This is in line with signaling theory, in which abnormally high yields may indicate the firm's distress rather than its strength (Bhattacharya, 1979). The same outcome is reported in empirical research: Pandey et al. (2024) found high dividend yields associated with low share prices in certain Nepalese banks, whereas Arshad et al. (2021) found that high yields were sometimes indicative of low growth potential. Josh et al. (2024) found that dividends are generally appreciated, but the yield component may negatively affect the price when shareholders expect earnings to decline. The crucial point to note is that this adverse impact demonstrates the necessity of considering dividend yield in context; a high yield does not always prove positive, particularly in markets where investors are more interested in long-term growth than in short-term earnings. The research established that firm size had a negative and significant impact on the share price (B = -0.205, p = 0.001), indicating that large firms, measured

by total assets, may face a valuation discount reflected in the share price. This contrasts with the traditional view that larger firms are safer and more highly priced (Ramadhani et al., 2024) but aligns with the pecking order theory and agency views, which suggest that larger firms may be less growth-oriented or have higher agency costs, thereby lowering per-share prices. This subtle finding is corroborated by empirical data: both Pandey et al. (2024) and Joshi et al. (2024) found that there was a negative or non-significant correlation between firm size and share price in Nepalese banks, and Dahal et al. (2024) also emphasized negative valuation discounts of large firms because of market inefficiencies. Most importantly, a negative value of firm size indicates that scale may take a back seat to growth and profitability for the investor. Therefore, it does not necessarily imply that the larger the firm, the higher the share price. All these results highlight the multifaceted roles of dividend policy and firm size in determining market valuation. Although an increase in dividend payout has a positive impact on share value, an increase in the dividend yield and firm size might lead to a negative impact; thus, the importance of both dividend payout policy and future growth level when assessing equity value. The findings support the importance of the dividend signaling theory, agency theory, and market perception in the emarketsg market like Nepal.

6. Conclusion

This analysis shows that dividend payout has a positive influence on the market price of shares (MPS) because dividend relevance theory indicates that dividend payments provide information about external sources of profit and enhance investor confidence. Dividend yield, conversely, negatively affects MPS per signaling theory: the higher the yields, the lower the retained earnings or the attractiveness of growth, thus eroding share values. Further, all firm sizes showed a negative correlation with share price, implying that large banks might experience valuation discounts due to lower expansion opportunities or anticipated inefficiencies, consistent with agency and pecking-order considerations. In sum, it was found that dividend policy and firm size are major factors in shaping share price in Nepalese commercial banks, but with different directions.

Limitations and Directions for the Study

The results are useful to investors, bank managers, and policymakers. It is best to view a consistent and reasonable dividend payout as a potentially valuable investment, and a large dividend yield as possibly an indication of financial stagnation. Bank managers should be advised to use dividend policies that not only reward shareholders but also retain earnings to grow, thereby elevating their market valuation. Regulators and policymakers can look to increase transparency, governance, and operational efficiency in larger banks to reduce potential sources of valuation discounts and create a fair market price. These insights will aid well-informed investment, corporate orientation, and policy formulation in Nepal's banking sector. Future studies based on the present one can take into account other aspects that may influence the market price of shares in Nepalese commercial banks, including per-share price, leverage, liquidity, corporate governance, and macroeconomic features. Comparative analysis of various methods, sectors, or markets, such as emerging and developed markets, will provide more insight into whether the observed relationship between dividend policy, firm size, and share price is the same across them. A longitudinal study observing the evolution of investor behavior, regulatory systems, and the economic environment would also contribute to understanding the dynamics of dividend policy returns and firm-specific attributes. Moreover, qualitative studies of investor perceptions and decision rules can be used in post to quantitative evidence to provide a more comprehensive picture of market valuation methods and to identify possible moderator or moderating variables that may contribute to share price formation.

Acknowledgement

The author would like to thank all stakeholders who made this study possible.

Conflict of Interest

The author declares no conflict of interest while preparing this article.

References

Amihud, Y., & Mendelson, H. (1986). Asset pricing and the bid-ask spread. *Journal of Financial Economics, 17*(2), 223–249. https://doi.org/10.1016/0304-405X(86)90065-6

Arshad, M. U., Khan, F. N., Ishfaq, M., Shabbir, M. N., & Shah, S. M. R. (2021). The relevance of financial and economic informational environment: evidence from South Asian markets. *Journal of Economic and Administrative Sciences*, *37*(4), 711–729.

Baker, M., & Wurgler, J. (2004). A catering theory of dividends. *The Journal of Finance, 59*(3), 1125–1165. https://doi.org/10.1111/j.1540-6261.2004.00658.x

Bhattacharya, S. (1979). Imperfect information, dividend policy, and "the bird in the hand" fallacy. *The Bell Journal of Economics, 10*(1), 259–270.

Creswell, J. W., & Creswell, J. D. (2018). *Research design: Qualitative, quantitative, and mixed methods approaches* (5th ed.). SAGE.

Dahal, P., Puri, R., Dahal, P., & Budhathoki, B. (2024). An empirical assessment of factors impacting stock prices of Nepalese commercial banks. *International Journal of Economics, Business and Management Research*, *8*(07), 46–60.

Damodaran, A. (2012). *Investment valuation: Tools and techniques for determining the value of any asset* (3rd ed.). Wiley.

Field, A. (2018). *Discovering statistics using IBM SPSS Statistics* (5th ed.). SAGE Publications.

Gordon, M. J. (1959). Dividends, earnings, and stock prices. *The Review of Economics and Statistics, 41*(2), 99–105. https://doi.org/10.2307/1927792

Gravetter, F. J., & Wallnau, L. B. (2017). Statistics for the behavioral sciences (10th ed.). Cengage Learning.

Hair, J. F., Black, W. C., Babin, B. J., & Anderson, R. E. (2019). *Multivariate data analysis* (8th ed.). Cengage Learning.

Joshi, S. P., Ghimire, B., & Singh, S. (2024). Factors influencing stock prices in commercial banks of Nepal. *KMC Research Journal, 7*(1), 112–126.

Kandel, M., & Timilsina, J. (2024). Determinants of stock prices in Nepal's banking sector: An empirical analysis. *International Journal of Research in Marketing Management and Sales, 6*(2), 207–213.

Lintner, J. (1956). Distribution of incomes of corporations among dividends, retained earnings, and taxes. *The American Economic Review, 46*(2), 97–113.

Litzenberger, R. H., & Ramaswamy, K. (1979). The effect of personal taxes and dividends on capital asset prices: Theory and empirical evidence. *Journal of Financial Economics, 7*(2), 163–195. https://doi.org/10.1016/0304-405X(79)90012-6

Merton, R. C. (1987). A simple model of capital market equilibrium with incomplete information. *The Journal of Finance, 42*(3), 483–510. https://doi.org/10.1111/j.1540-6261.1987.tb04565.x

Miller, M. H., & Modigliani, F. (1961). Dividend policy, growth, and the valuation of shares. *The Journal of Business, 34*(4), 411–433. https://doi.org/10.1086/294442

Msonde, G. R. (2021). *Determinants of Dividend Payout Ratio and Growth of Firms Listed at Dar Es Salaam Stock Exchange in Tanzania* (Doctoral dissertation, The Open University of Tanzania).

Munir, Q., Akram, B., & Abbas, S. A. (2024). Understanding stock price dynamics with dividend-related metrics and financial indicators in Pakistan's non-financial sectors. *Journal of Business and Economic Options*, *7*(1), 1–9.

Pandey, D., Risal, N., Basnet, B. J., & Bohara, B. (2024). Factors affecting stock price volatility of commercial banks in Nepal. *Asian Journal of Economics, Business and Accounting, 24*(5), 171–182.

Pertiwi, P. T., & Wiagustini, N. L. (2020). The impact of dividend payout ratio (DPR), leverage, and firm size on stock price volatility in manufacturing companies listed on the Indonesia Stock Exchange. *American Journal of Humanities and Social Sciences Research*, *4*(3), 399–405.

Ramadhani, S. M. T., Ekanova, A. P., & Anwar, C. S. (2024). The effect of firm size, dividend yield, earnings per share, and net profit margin on stock prices in pharmacy companies listed on the Indonesia Stock Exchange for the 2017–2022 period. *Journal of Comprehensive Science (JCS), 3*(7), 2320–2331.

Saunders, M.N.K., Lewis, P. & Thornhill, A. (2019). *Research methods for business students* (8th ed.), Pearson, New York.

Factors Shaping MBA Students' Enrollment in Foreign-Affiliated Colleges

Sunetra Pradhanang[1]*, Suresh Panthi[2], Avinash Shrestha[3]

[1]Himalayan Whitehouse College, Putalisadak, Kathmandu, Nepal, Email: sunetra2001@gmail.com, https://orcid.org/0009-0000-6485-6279

[2]Uniglobe College, Baneshwor, Kathmandu, Nepal, Email: panthisuresh@gmail.com, https://orcid.org/0000-0001-5268-2806

[3]Kantipur Valley College, Kumaripati, Lalitpur, Nepal, Email: avim.shrestha@gmail.com, https://orcid.org/0009-0007-4898-3252

Abstract

Based on participants' accounts, the growing demand for internationally recognized business qualifications in Nepal has led to a rapid expansion of internationally affiliated MBA institutions in Kathmandu; however, there is limited evidence on the factors influencing participants' choices of these institutions in the local context. The present study aims to explore the determinants shaping MBA participants' selection of internationally affiliated institutions in Kathmandu. A qualitative research design was employed using semi-structured interviews with 20 MBA participants enrolled in internationally affiliated institutions. An interview guide consisting of open-ended questions on motivations, information sources, perceived quality, social influence, financial considerations, and challenges was used. Data were transcribed and analyzed using thematic analysis, including coding, categorization, and theme development. The findings show that participants primarily choose internationally affiliated MBA programs for the perceived international recognition of degrees, locally accessible global education, practical, modern curricula, and expectations of improved career prospects. Family support, peer recommendations, and affordability compared to studying abroad were also notable contextual influences in the Nepalese setting. This research implies that institutions should strengthen transparency regarding degree recognition, emphasize employability outcomes, and align curricula with industry needs. At the same time, policymakers should enhance regulation and quality assurance of foreign affiliations. By situating institution-choice theory in Nepal, this study highlights context-specific drivers of demand for transnational higher education in developing-country settings.

Keywords: institution choice, internationally affiliated universities, MBA students, Kathmandu, college choice, thematic analysis

Volume 1, Issue no. 1, May 2026
Received Date: March 9, 2026
Revised Date: April 10, 2026
Accepted Date: May 7, 2026
ISSN: 3149-7144 (Print)
ISSN: 3149-7152 (Online)

1. Introduction

Overall, education plays a vital role not only in shaping individual life opportunities but also in advancing national development. At the individual level, academic qualifications are closely linked to career prospects and socioeconomic mobility, as employers often evaluate candidates drawing on academic performance, institutional reputation, and program quality. In Nepal, many participants aspire to obtain internationally recognized qualifications to enhance their competitiveness in the global labor market. However, the high financial cost of overseas education and frequent visa constraints limit access to foreign universities. In this context, internationally affiliated institutions operating within Nepal have emerged as an accessible alternative, enabling participants to obtain international degrees locally (Phyak, 2024).

According to participants' accounts, Nepal's higher education sector has expanded considerably in recent years. By 2023, the country had 13 central universities, 4 provincial universities, and 5 medical academies, encompassing 1,455 campuses, 162 constituent, 539 community, and 754 private institutions (Subedi, 2025). Alongside this expansion, demand for international academic programs has increased, reflecting participants' aspirations for globally relevant education and improved employability (Budhathoki, 2013). Consequently, internationally affiliated university institutions offering Master of Business Administration (MBA) programs have grown rapidly in Kathmandu.

Notably, despite this growth, limited empirical research has examined the considerations influencing participants' choice of internationally affiliated MBA institutions in Nepal. Existing studies on higher education choice have largely focused on general university selection or international student mobility, with insufficient attention to participants who pursue foreign degrees within their home country. As a result, there is a lack of context-specific understanding of the motivations, perceptions, and choice-making considerations of participants enrolled in internationally affiliated MBA programs in Kathmandu. This knowledge gap constrains higher education institutions and policymakers in designing strategies and policies aligned with participants' expectations and the evolving transnational education landscape.

Therefore, this study seeks to address the following research questions:

1. What factors influence students' choice of foreign-affiliated MBA colleges in Kathmandu?
2. How do these factors shape students' decision-making processes when selecting such institutions?

In many cases, the present study is significant for several reasons. First, it contributes to the limited literature on institution choice in Nepal by focusing specifically on participants enrolled in internationally affiliated MBA programs in Kathmandu. Second, the findings will provide evidence-based insights for higher education leaders and policymakers to develop student-oriented recruitment and program strategies that reflect learners' needs and preferences. Third, the study offers practical implications for strengthening the quality and relevance of higher education in Nepal within an increasingly globalized academic environment.

2. Review of Literature

2.1 College Choice as a Multidimensional Process

Across interviews, college choice is widely recognized as a complex, multifaceted decision shaped by academic, economic, social, psychological, and institutional factors. Rather than being influenced by a single determinant, participants typically evaluate a combination of factors when selecting higher education institutions (Hossler & Gallagher, 1987). College choice research, therefore, emphasizes the importance of examining diverse influences to capture the full scope of participants' decision-making processes.

It was evident that early work conceptualized institution choice as a staged process involving predisposition, search, and selection phases, each affected by different types of influences (Hossler & Gallagher, 1987). Later studies further demonstrated that participants' institutional choices emerge

from interactions between personal aspirations, family expectations, institutional characteristics, and broader socio-economic contexts (Perna, 2006). These perspectives support an exploratory approach that considers multiple potential influences rather than restricting analysis to a predetermined framework.

2.2 Academic and Institutional Factors

Overall, a substantial body of research identifies institutional attributes as central to college selection. Academic reputation, program availability, teaching quality, curriculum relevance, and accreditation status are consistently reported as major determinants (Briggs, 2006; Maringe, 2006). Students often associate reputable institutions with stronger career prospects and higher educational standards.

Notably, for postgraduate business education, program specialization and industry relevance are particularly influential. MBA applicants frequently evaluate curriculum structure, faculty expertise, and practical learning opportunities such as internships or industry projects (Browne & Kaldenberg, 1997). The perceived global recognition of qualifications is also notable, especially in internationally affiliated programs (Wilkins & Huisman, 2013).

2.3 Career and Employability Considerations

It was evident that employment prospects and career advancement opportunities are among the most influential motivations in higher education choices (James et al., 1999). Students tend to prefer institutions that demonstrate strong graduate employability outcomes, industry linkages, and professional networking opportunities (Maringe & Carter, 2007).

It was evident that for MBA participants in particular, expected salary growth, managerial career progression, and international mobility significantly shape institutional choice (Pimpa, 2005). Foreign-affiliated universities may therefore be attractive because they are perceived as enhancing global career competitiveness.

2.4 Financial Factors

In many cases, cost considerations remain a central influence across contexts. Tuition fees, availability of scholarships, payment flexibility, and perceived return on investment all affect participants' choices (Vrontis et al., 2007). Students often evaluate educational choices in terms of cost–benefit trade-offs, comparing financial expenditure with anticipated career benefits (Chapman, 1981).

From participants' accounts, affordability relative to studying abroad is particularly notable in developing-country contexts. Foreign-affiliated institutions may offer international degrees at lower costs than overseas study, thereby widening access to global education (Wilkins & Balakrishnan, 2013).

2.5 Social and Interpersonal Influences

Notably, family expectations, parental guidance, and peer recommendations are consistently identified as strong influences in university choice (Pimpa, 2005; Maringe, 2006). In collectivist societies, educational choices often involve family consultation and shared choice-making (Hofstede, 2011).

According to participants' accounts, parents may influence the type of institution, location, and field of study, drawing on perceived prestige, safety, or career outcomes. Peer experiences and alums feedback also shape perceptions of institutional quality and desirability (Briggs, 2006).

2.6 Personal and Psychological Factors

Notably, students' aspirations, interests, self-identity, and perceived fit with institutional culture also contribute to the choice of institution (Maringe & Gibbs, 2009). Individual motivations, such as a desire for international exposure, personal development, or status attainment, can guide institutional preferences (Bourdieu, 1986).

Overall, for postgraduate participants, prior educational experiences and professional goals strongly influence program selection (James et al., 1999). MBA candidates often seek institutions aligned with leadership ambitions and entrepreneurial goals.

2.7 Location and Accessibility

Overall, geographical proximity, urban environment, campus facilities, and living conditions are additional practical considerations in institutional selection (Briggs, 2006). Students may prefer institutions located in major cities due to access to employment opportunities, professional networks, and lifestyle amenities (Maringe, 2006).

It was evident that in Kathmandu, the concentration of internationally affiliated institutions may increase accessibility and visibility, thereby shaping student choices.

2.8 Information Sources and Marketing Influences

Notably, access to information significantly affects institutional selection. Students rely on multiple sources, including institutional websites, rankings, promotional materials, alums testimonials, education fairs, and social media (Maringe & Carter, 2007).

In many cases, marketing communication and brand image also influence perceptions of institutional quality and attractiveness (Ivy, 2001). Positive institutional branding can therefore strengthen student preference even before direct experience with the institution.

2.9 Perceived International Value of Foreign-Affiliated Institutions

It was evident that foreign-affiliated universities are often perceived as providing internationally recognized qualifications, modern curricula, and global academic standards (Wilkins & Huisman, 2013). Students may associate such institutions with better career mobility and opportunities for further study abroad.

According to participants' accounts, research on transnational education indicates that they frequently choose international branch or affiliated campuses to obtain foreign degrees without leaving their home countries (Wilkins & Balakrishnan, 2013). This perception is especially relevant for postgraduate business education, where global recognition and professional credibility are highly valued.

2.10 Implications for an Exploratory Approach

Based on participants' accounts, the literature demonstrates that university choice is influenced by a wide array of interacting factors rather than by a single predetermined set of variables. Academic, financial, social, psychological, and contextual elements all contribute to choice-making, and their relative importance varies across contexts and student groups.

Across interviews, given this multidimensional nature, an exploratory qualitative approach is appropriate for identifying context-specific influences on MBA participants' choice of internationally affiliated institutions in Kathmandu. Such an approach allows themes to emerge from participants' experiences rather than restricting analysis to predefined variables, thereby addressing the objectives of the present study.

3. Research Methodology

3.1 Research Design

Overall, the present study employed a qualitative research design to investigate how participants decide to enroll in internationally affiliated MBA institutions in Kathmandu. An exploratory qualitative approach is appropriate when prior research is limited, and the aim is to understand participants' perspectives, meanings, and experiences in depth rather than to test predetermined variables.

It was evident that college choices are complex and context-dependent, shaped by multiple academic, social, economic, and personal influences. Therefore, a qualitative design enables the researcher to capture nuanced decision-making processes and context-specific considerations that structured quantitative instruments may not capture.

Across interviews, data were collected through semi-structured interviews, which allow participants to describe their experiences and reasoning in their own words while enabling the researcher to probe emerging issues relevant to the study objectives.

3.2 Participants

The participants were enrolled in internationally affiliated MBA programs in institutions located in Kathmandu, Nepal. Students were drawn from several institutions across the city to capture diverse perspectives and experiences.

Notably, participants were selected using purposive sampling, a non-probability sampling technique commonly used in qualitative research to recruit individuals with direct experience of the phenomenon under investigation. The inclusion criterion required participants to be currently studying in an internationally affiliated MBA institution in Kathmandu. The continued until data saturation was reached, that is, when additional interviews no longer produced new insights or themes relevant to the research questions.

3.3 Data Collection

The data were collected through semi-structured, in-depth interviews to obtain detailed accounts of participants' choice-making experiences. Interviews were conducted in Nepali, the participants' primary language, to facilitate comfort and authentic expression. All interviews were audio-recorded with participants' informed consent.

It was evident that each interview lasted approximately 30–45 minutes and was conducted by the researcher, who is fluent in both Nepali and English. Conducting interviews in the local language helped ensure clarity of meaning and minimized linguistic barriers.

Across interviews, an interview guide was developed to explore considerations influencing participants' choice of internationally affiliated MBA institutions. Topics included academic considerations, career expectations, financial issues, family and peer influence, media exposure, institutional reputation, and societal perceptions. The use of open-ended questions allowed participants to elaborate on their motivations, experiences, and reasoning processes in detail.

3.4 Data Analysis

Overall, the data were analyzed using thematic analysis, a widely used qualitative method for identifying, analyzing, and reporting patterns within textual data. The analysis followed the six-phase process proposed by Braun and Clarke (2006):

1. **Familiarization :** Interview recordings were transcribed verbatim in Nepali and subsequently translated into English. The researcher repeatedly read the transcripts to gain an overall understanding of the data.
2. **Initial Coding :** Meaningful segments of text related to institution choice considerations were labeled with descriptive codes.
3. **Searching for Themes :** Related codes were grouped to form preliminary themes representing recurring influences on participants' choices.
4. **Reviewing Themes :** Themes were compared across interviews and refined to ensure internal coherence and distinctiveness.
5. **Defining and Naming Themes :** Final themes and subthemes were clearly defined to capture the essence of participants' experiences.
6. **Reporting :** The finalized thematic structure was incorporated into the results section and illustrated with participant quotations.

Notably, to enhance analytical rigor, coding choices and theme development were discussed among the research team until consensus was reached. This collaborative process improved consistency and interpretive validity.

3.5 Trustworthiness

Several strategies were used to ensure the credibility and trustworthiness of the findings. Interviews were conducted in participants' native language to preserve meaning. Verbatim transcription and careful translation helped maintain data accuracy. Repeated reading and systematic coding enhanced analytical reliability. In addition, collaborative review of themes among researchers reduced individual bias and strengthened the credibility of interpretations.

4. Results

Across interviews, 20 MBA participants enrolled in an internationally affiliated university in Kathmandu were interviewed. Data were analyzed using thematic analysis, moving from familiarization and coding to theme construction and refinement. Themes are presented below.

4.1 Access to Information and Guidance (most prevalent)

Across interviews, students frequently described how they learned about programs through prior institutional ties, social media, alum networks, consultancies/agents, and institutional outreach. These channels shaped early perceptions, shortlisting, and eventual selection.

Illustrative excerpts:

- "…social media… these days, social media is packed with ads and testimonials…"
- "Having completed my undergraduate studies at Pulse College (*college name changed*), I was already familiar… and alumni discounts made it practical…"

4.2 International Exposure and Recognition

Overall, the promise of an internationally recognized credential, credit mobility/pathways, and global classroom perspectives strongly motivated choices. Students emphasized the value of a foreign affiliation and the option of eventual study/placement abroad.

Illustrative excerpts:

- "I initially planned to go abroad, but realized I could still get international recognition without leaving Nepal."
- "A foreign affiliation does not automatically mean quality, so I checked the awarding university and curriculum first."

4.3 Perceived Academic Quality and Curriculum

Notably, learners valued an up-to-date syllabus, project- and assignment-based assessment, contemporary teaching methods, and industry-aligned coursework. Several contrasted "modern" curricula with "outdated" alternatives. *Illustrative excerpts:*

- "Assignment-based curriculum is favorable to traditional examinations."
- Overall, "I would rather pay more for the latest tools and updated curriculum than for outdated ones."

4.4 Challenges and Barriers

Overall, participants reported few procedural hurdles in admissions; however, perceived challenges included sorting reliable information from marketing, weighing social expectations, and ensuring degree credibility/recognition.

Illustrative excerpts:

- "The admission process was exceptionally simple and straightforward."
- "I made sure recognition and awarding university credentials were legit before deciding."

4.5 Employability and Career Outcomes

Notably, anticipated career mobility, placements, industry exposure, and networks factored heavily. Students linked international curricula and assessment styles to practical skills and employability.

Illustrative excerpts:

- "Foreign-affiliated programs emphasize practical knowledge and industry connections."
- "I wanted global perspectives that translate to better career opportunities."

4.6 Social & Cultural Influences

Overall, parents, close friends, and alums often validated the choices; encouragement outweighed pressure. Peer examples and family trust in foreign affiliations were common.
Illustrative excerpts:

- "My parents encouraged me a lot."
- "… close friends were supportive."

4.7 Financial Considerations

Overall, cost mattered, but many framed it in value-for-money terms (modern curriculum, recognition, and outcomes). Scholarships and alumni discounts influenced some choices; others prioritized quality over price differentials.

Illustrative excerpts:

- "Financial considerations played a role."
- "… the total cost was far less than going abroad."

4.8 Accessibility, Location & Process

In many cases, students appreciated local access to international programs, clear eligibility criteria, and streamlined admissions processes, reducing the need to relocate or navigate visa requirements.

Illustrative excerpts:

- "The process was clear and professionally managed."
- "We instantly got registration from the university…"
- "The college is centrally located, and amenities are futuristic…"

5. Discussion

The purpose of this study was to explore the factors influencing participants' choice of internationally affiliated MBA institutions in Kathmandu. Through thematic analysis of interview data, several key themes emerged: access to information and guidance; international exposure and recognition; perceived academic quality; employability and career outcomes; social and cultural influences; financial considerations; and accessibility/ admission processes. These findings resonate with and, in some cases, extend existing literature on higher education choice.

5.1 Information Sources and Decision-Making

It was evident that a dominant theme was participants' reliance on social media, alums, and prior institutional ties when making choices. This aligns with Perna (2006), who emphasizes the role of information channels in shaping institutional choice, particularly in contexts where participants lack prior exposure to international options. Similar to findings by Hossler and Gallagher (1987), who highlight the salience of institutional communication, participants demonstrated how digital platforms and alums endorsements can shape perceptions and influence final choices. Unlike in some Western contexts, where guidance counselors play a critical role (Chapman, 1981), peer networks appeared more influential here.

5.2 International Recognition and Academic Quality

The pursuit of internationally recognized degrees was another strong motivator. This corroborates earlier research by Maringe and Gibbs (2009), which found that global recognition and quality assurance are decisive in participants' preference for international programs. For participants, the appeal was not only global recognition but also the ability to access it locally without the financial and logistical burdens of studying abroad. The emphasis on curriculum modernity and assignment-based learning reinforces

Perna's (2006) argument that participants seek institutions that align with contemporary and practical approaches to learning. Unlike in studies where participants primarily focused on institutional reputation (Maringe & Gibbs, 2009), these participants were equally attentive to curriculum design and pedagogy.

5.3 Employability and Career Prospects

Consistent with prior studies of Mazzarol & Soutar (2002), employability outcomes were central in shaping student choices. Respondents highlighted that international affiliations provided greater industry exposure, practical skills, and professional networks. This reflects a global trend where higher education is increasingly evaluated in terms of its return on investment. However, the context shows that employability is framed not just in terms of local job opportunities but also in relation to international career mobility, a nuance less pronounced in Western-focused literature.

5.4 Social and Cultural Influences

Across interviews, the role of parents, peers, and alums was evident in legitimizing participants' choices, though the influence was more supportive than coercive. This mirrors Chapman's (1981) model, which identifies family and peer groups as primary reference points in institution choice. In Nepal's collectivist cultural context, such supportive validation may be particularly notable in confirming choices, even when participants themselves are the primary choice-makers.

5.5 Financial Considerations and Accessibility

Across interviews, although cost was acknowledged, it was often interpreted through a value-for-money lens, similar to findings by Mazzarol and Soutar (2002), who note that participants weigh tuition against perceived educational returns. What distinguishes this research is that studying locally in an internationally affiliated institution was often seen as a cost-effective alternative to international mobility, especially when scholarships or alumni discounts were available. Accessibility through straightforward admissions processes and convenient local locations further reduced barriers, echoing Hossler and Gallagher's (1987) argument that procedural simplicity is a key enabler of choice.

5.6 Contribution to Literature

Overall, the present study both confirms and extends existing frameworks of higher education choice. While the broad considerations (information, recognition, quality, employability, social influence, and cost) are consistent with prior studies (Perna, 2006; Hossler & Gallagher, 1987; Mazzarol & Soutar, 2002; Maringe & Gibbs, 2009), the research highlights unique dynamics:

- The centrality of social media and alums networks as choice-shaping tools.
- The dual role of recognition, both as an assurance of quality and as a substitute for overseas study.
- A stronger orientation toward curriculum content and pedagogy, compared to reputation alone.

6. Conclusion

The present study explored the considerations influencing MBA participants' choices of internationally affiliated universities in Kathmandu using a qualitative thematic analysis. The findings reveal that the choice-making process is multifaceted, shaped by a combination of academic, social, financial, and informational influences.

The most dominant theme was access to information, demonstrating that participants rely heavily on social media, alums, prior institutional links, and consultancies. Alongside this, international exposure and recognition emerged as a central motivator, with participants placing significant value on globally recognized qualifications and the prospect of international pathways. Closely tied to this was the importance of perceived academic quality, where modern curricula, assignment-based assessment, and practical industry alignment were viewed as decisive advantages over traditional alternatives.

From participants' accounts, while employability and career outcomes provided a strong rationale for investing in these programs, social and cultural influences, especially parental encouragement and peer validation, helped

legitimize and reinforce participants' choices. Financial considerations did play a role, but were often framed in terms of value for money compared to studying abroad, rather than absolute affordability. Finally, participants consistently emphasized the ease of access and admission processes, while noting that the few challenges they encountered primarily concerned verifying the credibility and recognition of foreign affiliations.

These findings underscore that choosing an internationally affiliated MBA program in Kathmandu is not a single-factor choice, but rather the outcome of interconnected influences. Students are balancing aspirations for international exposure, quality education, and employability with practical realities of cost, location, and recognition.

The study suggests that success in attracting learners lies in transparent communication of recognition and quality, active use of digital and alums networks for outreach, continuous curriculum innovation, and strengthening career support services. For policymakers, the findings highlight the need for clear standards of recognition, supportive policies for quality assurance, and mechanisms to ensure credibility of foreign partnerships.

In conclusion, the study contributes to understanding institution choice in the Nepalese context, offering insights that can help institutions align strategies with participants' expectations and support the broader development of higher education in Nepal.

References

Phyak, P. (2024). English-medium instruction in higher education in Nepal. In *The Routledge Handbook of English-Medium Instruction in Higher Education* (pp. 394–409). Routledge.

Subedi, G. (2025). Exploring the Expansion, Equity, Excellence, and Emergent Challenges in Higher Education in Nepal. *Perspectives on Higher Education*, *15*(02), 121-136.

Budhathoki, S. (2013). International Degrees in Nepal. *Business Age*. https://www.newbusinessage.com/MagazineArticles/view/244

Hossler, D., & Gallagher, K. S. (1987). Studying student college choice: A three-phase model and the implications for policymakers. *College and University, 62*(3), 207–221.

Perna, L. W. (2006). Studying college access and choice: A proposed conceptual model. In J. C. Smart (Ed.), *Higher education: Handbook of theory and research* (Vol. 21, pp. 99–157). Springer.

Briggs, S. (2006). An exploratory study of the factors influencing undergraduate student choice. *Journal of Higher Education Policy and Management, 28*(2), 113–123. https://doi.org/10.1080/13600800600750981

Maringe, F. (2006). University and course choice: Implications for positioning, recruitment, and marketing. *International Journal of Educational Management, 20*(6), 466–479.

Browne, B. A., & Kaldenberg, D. O. (1997). Conceptualizing self-monitoring: Links to materialism and product involvement. *Journal of Consumer Marketing, 14*(1), 31–44.

Wilkins, S., & Huisman, J. (2013). Student evaluation of university image attractiveness and its impact on choice. *Journal of Studies in International Education, 17*(5), 607–623.

James, R., Baldwin, G., & McInnis, C. (1999). *Which university? The factors influencing prospective undergraduates' choices*. Center for the Study of Higher Education, University of Melbourne.

Maringe, F., & Carter, S. (2007). International students' motivations for studying in the UK HE. *International Journal of Educational Management, 21*(6), 459–475.

Pimpa, N. (2005). A family affair: The effect of family on Thai students' choices of international education. *International Journal of Educational Management, 19*(6), 431–448.

Vrontis, D., Thrassou, A., & Melanthiou, Y. (2007). A contemporary higher education student-choice model. *Journal of Business Research, 60*(9), 979–989.

Chapman, D. W. (1981). A model of student college choice. *The Journal of Higher Education, 52*(5), 490–505. https://doi.org/10.1080/00221546.1981.11778120

Wilkins, S., & Balakrishnan, M. S. (2013). Assessing student satisfaction in transnational higher education. *International Journal of Educational Management, 27*(2), 143–156.

Hofstede, G. (2011). Dimensionalizing cultures: The Hofstede model in context. *Online Readings in Psychology and Culture, 2*(1), 8. https://doi.org/10.9707/2307-0919.1014

Bourdieu, P. (1986). The forms of capital. In J. Richardson (Ed.), *Handbook of theory and research for the sociology of education* (pp. 241–258). Greenwood.

Maringe, F., & Gibbs, P. (2009). *Marketing higher education: Theory and practice*. McGraw-Hill.

Mazzarol, T., & Soutar, G. N. (2002). "Push-pull" factors influencing international student destination choice. *International Journal of Educational Management, 16*(2), 82–90. https://doi.org/10.1108/09513540210418403

Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology, 3*(2), 77–101. https://doi.org/10.1191/1478088706qp063oa

Workplace Ostracism and Turnover Intentions: A Moderated Mediation Model of Organizational Commitment and Emotional Intelligence in the Hospitality Industry

Madan Dhungana[1], Anisha Shrestha[2]

[1]*Faculty, DAV College, Lalitpur, Nepal, Email:dhmadan8363@gmail.com,https://orcid.org/0009-0006-9163-9425*

[2]*BBA Graduate, DAV College, Lalitpur, Nepal, Email: shresthaanisha2002 @gmail.com, https://orcid.org/0009-0004-3477-7915*

Abstract

Employee turnover remains a significant and costly issue in the hospitality industry. Ostracism at work, a subtle but significant kind of social exclusion, is an essential predictor of intentions to leave. This study investigates the influence of workplace ostracism on turnover intentions in the hospitality sector of Lalitpur, focusing on organizational commitment as a mediating factor and emotional intelligence as a moderating variable. The study employs Quantitative research methodologies with a causal research design. Moreover, a cross-sectional design was employed to collect data from a sample of 262 employees at five government-classified tourist-standard hotels in Lalitpur.

Workplace ostracism demonstrated a direct and positive effect on turnover intentions, and organizational commitment partially mediated this relationship, as indicated by the indirect effect, whereas emotional intelligence significantly reduced the impact of ostracism. When employees feel left out at work, they are more likely to think about leaving their jobs. Organizational commitment can help reduce this risk, but emotional intelligence does not seem to make a difference. This shows that companies should focus on building inclusive cultures instead of relying on individual coping skills. Recognizing employees' efforts helps build commitment and transparency and reduces feelings of exclusion. To truly improve workplace dynamics, organizations need to implement systematic changes alongside encouraging emotional intelligence.

Keywords: *Emotional Intelligence, Hospitality Industry, Organizational Commitment, Turnover Intentions, Workplace Ostracism.*

Volume 1, Issue no. 1, May 2026
Received Date: March 11, 2026
Revised Date: April 12, 2026
Accepted Date: May 9, 2026
ISSN: 3149-7144 (Print)
ISSN: 3149-7152 (Online)

1. Introduction

The demanding and stressful atmosphere of the hospitality industry makes it less likely for workers to provide exceptional customer service and encourages thoughts of quitting (Rao & Goel, 2017). Workplace ostracism is a common yet often hidden form of interpersonal mistreatment that can significantly harm employee well-being and organizational outcomes (Williams & Nida, 2009). The social rejection or exclusion of an individual by others in the workplace is known as ostracism, and it poses a significant challenge to basic human needs, including a sense of control, self-worth, and belonging (Williams, 2001). As of now, many studies indicate that ostracism is associated with the anterior cingulate cortex, a region linked to physical pain, as determined by functional magnetic resonance imaging (fMRI) (Einsberger et al., 2003). Research has linked workplace ostracism to psychological distress, reduced work engagement, and turnover intentions among employees (Ferris et al., 2008). This silent but widespread problem is frequently overlooked because it takes the form of subtle acts of exclusion, such as dismissing colleagues' opinions in meetings or excluding them from social situations, rather than overt disagreement. These actions produce a toxic atmosphere that hinders cooperation and output (O'Reilly & Robinson, 2009). Furthermore, the mediating element between attitudes that influence intent to leave and actual departure from an organization is known as turnover intention (Glissmeyer et al., 2008). According to reports, firms with engaged employees are 21% more productive, 22% more lucrative, and have much lower turnover rates. However, internationally, just 13% of employees feel engaged (Hoisington, 2019).

The concept of organizational commitment can be illustrated by how an employee sacrifices their personal interests for the benefit of the company, as well as by how the company treats its employees when an individual connects with and contributes more to achieving organizational objectives. Three distinct approaches to organizational commitment are distinguished: affective, continuance, and normative commitment. Employees who are ostracized exhibit poorer citizenship behavior, which in turn leads to lower levels of commitment (Leung et al., 2011). Ostracism must therefore prove to be a concerning situation for the companies. According to conservation resource (COR) theory, employees' physical and emotional resources are depleted when they experience ostracism, thereby further affecting work-related outcomes such as organizational commitment. The term 'emotional intelligence' refers to a range of competencies, including the capacity to recognize and manage one's own emotions as well as others' (Mayer & Salovey, 1997). Employees with high emotional intelligence and a positive outlook on life are more likely to manage their emotions effectively and be less susceptible to professional ostracism. (Zhang et al.,2017).

As a result, workplace ostracism, although subtle and often unrecognized, can have a profound impact on individuals, making them feel alienated and undervalued. Over time, these experiences contribute to higher turnover intentions, making it more challenging for organizations to retain talented employees and foster a positive workplace culture (Anasori et al., 2020).

The study reveals the mechanism by which workplace ostracism affects turnover intentions, focusing on the role of organizational commitment and the potential protective effects of emotional intelligence. The goal is to offer practical insights that help organizations address this silent but impactful problem and build stronger, more engaged teams.

Literature Review and Hypothesis Development

Workplace Ostracism, a subtle yet harmful form of interpersonal mistreatment, has gained increasing attention in organizational research due to its significant impact on employee well-being and performance (Williams & Nida, 2009). Researchers using functional magnetic resonance imaging (FMRI) discovered that social isolation and ostracism stimulate the anterior cingulate cortex, an area linked to physical pain. (Eisenberger et al., 2003). A person's sense of purpose, control, self-worth, and belonging are all adversely impacted by ostracism. Ostracism is considered an interpersonal stressor within stress models (Büttner et al., 2024; Dong et al., 2024). Cortisol and other stress-related chemicals may be released as a result, causing social pain that is

neurologically comparable to physical pain. Long-term social isolation can cause chronic stress, which affects the human body in several ways. (Dickerson & Kemeny, 2004). The negative consequences of workplace exclusion on employee outcomes, especially turnover intentions, have been the subject of numerous studies. According to Ferris et al. (2008), for example, ostracism at work produces feelings of rejection and isolation that dramatically increase employees' turnover intentions. Research in other high-stress industries also shows a link between negative workplace experiences and employee turnover. For example, studies have found that factors such as heavy workload, unclear roles, and unmet growth expectations increase the likelihood that employees in the banking industry will want to leave their jobs (Gautam & Gautam, 2024). For this study, workplace ostracism is conceptualized as a negative social experience that affects employees' sense of belonging and can have profound implications for their work attitudes and behaviors. The measurement items capture various dimensions of exclusion experienced in day-to-day organizational interactions.

Turnover intention is defined as the mediator between attitudes and the intent to resign, and between the intent to resign and actual departure from an organization (Glissmeyer, Bishop, & Fass, 2008). Unlike actual turnover, which involves the physical act of leaving, turnover intention serves as the precursor or psychological state that predicts an employee's likelihood of quitting (Long et al., 2012). This variable is operationalized to assess employees' cognitive and emotional considerations related to leaving the organization. Organizational commitment has been empirically established as a significant factor in understanding employee retention. According to Meyer & Allen (1991), employees with high organizational commitment, particularly affective commitment, are more likely to remain in the organization despite negative workplace experiences. Moreover, the study examines organizational commitment, a key mediating variable that influences how employees' experiences of workplace ostracism translate into turnover intentions. It is operationalized to measure the extent of employees' dedication, loyalty, and willingness to contribute to organizational success.

Emotional intelligence (EI) is a collection of non-cognitive capabilities, competencies, and skills that influence one's ability to manage environmental demands and pressures (Bar-On, 1997). In addition, EI is an individual's ability to understand and manage others' emotions. This variable is operationalized to reflect the employee's capacity to maintain emotional balance and build positive workplace relationships despite challenging social dynamics (Zhang et al., 2015). Additionally, the potential of emotional intelligence as a protective factor remains underexplored. Can employees with higher emotional intelligence better navigate the challenges of workplace ostracism? If so, how can organizations support and develop the skill to reduce the negative consequences of ostracism? Hence, by addressing these gaps, this study provides a comprehensive understanding of the relationships and offers actionable strategies for organizations to reduce turnover, foster inclusion, and create healthier work environments (Williams & Nida, 2009).

Workplace Ostracism and Turnover Intentions

According to Ferris et al. (2008), ostracism at work produces feelings of rejection and isolation that dramatically increase employees' turnover intentions. The negative consequences of workplace exclusion on employee outcomes, especially turnover intentions, have been the subject of numerous studies. A 2024 meta-analysis of 32 studies finds a moderate positive correlation between ostracism and turnover intention (Das & Ekka, 2024), confirming that ostracized employees are more likely to consider leaving their jobs. Turnover intention serves as the intermediary factor linking an individual's attitudes, which influence their desire to leave, to the actual decision to resign from an organization. (Glissmeyer, Bishop, & Fass, 2008).

H1: Workplace ostracism has a positive relationship with turnover intentions.

Workplace Ostracism and Organizational Commitment

Workplace Ostracism, a subtle yet harmful form of interpersonal mistreatment, has gained increasing attention in organizational research based on its significant impact on employee well-being and performance (Williams & Nida, 2009). Organizational commitment has been empirically established as a significant factor in understanding employee retention. According to Meyer & Allen (1991), employees with high organizational

commitment, particularly affective commitment, are often more likely to stay despite negative workplace experiences. However, studies such as Leung et al. (2011) found that workplace ostracism reduces organizational commitment, particularly by weakening employees' sense of belonging and emotional connection to the organization.

H2: Workplace ostracism is significantly related to organizational commitment.

Organizational Commitment and Turnover Intentions

Several studies demonstrated that organizational commitment significantly reduces turnover intentions. For instance, Meyer et al. (2002) found that affective commitment is the dominant predictor of an employee's intention to stay, as employees who feel emotionally connected to their organization are less likely to leave. Similarly, Long et al. (2012) reported that low levels of commitment, often stemming from poor workplace relationships or a lack of inclusion, lead to increased turnover intentions.

H3: There is a significant relationship between organizational commitment and turnover intentions.

Organizational Commitment as a mediator

Organizational commitment plays a critical mediating role in the relationship between workplace ostracism and turnover intentions. As employees experience ostracism, their sense of belonging, self-worth, and emotional connection to the organization are undermined. This erosion of emotional and psychological bonds often manifests as a decline in organizational commitment, which in turn increases the intention to leave the organization. It even demonstrates that ostracized employees exhibit diminished commitment, thereby increasing turnover intentions (Wu et al., 2016).

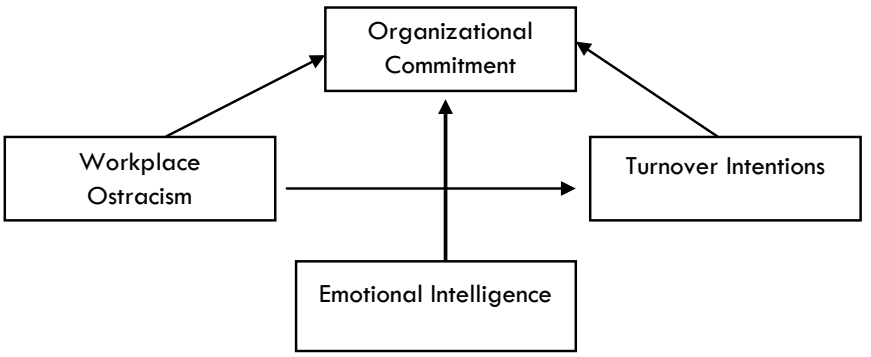
H2: Organizational commitment mediates the relationship between workplace ostracism and turnover intentions.

Emotional Intelligence as a moderator

More and more people are paying attention to how emotional intelligence might mitigate the inverse effects of workplace ostracism. Employees with high emotional intelligence are better able to control their emotions and handle stress at work (Zhang et al., 2017). This skill mitigates the effect of ostracism on turnover intentions by helping them manage its negative repercussions. In a similar vein, Kalyar et al. (2019) discovered that emotional intelligence increases workers' resilience, enabling them to handle interpersonal difficulties without abandoning their organizational responsibilities.

H5: Emotional intelligence moderates the relationship between workplace ostracism and turnover intentions.

Figure 1: *Research Framework*



Source: *(Anosari et al., 2021)*

2. Method

The study adopted a quantitative research design, using a cross-sectional survey to collect data from employees in the Hospitality Industry in the Lalitpur Valley. The structured questionnaire, incorporating validated instruments from prior research, gathered information on demographics, workplace ostracism, organizational commitment, emotional intelligence, and turnover intentions. A causal research design was applied to explore relationships between variables, examining organizational commitment as a mediating factor and emotional intelligence as a moderating factor.

The study employed purposive sampling to reach workers directly involved in the hospitality industry of Lalitpur, Nepal. There were 262 valid responses to the 280 questionnaires that were distributed. Even though the precise population size was unknown, the sample size is deemed statistically adequate because it exceeds the 200 cases that Hair et al. (2019) recommend as a minimum threshold for multivariate analysis and approaches the specifications proposed by Krejcie and Morgan (1970) for large or unknown populations. Furthermore, data were collected via a structured questionnaire distributed manually to employees in the Hospitality Industry and via Google Forms. The questionnaire consisted of two sections: one covering demographic details, including age, gender, education, and job tenure, and the other assessing key constructs using a five-point Likert scale (1 = Strongly Disagree to 5 = Strongly Agree).

Data analysis was done using SPSS 26 and Microsoft Excel. Analysis of the relationships between the variables was done using regression and correlation, and moderating and mediating effects were looked into using SPSS's PROCESS Macro. This study also employed a regression model to investigate the impact and relationships among demographic variables, Workplace Ostracism, Turnover Intentions, Organizational Commitment, and Emotional Intelligence. More especially, the regression model is defined as follows:

$$TI = \alpha + \beta 1O + \beta 2OC + \beta 3EI + \beta 4DF + \varepsilon$$

where,

TI = Turnover Intentions
O = Workplace Ostracism
OC = Organizational Commitment
EI = Emotional Intelligence
DF=Demographic Factors
α= Constant
β= Coefficient of Independent Variable
ε= Error terms

3. Findings

Demographic Information

The questionnaire requested participants to share their demographic information,

including gender, age, highest level of education completed, and length of job tenure.

Table 1 : *Demographic Profile of Respondents*

Demographic Variables	No. of responses	Percentage (%)
Gender		
Male	133	50.76
Female	129	49.24
Age (in years)		
below 25	49	19
26-35	185	71
36-45	24	9
Above 46	4	2

Education		
High School	38	14.50
Bachelor's degree	153	58.40
Master's degree & above	71	27.10
Job Tenure		
Less than 2 years	122	46.56
3-6 years	120	45.80
More than 7 years	20	7.63

Table 1 presents the demographic profile of respondents by gender, age, education, tenure, and other characteristics—sample: 133 males (50.76%) and 129 females (49.24%). Major respondents (71%) are in the 25-35 age group, while fewer than 2% are over 46. One with a bachelor's degree (58.40%), ahead of a master's degree or higher (27.10%). In terms of job tenure, approximately 46.56% have less than 2 years of experience, 45.80% have 3-6 years, and only 7.63% have more than 7 years.

Reliability Analysis

This section focuses on testing the reliability of questionnaires and concludes the data collection. SPSS software is used to analyze the reliability of the questionnaires and produce the results. Cronbach's Alpha is the most often used technique by researchers to assess the internal consistency of data.

Table 2 : *Reliability Analysis*

Variables	No. of Items	Cronbach's alpha
Workplace Ostracism	7	0.917
Turnover Intention	3	0.868
Emotional Intelligence	10	0.788
Organizational Commitment	12	0.922
Total	32	0.783

Table 2 presents the reliability analysis of different variables using Cronbach's alpha. It includes Workplace Ostracism ($\alpha = 0.917$), Turnover Intention ($\alpha = 0.868$), Emotional Intelligence ($\alpha = 0.788$), and Organizational Commitment ($\alpha = 0.922$). The overall reliability for all 32 items is 0.783, indicating an acceptable level of internal consistency for the study's measurement scales.

Descriptive Analysis

This part consists of descriptive statistics, or central tendency measures, for the constructs (Workplace Ostracism, i.e., independent variable; Organizational Commitment, i.e., mediating variable; Emotional Intelligence, i.e., moderating variable; and Turnover Intentions, i.e., dependent variable). This involves calculating measures such as the mean and Standard Deviation for every variable used.

Table 3 : *Descriptive Statistics of all Variables*

Variables	N	Mean	Standard Deviation
Workplace Ostracism	262	2.496	.873
Turnover Intentions	262	2.799	1.073
Emotional Intelligence	262	3.788	0.478
Organizational Commitment	262	3.274	0.789

Table 3 presents descriptive statistics for Workplace Ostracism, Turnover Intentions, Emotional Intelligence, and Organizational Commitment. Each variable has 262 respondents (N = 262). The mean values range from 2.496 (Workplace Ostracism) to 3.788 (Emotional Intelligence), indicating the average responses. The

standard deviation values indicate variability, with Turnover Intentions showing the highest dispersion (1.073) and Emotional Intelligence the lowest (0.478), suggesting a more consistent response pattern for the latter.

Correlation Analysis

Pearson correlation analysis measures the degree and direction of correlation between variables. Pearson correlation analysis requires a correlation coefficient (r) ranging from -1 to 1. This analysis will help us draw meaningful inferences about the relationships between variables such as Workplace Ostracism, Organizational Commitment, Emotional Intelligence, and Turnover Intentions.

Table 4 : *Correlation analysis among variables.*

	Workplace ostracism	Turnover intentions	Emotional intelligence	Organizational commitment
Workplace ostracism	1			
Turnover intentions	0.751**	1		
Emotional Intelligence	0.087	0.031	1	
Organizational commitment	-0.456**	-0.433**	0.217**	1
**. Correlation is significant at the 0.01 level (2-tailed).				

Table 4 contradicts correlations between workplace ostracism, turnover intentions, emotional intelligence, and organizational commitment. Workplace ostracism strongly correlates with increased turnover intentions (r = 0.751) and decreased organizational commitment (r =-0.456). Conversely, organizational commitment shows a negative relationship with turnover intentions (-0.433). Emotional intelligence has weak correlations with the other variables. All significant correlations are at the 0.01 level.

Regression Analysis

Regression analysis helps to assess the impact of the independent variable on the dependent variable. Here, the analysis is conducted on the relationship between the independent and dependent variables. The study used the Enter method of linear regression analysis.

Table 5 : *Regression Model Summary*

Model	R	R Square	Adjusted R-Square	Std. Error of the Estimate	Durbin-Watson
1	0.751[a]	0.563	0.562	0.710	1.365
a. Predictors: (Constant), Turnover intentions					
b. Dependent Variable: Workplace ostracism					

Table 5 presents a regression model with a strong positive relationship (R=0.751) between turnover intentions and workplace ostracism. Turnover intentions explain 56.3% (R-squared) of the variance in workplace ostracism. A Durbin-Watson value of 1.365 suggests possible autocorrelation.

Table 6 : *Regression Analysis of Workplace Ostracism and Turnover Intentions*

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
	B	Std. Error	Beta			Toler-ance	VIF	
1	(Constant)	0.492	0.133		3.736	0.000		
	Turnover intentions	0.922	0.050	0.751	18.315	0.000	1.000	1.000
a. Dependent Variable: Workplace ostracism								

Table 6 shows the relationship between turnover intentions and workplace ostracism. This regression indicated a strong positive correlation between turnover intentions and workplace ostracism (Beta = 0.751, t = 18.315, p < .000), indicating that workplace ostracism is associated with higher turnover intentions. The unstandardized B = 0.922 indicates that for every 1-unit increase in turnover intentions, workplace ostracism is expected to increase by the same amount, 0.922. The value of the constant (0.492) represents the amount of workplace ostracism predicted to occur when there are no turnover intentions. The collinearity statistics are Tolerance = 1 and VIF (Variance Inflation Factor) = 1. Therefore, this model produces no multicollinearity. Hence, the model reveals a very strong predictive relationship between greater aspirations to quit and further experiences of workplace ostracism.

Mediation Analysis

Mediation analysis examines how an independent variable (IV) influences a dependent variable (DV) through a mediator, providing deeper insight into the process linking the two variables. First proposed by Baron and Kenny (1986), this technique partitions the total effect of the IV on the DV into a direct effect that does not pass through the mediator and an indirect effect that does (Preacher & Hayes, 2004).

Table 7 : *Mediation Analysis of Organizational Commitment*

Path	Effect	SE	t	p	95% CI (LLCI)	95% CI (ULCI)	Standardized Effect
(WO → OC)	-0.412	0.050	-8.254	0.000	-0.510	-0.313	-0.456
(OC → TI)	-0.156	0.062	-2.523	0.012	-0.278	-0.034	-0.125
Direct: (WO→ TI)	0.858	0.056	15.321	0.000	0.747	0.968	0.758
Total : (WO → OC → TI)	0.922	0.050	18.315	0.000	0.823	1.021	0.751
Indirect Effect	0.064	0.027	-	-	0.021	0.125	0.057

(WO= Workplace Ostracism, OC= Organizational Commitment, TI= Turnover Intention)

Table 7 shows the partial mediation effect of Organizational Commitment (OC) on the relationship between Workplace Ostracism (WO) and Turnover Intention (TI). Workplace ostracism significantly reduces organizational commitment (β = -0.412, p < .001), and lower commitment increases turnover intention (β = -0.156, p = .012). However, workplace ostracism still has a strong direct effect on turnover intention (β = 0.858, p < .001). The indirect effect (β = 0.064, CI: 0.021–0.125) confirms partial mediation, meaning ostracism influences turnover both directly and indirectly through commitment.

Moderation Analysis

Moderation analysis assesses how the dimension of a variable changes as a function of the level of a third variable, called the moderator. As introduced by Aiken and West (1991), moderation analysis typically uses interaction terms in regression models and can be handled precisely with tools such as the PROCESS macro in SPSS. Thus, this analysis evaluates emotional intelligence, workplace ostracism, and turnover intentions.

Table 8

Path	Effect	SE	t	p-value	95% CI (LLCI)	95% CI (ULCI)
Constant	2.852	1.089	2.618	0.009	0.706	4.997
WO	0.159	0.384	0.413	0.680	-0.598	0.915
EI	-0.604	0.277	-2.180	0.030	-1.150	0.059
Interaction (WO × EI)	0.194	0.096	2.013	0.045	0.004	0.383

Moderation Analysis of Emotional Intelligence

(WO= Workplace Ostracism, TI= Turnover Intentions, EI= Emotional Intelligence)

Table 8 shows a significant moderate effect (WO × EI: β = 0.194, p = 0.045), suggesting that emotional intelligence moderates this relationship. The effect of workplace ostracism on turnover intention was not significant (β = 0.159, p = 0.680), suggesting that ostracism alone will not independently influence turnover intentions. However, there is a significant negative effect on turnover intentions (β = -0.604, p = 0.030), implying that employees with higher emotional intelligence are less likely to consider leaving their jobs. The significant interaction terms suggest that the effect of workplace ostracism on turnover intention varies with variations in emotional intelligence levels.

Table 9 : *Hypothesis Testing*

Hypothesis	Statements	Conclusion
H1	Workplace Ostracism (O) positively influences Turnover Intentions (TI).	Accepted
H2	Workplace ostracism (O) has a significant negative relationship with organizational commitment (OC).	Accepted
H3	There is a significant negative relationship between organizational commitment and turnover intentions.	Accepted
H4	Organizational Commitment (OC) mediates the relationship between Workplace Ostracism (O) and Turnover Intentions (TI).	Accepted
H5	Emotional Intelligence (EI) moderates the relationship between Workplace Ostracism (O) and Turnover Intentions (TI).	Accepted

4. Discussion

This study investigates workplace ostracism, organizational commitment, emotional intelligence, and turnover intentions among hotel employees in Lalitpur Valley. Consistent with previous studies linking ostracism with one of the leading causes of employee turnover (Ferris et al., 2008; O'Reilly & Robinson, 2009), the findings show evidence that workplace ostracism has a major influence on turnover intentions. Employees who are excluded tend to experience emotional disengagement, which weakens their organizational attachment and increases their probability of turnover. Results from this study suggest that subtle exclusionary acts should be addressed to increase retention.

Furthermore, this research indicated the mediating role of organizational commitment in the relationship between workplace ostracism and the yearning for turnover, reiterating previous studies (Meyer & Allen, 1991; Leung et al., 2011) that emphasize the importance of emotional and psychological bonds in the workplace. Therefore, enhancing organizational commitment might mitigate the damaging effects of ostracism, thereby reducing turnover intentions. Findings grounded in Conservation of Resources (COR) theory show that workplace ostracism reduces essential personal and job-related resources and can clearly lead to negative outcomes, such as decreased engagement and performance. Accordingly, COR theory (Hobfoll, 1989) posits that employees who experience resource loss due to ostracism conserve their remaining resources by reducing effort and withdrawing from work activities. This perspective explains quite well the psychological strain of ostracism and, more widely, its impact in settings where interpersonal relations are significant, especially in service industries (Leung et al., 2011). The analysis goes a step further by expanding on COR theory to consider organizational commitment as a syndicator. From the general findings, it became evident that ostracism dampens employees' emotional ties to their organizations, leading to decreased commitment and increased turnover intentions (Meyer & Allen, 1991). Thus, emotional intelligence can play a moderating role, whereby an employee is readily able to control her emotions and effectively cope with exclusion (Zhang et al., 2017). COR, this perspective further clarifies the theory by demonstrating how organizational commitment

and emotional intelligence can protect against the negative consequences of resource depletion from ostracism.

Moreover, these results underscore the need to create work environments that are supportive and inclusive to mitigate the effects of ostracism. Organizations can then work to retain employees through emotional intelligence training and strategies that enhance organizational commitment. Future investigations could further examine other moderators-organizational culture and leadership style-to enhance understanding of managing and lessening the effects of ostracism. In addition, organizations can learn how to mitigate the damaging effects of ostracism by focusing on employee well-being and organizational performance (Wu et al., 2012; Zaman et al., 2021).

Most interestingly, ostracism and turnover intentions were significantly semi-moderated by emotional intelligence. While emotionally intelligent employees exhibited slightly lower turnover intentions, these were insufficient to offset the adverse effects of ostracism fully. This differs from the findings of Zhang et al. (2017), suggesting that structural and organizational interventions may be more effective against ostracism than relying solely on individual emotional competencies.

5. Conclusion

This study provides an in-depth, holistic analysis of workplace ostracism, organizational commitment, emotional intelligence, and turnover, and their relationship to the results. It underscores the major critical impact of workplace ostracism, a subtle yet harmful form of interpersonal mistreatment, on employees' emotional well-being and organizational outcomes. The findings demonstrate that employees experiencing ostracism are more likely to feel excluded, undervalued, and disconnected from their workplace. This weakened sense of belonging directly contributes to increased turnover intentions, highlighting the high costs of ostracism for organizations, including talent loss and reduced productivity.

Furthermore, it concludes that organizational commitment serves as a strong mediator between workplace ostracism and turnover intentions. Employees' emotional commitment toward their organization is a buffer against any tendencies to leave, no matter how severe the demands of ostracism may be. However, this further escalates the desire to depart, which, in addition, erodes organizational commitment due to ostracism. The result underscores the importance of fostering an environment in which employees feel emotionally attached to their organization, as this will serve as a buffer against ostracism. Interestingly, emotional intelligence failed to moderate the relationship between ostracism and turnover intentions in a statistically meaningful way, contrary to the prior hypothesis. Although emotionally intelligent people exhibit somewhat lower turnover intentions, they cannot substitute for structural and cultural interventions meant to counter ostracism. The finding implies that while emotional intelligence remains a potent resource, it cannot replace structural and cultural interventions aimed at confronting workplace ostracism head-on.

In summary, the present research shows that workplace ostracism poses significant challenges for employee retention and the organizational culture. The research supports the claim that workplace ostracism explains a considerable amount of variance in turnover intentions. Therefore, this avalanche of results also indicates an immediate need for organizations to find practical means to minimize exclusionary behavior in the workplace and encourage inclusivity. The findings highlight an incredible body of insights for organizations, providing a roadmap to address workplace ostracism and its effects through interventions, leadership development, and employee engagement strategies.

Implications

These findings have a far-reaching impact on organizations' efforts to improve employee well-being, reduce turnover, and build a strong organizational culture. Organizations must realize that workplace ostracism is not to be taken seriously, as it poses serious challenges to employee morale and commitment. Fighting against ostracism should begin with clearly imposed various anti-ostracism rules and conduct to check exclusionary conduct. Regular assessment through user surveys or feedback mechanisms should identify subtle instances of ostracism before they escalate into serious evaluations. Organizations could create positive, inclusive

environments that foster belonging among employees, thereby making them less likely to feel ostracized. Team-building exercises, cross-functional cooperation, and diversity programs are among the most crucial tools for reinforcing inclusiveness over isolation.

Nevertheless, the study claims that commitment serves as a mediator in the relationship between ostracism and turnover intentions, so developing organizational commitment becomes all the more critical, as it would work against ostracism. It would be much better for employers to foster a workplace culture that values and recognizes employees' contributions, aligns individuals' roles with organizational missions, and promotes career development. Employees with a deeper emotional bond with their organizations would likely not flee at the first opportunity; they would endure through thick and thin. Certainly, organizations need to build on connections between employees and management by developing open, transparent communication complemented by shared values of trust and accountability across the workforce.

Leadership plays a central role in addressing ostracism and its consequences. Inclusive leadership practices, such as empathetic communication, conflict resolution, and active listening, can significantly improve workplace relationships. Leadership styles that embrace inclusion-the use of empathy to communicate, mediation of conflict, and active listening-have the potential to vastly improve workplace relationships. Managers should be trained to identify behaviors that lead to ostracism and to intervene effectively, creating a work environment where all employees feel respected and valued. Equally important is establishing a safe culture in which employees may express their concerns without fear of retaliation. Communication, particularly through one-on-one meetings and team discussions, can help leaders stay attuned to their teams' dynamics and tackle issues proactively.

Therefore, the organization is committing to constant observation and investigation of the dynamics in work settings. Regular evaluation of employee experiences, organizational commitments, and turnover intentions may enable leaders to make data-driven decisions to improve workplace conditions. This dissertation reinforces the view that an acceptable and supportive platform should be created for employees to feel connected, be dealt with, and be valued. When organizations, employees, and retention deal with ostracism, compassion and a sense of belonging are enhanced, which, in turn, translates into long-term business success.

6. Limitations and directions for results search

Overall, the results have limited localization due to the specific locales studied. Further, since this study is qualitative, it collects data at a single point in time, which limits the ability to draw broader conclusions beyond that one-time interval. The researchers also introduced a purposive template sampling method, which undoubtedly suggests that selection bias was possible, given that participants were selected based on specific criteria relevant to the study's focus. This type of sampling usually compromises the sample's representativeness, distorting the results. Therefore, the results of the study apply to a specific population due to the limited context and criteria used to select participants. Hence, the applicability of the findings is in question, as they were confined to a particular environment and a specific set of participants. There is no denying that these insights hold significance. However, they must be handled very carefully when used in a completely different context or broader audience. There is a need to conduct the study across varying environments and use different sampling techniques to strengthen and broaden the applicability of the findings. These limitations remind the reader to be careful and considerate when interpreting the conclusions the study seeks to establish.

7. Acknowledgement

The author would like to thank the anonymous respondents and the individuals who made this study possible.

8. Conflict of Interest

The author declares no conflict of interest while preparing this article.

References

Allen, N. J., & Meyer, J. P. (1990). The measurement and antecedents of affective, continuance, and normative commitment to the organization. *Journal of Occupational Psychology, 63*(1), 1–18. https://doi.org/10.1111/j.2044-8325.1990.tb00506

Anasori, E., Bayighomog, S. W., & Tanova, C. (2020). Workplace bullying, psychological distress, resilience, mindfulness, and emotional exhaustion. The Service Industries Journal, 40(1–2), 65–89. https://doi.org/10.1080/02642069.2019.1589456.

Anderson, J. C., & Gerbing, D. W. (1988). Structural equation modeling in practice: A review and recommended two-step approach. Psychological Bulletin, 103(3), 411–423. https://doi.org/10.1037/0033-2909.103.3.411.

Attaullah, & Afsar, B. (2021). Workplace ostracism and counterproductive work behaviors in the healthcare sector: A moderated mediation analysis of job stress and emotional intelligence. *Dynamic Relationships Management Journal.*

Bilal, A., & Attaullah, M. (2021). Workplace ostracism and counterproductive work behaviors in the healthcare sector: A moderated mediation analysis of job stress and emotional intelligence. *Dynamic Relationships Management Journal*, 10(1), 73–92. https://doi.org/10.17708/DRMJ.2021.v10n01a05

Büttner, C., Ren, D., Stavrova, O., Rudert, S., Williams, K., & Greifeneder, R. (2024). Ostracism in everyday life: A framework of threat and behavioral responses in real life. *Journal of personality and social psychology*. 129(5), 870–887. https://doi.org/10.1037/pspi0000471.

Chiu, C. K., & Chien, C. S. (2012). Examining the relationships among job satisfaction, organizational commitment, and turnover intention: An empirical study. *International Journal of Business and Management, 7*(20), 44–58. https://doi.org/10.5539/ijbm.v7n20p44

Das, S., & Ekka, D. (2024). Workplace Ostracism and Turnover Intention in Organizations: A Meta-analytic Review. *BIMTECH Business Perspectives*. 5(1), 48–73. https://doi.org/10.1177/25819542241250147.

Dong, N., Zhang, Y., Ma, X., Yin, K., & Liu, Y. (2024). Carrying Ostracism Overnight: The Cognitive Mechanism Underlying the Effect of Daily Workplace Ostracism on Next-Day Work Engagement. *Stress and Health.* 40(6), e3500. https://doi.org/10.1002/smi.3500.

Einsberger, R., Lieberman, M. D., & Williams, K. D. (2003). Does rejection hurt? An FMRI study of social exclusion. *Science, 302*(5643), 290–292. https://doi.org/10.1126/science.1089134

Ferris, D. L., Brown, D. J., Berry, J. W., & Lian, H. (2008). The development and validation of the Workplace Ostracism Scale. *Journal of Applied Psychology, 93*(6), 1348–1366. https://doi.org/10.1037/a0012743

Gautam, D. K., & Gautam, P. K. (2024). Occupational stress for employee turnover intention: mediation effect of service climate and emotion regulation. *Asia-Pacific Journal of Business Administration*, 16(2), 233–255. https://doi.org/10.1108/APJBA-02-2021-0056.

Glissmeyer, M., Bishop, J. W., & Fass, R. D. (2008). Role conflict, role ambiguity, and intention to quit the organization: The case of law enforcement officers. *Journal of Organizational Behavior, 29*(1), 57–77. https://doi.org/10.1002/job.403

Hobfoll, S. E. (1989). Conservation of resources: A new attempt at conceptualizing stress. American Psychologist, 44(3), 513–524.

Hoisington, S. (2019). Engaged employees drive profitability and productivity. *Gallup Workplace Report.*

Hsieh, Y. H., & Karatepe, O. M. (2019). Poor service recovery performance is a reason for high turnover intentions in the hospitality industry. *International Journal of Contemporary Hospitality Management, 31*(4), 1694–1712.

Karatepe, O. M., & Uludag, S. (2012). The effect of job insecurity on hotel employees' organizational citizenship behaviors: The mediating role of emotional exhaustion—*Journal of Business and Management.*

Krejcie, R. V., & Morgan, D. W. (1970). Sample size determination table. *Educational and Psychological Measurement, 30(3), 607–610.*

Leung, A. S. M., Wu, L. Z., Chen, Y. Y., & Young, M. N. (2011). The impact of workplace ostracism in service organizations. *International Journal of Hospitality Management,* 30(4), 836–844. https://doi.org/10.1016/j.ijhm.2011.01.004.

Leung, K., Wu, L. Z., Chen, Y. Y., & Young, M. N. (2011). The impact of workplace ostracism on job performance: The mediating role of organizational citizenship behavior. *Journal of Applied Psychology, 96*(6), 1237–1245. https://doi.org/10.1037/a0021883

Long, C. S., Thean, L. Y., Ismail, W. K. W., & Jusoh, A. (2012). Leadership styles and employees' turnover intention: Exploratory study of academic staff in a Malaysian college. *World Applied Sciences Journal, 19*(4), 575–581.

Lyu, X., & Zhu, H. (2020). The impact of workplace ostracism on turnover intention: The mediating role of organizational commitment and the moderating role of emotional intelligence. *International Journal of Hospitality Management.*

Ma, S., Silva, M., & Trigo, V. (2020). Tourism and hospitality employability: Perspectives from a systematic review. *International Journal of Hospitality Management, 91,* 102829. https://doi.org/10.1016/j.ijhm.2020.102829

Meyer, J. P., & Allen, N. J. (1991). A three-component conceptualization of organizational commitment. *Human Resource Management Review, 1*(1), 61–89. https://doi.org/10.1016/ 1053-4822(91)90011-Z

O'Reilly, J., & Robinson, S. L. (2009). The negative impact of ostracism on thwarted belongingness and workplace behaviors. *Academy of Management Proceedings, 2009*(1), 1–6. https://doi.org/10.5465/ambpp.2009.44244139

Olorunsola, E. O. (2018). Organizational commitment and turnover intentions: Evidence from a Nigerian paramilitary organization. *International Journal of Advanced Research.*

Ram, P. (2018). Workplace stress: Effects on organizational performance in the hospitality industry. *International Journal of Contemporary Hospitality Management, 30*(3), 1810–1826.

Rao, E., & Goel, A. (2017). Factors causing work-related stress in the Hospitality Sector: A study of employees in three-star hotels in Dehradun Region, India. *IARS ' International Research Journal,* 7(1).

Rehman, W., Jalil, F., Hassan, M., Naseer, Z., & Ikram, H. (2021). Workplace spirituality and organizational citizenship behavior: A mediating and moderating role of organizational commitment and workplace ostracism. *Cogent Business & Management.*

Reichers, A. E. (1985). A review and reconceptualization of organizational commitment. *Academy of Management Review, 10*(3), 465–476. https://doi.org/10.5465/amr.1985.4278963

Robinson, S. P., & O'Leary-Kelly, A. M. (2011). The impact of workplace ostracism on turnover intentions: The mediating role of organizational commitment. *International Journal of Hospitality Management.*

Singh, S., Subramani, A. K., David, R., & Jan, N. A. (2024). Workplace ostracism influencing turnover intentions: Moderating roles of perceptions of organizational virtuousness and authentic leadership. *Acta Psychologica.*

Suharti, L., Sugiarto, S., & Farhani, S. (2021). Work–family conflict and turnover intention in millennial employees: The role of job satisfaction. *Cogent Business & Management, 8*(1), Article 1941586. https://doi.org/10.1080/23311975.2021.1941586

Warburton, W. A., Williams, K. D. & Cairns, D. R. (2006). When ostracism leads to aggression: the moderating effects of control deprivation. *Journal of Experimental Social Psychology, 42(2),* 213–220

Williams, K. D., & Nida, S. A. (2009). Ostracism: Consequences and coping. *Current Directions in Psychological Science, 18*(3), 145–149. https://doi.org/10.1111/j.1467-8721.2009. 01626

Wright, T. A., & Hobfoll, S. E. (2004). Conservation of resources in organizational research: Review and future directions. *Journal of Organizational Behavior, 25*(1), 103–121. https://doi.org/10.1002/job.242

Wu, L. Z., Yim, F. H. K., Kwan, H. K., & Zhang, X. (2012). Coping with workplace ostracism: The roles of ingratiation and political skill in employee psychological distress. *Journal of Management Studies*, 49(1), 178–199.

Yang, L., Liu, J., & Li, Y. (2020). The effect of workplace ostracism on service sabotage behavior among nurses: The mediating role of stress and the moderating role of perceived organizational support. *Frontiers in Psychology*.

Zaman, U., Nawaz, S., Shafique, O., & Rafique, S. (2021). Making of rebel talent through workplace ostracism: A moderated-mediation model involving emotional intelligence, organizational conflict, and knowledge sharing behavior. *Cogent Business & Management,* 8(1), 1938379.

Zhang, H., Liu, Y., & Zhang, Y. (2017). Emotional intelligence as a buffer for workplace ostracism. *Journal of Business Research, 80*(1), 116–123. https://doi.org/10.1016/j .jbusres.2017.07.011

Zhang, Z., Wang, M., & Shi, J. (2017). Leader-follower congruence in proactive personality and work engagement: The role of leader identification and trust. *Journal of Organizational Behavior*, 38(5), 618–637.

Green Human Resources Management and Employee Engagement in Nepalese Commercial Banks

Nabin Kanujiya

Lecturer, Public Youth Campus, Thamel, Kathmandu, Email:kanaujiyanabin@gmail.com, https://orcid.org/0009-0001-5252-5832

Abstract

Emotional Intelligence has increasingly been recognized as a crucial predictor of workplace behavior and performance, especially in service-oriented industries such as banking. In Nepalese commercial banks, where employees frequently interact with clients and navigate high-pressure environments, EI may play a vital role in shaping employee outcomes.

This study investigates the impact of three key dimensions of emotional intelligence: self-awareness, empathy, and stress management, on employee performance in Class 'A' commercial banks in Nepal. It aims to identify which emotional competencies are most influential in enhancing workplace effectiveness. Used a descriptive and explanatory research design; the study adopted a quantitative approach. Data were collected through structured questionnaires using a 5-point Likert scale, distributed to bank employees via Google Forms and print copies. Out of 600 distributed questionnaires, 398 valid responses were analyzed using SPSS and AMOS. Reliability, validity, and model fitness were assessed using composite reliability, AVE, and structural equation modeling.

The findings reveal that empathy and stress management have significant positive effects on employee performance, while self-awareness does not show a statistically significant influence. Among the constructs, empathy emerged as the strongest predictor of employee performance, suggesting the importance of interpersonal sensitivity in the banking context. Emotional intelligence, particularly empathy and stress management, plays a significant role in shaping employee performance. However, self-awareness alone may not be sufficient to drive performance outcomes without supportive organizational or behavioral mechanisms. The results underscore the need for banks to integrate emotional intelligence training, especially in empathy and stress regulation, into employee development programs. Organizations should also consider emotional competence in recruitment and leadership development. This study provides novel insights into the domain-specific role of emotional intelligence in the Nepalese banking sector and offers empirical evidence from a developing-country context, where such research remains relatively limited.

Keywords: *Commercial Banks, Emotional Intelligence, Empathy, Employee Performance, Self-Awareness, and Stress Management*

Volume 1, Issue no. 1, May 2026
Received Date: March 15, 2026
Revised Date: April 13, 2026
Accepted Date: May 10, 2026
ISSN: 3149-7144 (Print)
ISSN: 3149-7152 (Online)

Introduction

In recent years, Green Human Resource Management (GHRM) has gained increasing attention as organizations align their practices with sustainability goals (Efranto et al., 2026). GHRM involves integrating environmentally friendly practices into traditional HR functions, such as recruitment, training, performance management, and employee engagement, to reduce the organization's environmental footprint and support sustainable development (Banerjee, 2025). This growing interest is linked to rising global concerns about climate change and environmental degradation, which have encouraged businesses to adopt sustainable practices (Shivanna, 2022). Employees play a central role in this process because their behaviors and engagement determine whether sustainability initiatives succeed (Pincus, 2023). At the same time, organizations face external pressures from consumers who increasingly prefer environmentally responsible brands, making sustainability a competitive factor in today's market (Ababneh, 2021).

Although many industries, such as manufacturing and energy, have widely implemented GHRM practices, the financial sector has received limited attention. However, banks also have significant sustainability responsibilities. They may not produce physical emissions like factories do, but they consume large amounts of energy, generate e-waste, and influence the environment through lending and investment decisions (Joshi et al., 2023). This creates a pressing need to explore how GHRM can enhance sustainable performance in commercial banks.

Despite its potential, GHRM in the banking sector remains underdeveloped. There is still no standardized framework for measuring sustainable performance, and empirical research linking green HR practices, such as green recruitment, training, and employee engagement, to organizational outcomes remains scarce (Shakil, 2021). The challenges, such as resistance to change, cost concerns, and regulatory barriers, further complicate GHRM implementation. This knowledge gap highlights the importance of investigating how banks can integrate green HRM effectively to improve both environmental and organizational performance.

Nepal, as a member of the United Nations, has committed to the Sustainable Development Goals (SDGs) since 2015. This has increased the pressure on Nepalese organizations, including commercial banks, to adopt sustainable business models. However, research on GHRM in Nepal's financial sector is still limited, making it essential to understand how these practices influence employee engagement and sustainability outcomes. The banking industry, though service-based, contributes to sustainability concerns through high energy use, heavy paper consumption, and environmentally impactful financing decisions (Chapagain & Dangol, 2024; Aracil et al., 2021). With digital transformation, banks also face new challenges such as energy-intensive data centers and e-waste management. Therefore, promoting green practices in HRM, such as paperless operations, green training, and eco-friendly workplace policies, is crucial to enhancing both environmental performance and corporate social responsibility (Siyambalapitiya et al., 2018).

Research on the application of GHRM in commercial banks remains in its early stages. Few studies have examined how GHRM influences employee engagement, which is a critical factor in ensuring the success of sustainability initiatives. The mediating role of employee engagement, in particular, remains underexplored. In addition, banks face barriers such as limited awareness, financial costs, and organizational resistance that hinder the effective adoption of GHRM. These gaps highlight the need for systematic research on GHRM in the banking sector, focusing on its relationship with employee engagement and its role in driving sustainable organizational performance. By addressing this problem, the study will contribute to academic knowledge and provide practical insights to help commercial banks integrate sustainability into their HR strategies more effectively. The objective of this study is to examine the influence of green human resource management practices on employee engagement in Nepalese commercial banks.

Review of Literature

Jabbour (2013) views GHRM as the systematic alignment of human resource practices with organizational environmental objectives. Similarly, Renwick et al. (2008) describe it as the management of human resources

to support environmental management initiatives. Expanding on this, Opatha and Arulrajah (2014) highlight GHRM as a set of policies and practices that benefit individuals, society, the natural environment, and organizations by guiding employees toward green behavior. Masri and Jaaron (2017) emphasize the role of GHRM in reinforcing environmentally sustainable practices while enhancing employee commitment to sustainability.

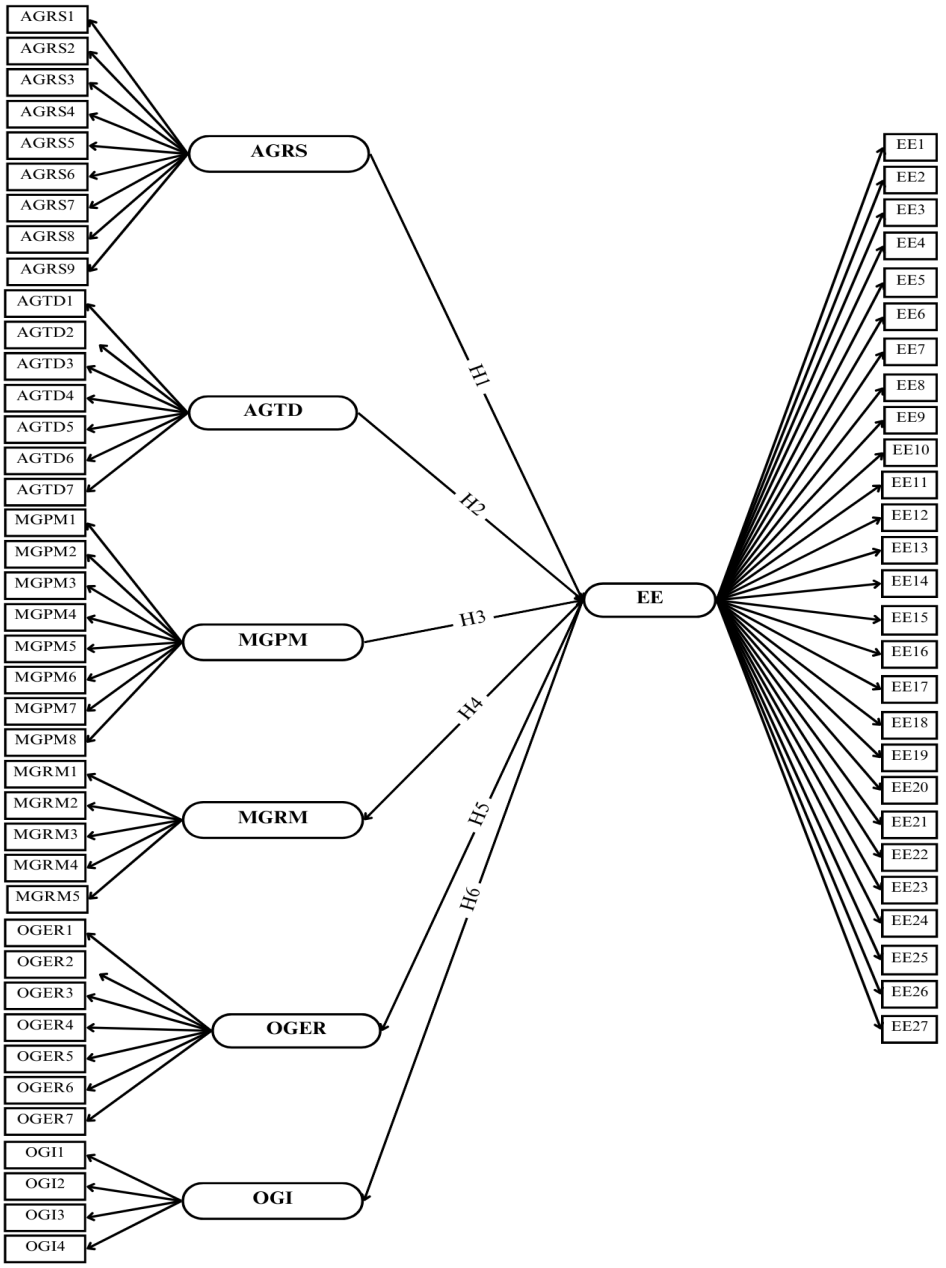
Employee engagement is widely regarded as a central factor in organizational sustainability and long-term success (Boccoli et al., 2023). Since Kahn's (1990) seminal work, engagement has been conceptualized as employees' physical, cognitive, and emotional investment in their roles, whereas disengagement reflects withdrawal from these dimensions. Engaged employees demonstrate attentiveness, energy, emotional connection, and willingness to "go the extra mile" (Macey & Schneider, 2008). Building on Kahn, later scholars such as Schaufeli et al. (2002) defined engagement as a positive, fulfilling state characterized by vigor, dedication, and absorption, while Ababneh et al. (2019) expanded this to include emotions, discretionary effort, and goal alignment. Saks (2006) further conceptualized engagement as a multidimensional construct with cognitive, emotional, and behavioral components, reinforcing its role as a distinct driver of role performance. Measurement instruments such as the UWES and JES have been widely applied, though studies often use employee and work engagement interchangeably (Kosaka & Sato, 2020).

From a theoretical lens, the Ability-Motivation-Opportunity theory (Appelbaum et al., 2001) provides a useful framework for linking Green Human Resource Management with employee engagement. According to this theory, HR practices enhance organizational performance by strengthening employees' abilities, motivations, and opportunities to contribute (Rynes et al., 2005; Katou & Budhwar, 2010). In the GHRM context, green recruitment and training build employees' environmental abilities. In contrast, green rewards and performance evaluations enhance motivation, and practices such as green induction and participative decision-making provide opportunities for involvement (Renwick et al., 2012).

Alshaabani et al. (2021) found that rewards, training, and performance management significantly enhance green work engagement, though green recruitment was not a strong predictor. Younas et al. (2023) emphasized the importance of green training, leadership support, communication, and environmentally responsible behavior beyond the workplace. Employee engagement emerged as a crucial mediator, as demonstrated by Gupta and Jangra (2024), who showed that GHRM enhances job performance through engagement. Other studies highlighted specific practices, such as job rotation to develop future green managers (Kossyva et al., 2023), raising awareness and providing green training in the garment sector (Aktar & Islam, 2019), and integrating environmental concerns into HR functions to shape sustainable behaviors (Adriana et al., 2020). Moreover, Gomes et al. (2023) linked GHRM practices with affective commitment, while Ababneh (2021) argued for a holistic approach that combines HR practices with individual predispositions to strengthen engagement in green initiatives.

Research Methodology

This study investigates the impact of GHRM practices on employee engagement in selected Nepalese commercial banks located in Kathmandu district. A quantitative, cross-sectional survey design was adopted, and primary data were collected from 363 employees, including managers, officers, and clerks, in selected commercial banks using a structured five-point Likert scale questionnaire. Purposive sampling was used, and the sample size was determined using Yamane's formula to ensure statistical reliability. Data analysis was conducted using SmartPLS, using structural equation modeling to test the measurement and structural models. Descriptive statistics summarized the patterns, while confirmatory factor analysis assessed the reliability and validity of constructs. The hypothesized relationships between GHRM practices and employee engagement were then examined through path analysis within the SEM framework at a 5% significance level.



Source: *Ababneh (2021); Alshaabani et al. (2021)*

Figure 1 : *Conceptual Framework*

Studies on green human resource management by Ababneh (2021) and Alshaabani et al. (2021) identify several practices that influence employee engagement (EE). These include AGRS (Attracting Green Recruitment and Selection), AGTD (Applying Green Training and Development), MGPM (Managing Green Performance Management), MGRM (Managing Green Reward Management), OGER (Organizational Green Employee Relations), and OGI (Organizational Green Involvement).

Results

Table 1 presents the results of reliability and convergent validity for the study constructs. The reliability of the constructs was assessed using Cronbach's alpha and Composite Reliability, while Average Variance Extracted (AVE) was used to evaluate convergent validity.

***Table 1** : Reliability and Convergent Validity*

Items	Cronbach's alpha	Composite reliability	Average variance extracted
AGTD	0.88	0.781	0.592
ARGS	0.884	0.974	0.555
EE	0.957	0.967	0.661
MGRM	0.924	0.939	0.814
OGI	0.86	0.871	0.703

The results indicate that all constructs demonstrate acceptable levels of reliability and validity. The Cronbach's alpha values range from 0.86 to 0.957, exceeding the recommended threshold of 0.70, indicating strong internal consistency among the measurement items. Similarly, the Composite Reliability values range from 0.781 to 0.974, which are above the acceptable level of 0.70, confirming the reliability of the constructs. In addition, the AVE values range from 0.555 to 0.814, exceeding the recommended minimum of 0.50, confirming adequate convergent validity.

Table 2 presents the results of the discriminant validity assessment using the Fornell–Larcker criterion. Discriminant validity is established when the square root of the AVE for each construct is greater than its correlations with other constructs in the model.

***Table 2 :** Discriminant Validity (Fornell–Larcker Criterion)*

	AGTD	ARGS	EE	MGRM	OGI
AGTD	0.769				
ARGS	0.072	0.745			
EE	0.1	0.053	0.813		
MGRM	0.144	-0.043	-0.068	0.902	
OGI	0.259	-0.091	-0.119	0.408	0.838

As shown in Table 2, the diagonal values representing the square root of AVE for AGTD (0.769), ARGS (0.745), EE (0.813), MGRM (0.902), and OGI (0.838) are higher than the corresponding inter-construct correlation values in the same rows and columns. This indicates that each construct accounts for more variance in its indicators than in other constructs in the model.

Figure 2 illustrates the structural model of green human resource management practices and their influence on employee engagement. The model includes four independent constructs: ARGS, MGRM, and OGI, which are linked to the dependent construct EE (Employee Engagement). Each construct is measured through several observed indicators shown as rectangles connected to the latent variables. The arrows from the independent constructs to EE represent the hypothesized relationships tested in the structural model.

The values displayed on the arrows between constructs represent the p-values obtained from the structural model analysis. According to the figure, the path AGTD → EE has a p-value of 0.203, ARGS → EE has a p-value of 0.785, and MGRM → EE has a p-value of 0.704, indicating that these relationships are not statistically significant. In contrast, the path OGI → EE shows a p-value of 0.013, indicating a statistically significant relationship at the 0.05 level. The value 0.034 shown within the EE construct represents R, indicating that approximately 3.4% of the variance in Employee Engagement is explained by the GHRM practices included in the model.

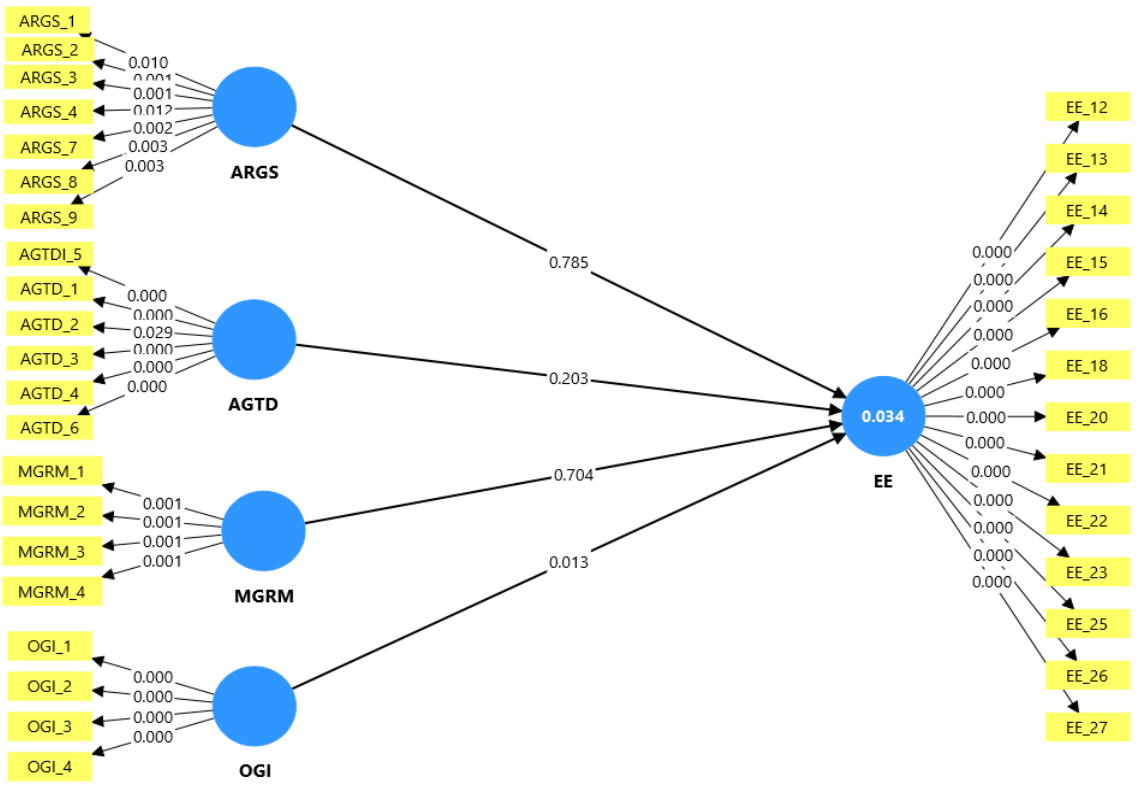


Table 3 presents the results of the structural model analysis, which examines the hypothesized relationships between the green human resource management practices and employee engagement. The results indicate that AGTD → EE has a path coefficient (β) of 0.139, with a t-value of 1.274 and a p-value of 0.203, indicating that the relationship is not statistically significant; therefore, H1 is not supported. Similarly, ARGS → EE shows a β of 0.029, a t-value of 0.273, and a p-value of 0.785, suggesting no significant effect; thus, H2 is not supported.

Table 3 : *Structural Model Results*

Hypothesis	Path	β	t-value	p-value	Decision
H1	AGTD -> EE	0.139	1.274	0.203	Not Supported
H2	ARGS -> EE	0.029	0.273	0.785	Not Supported
H3	MGRM -> EE	-0.03	0.38	0.704	Not Supported
H4	OGI -> EE	-0.14	2.475	0.013	Supported

The relationship MGRM → EE also shows a non-significant effect with β = -0.03, t-value = 0.38, and p-value = 0.704, indicating that H3 is not supported. However, the relationship OGI → EE shows a statistically significant effect (β = -0.14, t = 2.475, p = 0.013), which is below the significance threshold of 0.05. Therefore, H4 is supported, suggesting that Organizational Green Involvement significantly influences Employee Engagement in the model.

Table 4 : *Coefficient of Determination and Effect Size*

Endogenous Construct	**R^2**	**Interpretation**
Employee Engagement	0.034	
Path	**f^2**	**Effect**
AGTD -> EE	0.018	
ARGS -> EE	0.001	
MGRM -> EE	0.001	
OGI -> EE	0.016	**Medium**

Table 4 presents the R^2 and effect size (f^2) for the structural model. The R^2 value for employee engagement is 0.034, indicating that the independent variables AGTD, ARGS, MGRM, and OGI collectively explain 3.4% of the variance in employee engagement. This value suggests a weak explanatory power of the model.

The f^2values indicate the individual contribution of each predictor to the endogenous construct. The path AGTD → EE has an f^2 value of 0.018, which indicates a small effect size. Similarly, ARGS → EE and MGRM → EE both show f^2 values of 0.001, suggesting negligible effects on Employee Engagement. The path OGI → EE has an f^2 value of 0.016, indicating a small effect size. According to commonly accepted guidelines (0.02 = small, 0.15 = medium, 0.35 = large), the results indicate that all predictors have negligible to very small effects on employee engagement. However, OGI shows the relatively strongest influence among the variables.

Discussion

The study partially supports earlier theoretical perspectives on GHRM proposed by Jabbour (2013), Renwick et al. (2008), and Opatha and Arulrajah (2014), particularly in their emphasis on employee involvement in environmental initiatives. The significant effect of Organizational Green Involvement (OGI) aligns with engagement theory (Kahn, 1990; Schaufeli et al., 2002), which highlights participation as a key driver of employee engagement. The findings diverge from much of the empirical literature, including Alshaabani et al. (2021) and Gupta and Jangra (2024), in that they show that green training, rewards, and performance management do not significantly influence employee engagement. Additionally, the model's low explanatory power suggests that GHRM practices alone are insufficient predictors of engagement, supporting Ababneh's (2021) arguments for a more integrated approach.

Importantly, the negative yet significant relationship between OGI and engagement contrasts with prior positive assumptions (Masri & Jaaron, 2017), indicating that poorly implemented or burdensome green initiatives may reduce engagement. From the perspective of the Ability-Motivation-Opportunity Theory (Appelbaum et al., 2001), the findings suggest an imbalance in which opportunity exists without sufficient support from the ability and motivation components.

Conclusion

This study finds that the influence of GHRM practices on employee engagement in Nepalese commercial banks is limited and highly context-dependent. Among the examined practices, only organizational green involvement shows a statistically significant effect, emphasizing the importance of employee participation in environmental initiatives. However, the negative direction of this relationship suggests that such involvement may reduce engagement if it is perceived as an additional burden or is not adequately supported. In contrast, green training, rewards, and performance management do not have a significant impact on employee engagement, indicating that the mere implementation of formal green HR practices is insufficient to drive engagement. The model's low explanatory power further suggests that other organizational and individual factors play a more substantial role in influencing employee engagement.

The study concludes that the effectiveness of GHRM practices depends largely on how they are implemented and perceived by employees. For Nepalese commercial banks, a more integrated and supportive approach is necessary to ensure that green initiatives positively contribute to employee engagement.

Limitations and Directions for the Study

This study has several limitations. It uses a cross-sectional design, which limits causal inferences, and focuses only on Nepalese commercial banks, thereby restricting generalizability. The low explanatory power suggests other factors, such as leadership or organizational culture, were not included. Reliance on self-reported data may introduce bias, and only a limited set of GHRM practices was examined.

Future research should adopt longitudinal or multi-source designs, include additional contextual and

organizational factors, explore broader GHRM dimensions, and investigate mediating or moderating variables better to understand the relationship between GHRM and employee engagement.

Acknowledgement

The author would like to thank the anonymous respondents and all individuals involved in making this study possible.

Conflict of Interest

The author declares no conflict of interest while preparing this article.

References

Ababneh, O. (2021). How do green HRM practices affect employees' green behaviors? The role of employee engagement and personality attributes. *Journal of Environmental Planning and Management, 64*, 1–23. https://doi.org/10.1080/09640568.2020.1814708

Adriana, L., Fahira, K., Nailissa'adah, M., & Maula, H. (2020). A review of the importance of green human resource management practices toward employee green behavior in an organization. *Journal of International Conference Proceedings, 3*, 124–135. https://doi.org/10.32535/jicp.v2i4.787

Aktar, A., & Islam, Y. (2019). Green human resource management practices and employee engagement: Empirical evidence from the RMG sector in Bangladesh. *SSRN Electronic Journal*.

Alshaabani, A., Hamza, K. A., & Rudnák, I. (2021). Impact of diversity management on employees' engagement: The role of organizational trust and job insecurity. *Sustainability, 14*, 10420. https://doi.org/10.3390/su14010420

Appelbaum, E., Bailey, T., Berg, P., & Kalleberg, A. (2000). *Manufacturing advantage: Why high-performance work systems pay off*. Cornell University Press.

Aracil, E., Nájera-Sánchez, J.-J., & Forcadell, F. J. (2021). Sustainable banking: A literature review and integrative framework. *Finance Research Letters, 42*, 101932. https://doi.org/10.1016/j.frl.2021.101932

Banerjee, G. (2025). The impact of employee engagement and organizational environmental performance: A literature review. *Journal of Information Systems Engineering and Management, 10*, 991–1001. https://doi.org/10.52783/jisem.v10i35s.6179

Boccoli, G., Gastaldi, L., & Corso, M. (2023). The evolution of employee engagement: Towards a social and contextual construct for balancing individual performance and wellbeing dynamically. *International Journal of Management Reviews, 25*, 75–98. https://doi.org/10.1111/ijmr.12304

Chapagain, B., & Dangol, S. (2024). Green human resource management practices in Nepalese commercial banks: A qualitative inquiry among human resource managers. *Journal name not specified*, 1, 91–105.

Efranto, R. Y., Sipayung, S. N., & Amrulloh, A. B. Y. (2026). Green human resource management: A decade of evolution in practices, employee green behavior, and organizational sustainability. *Cogent Business & Management, 13*(1). https://doi.org/10.1080/23311975.2025.2598686

Gomes, J. F. S., Sabino, A., & Antunes, V. (2023). The effect of green human resources management practices on employees' affective commitment and work engagement: The moderating role of employees' biospheric value. *Sustainability, 15*(3), 2190. https://doi.org/10.3390/su15032190

Gupta, A., & Jangra, S. (2024). Green human resource management and work engagement: Linking HRM performance attributions. *Sustainable Futures, 7*, 100174. https://doi.org/10.1016/j.sftr.2024.100174

Jabbour, C. J. C. (2013). Environmental training in organizations: From a literature review to a framework for future research. *Resources, Conservation and Recycling, 74*, 144–155. https://doi.org/10.1016/j.resconrec.2012.12.017

Joshi, A., Kataria, A., Rastogi, M., Beutell, N. J., Ahmad, S., & Yusliza, M. Y. (2023). Green human resource management in the context of organizational sustainability: A systematic review and research agenda. *Journal of Cleaner Production, 430*, 139713. https://doi.org/10.1016/j.jclepro.2023.139713

Katou, A. A., & Budhwar, P. S. (2010). Causal relationship between HRM policies and organizational performance: Evidence from the Greek manufacturing sector. *European Management Journal, 28*(1), 25–39. https://doi.org/10.1016/j.emj.2009.06.001

Kosaka, D., & Sato, H. (2020). Employee engagement and work engagement. *Annals of Business Administrative Science, 19*(6), 227–239. https://doi.org/10.7880/abas.0200911a

Kossyva, D., Theriou, G., Aggelidis, V., & Sarigiannidis, L. (2023). Outcomes of engagement: A systematic literature review and future research directions. *Heliyon, 9*(6), e17565. https://doi.org/10.1016/j.heliyon.2023.e17565

Macey, W. H., & Schneider, B. (2008). The meaning of employee engagement. *Industrial and Organizational Psychology, 1*, 3–30. https://doi.org/10.1111/j.1754-9434.2007.0002.x

Masri, H. A., & Jaaron, A. A. M. (2017). Assessing green human resources management practices in the Palestinian manufacturing context: An empirical study. *Journal of Cleaner Production, 143*, 474–555. https://doi.org/10.1016/j.jclepro.2016.12.087

Opatha, H. H. D. N. P., & Arulrajah, A. A. (2014). Green human resource management: Simplified general reflections. *International Business Research, 7*, 101–101. https://doi.org/10.5539/ibr.v7n8p101

Pincus, J. D. (2023). Employee engagement as human motivation: Implications for theory, methods, and practice. *Integrative Psychological and Behavioral Science, 57*, 1223–1255. https://doi.org/10.1007/s12124-022-09737-w

Renwick, D. W. S., Redman, T., & Maguire, S. (2013). Green human resource management: A review and research agenda. *International Journal of Management Reviews, 15*, 1–14. https://doi.org/10.1111/j.1468-2370.2011.00328.x

Rynes, S. L., Gerhart, B., & Parks, L. (2005). Personnel psychology: Performance evaluation and performance pay. *Annual Review of Psychology, 56*, 571–600. https://doi.org/10.1146/annurev.psych.56.091103.070254

Saks, A. M. (2006). Antecedents and consequences of employee engagement. *Journal of Managerial Psychology, 21*(7), 600–619. https://doi.org/10.1108/02683940610690169

Schaufeli, W. B., Salanova, M., González-Romá, V., & Bakker, A. B. (2002). The measurement of engagement and burnout: A two-sample confirmatory factor analytic approach. *Journal of Happiness Studies, 3*, 71–92. https://doi.org/10.1023/A:1015630930326

Shakil, M. H. (2021). Environmental, social, and governance performance and financial risk: Moderating role of ESG controversies and board gender diversity. *Resources Policy, 72*, 102144. https://doi.org/10.1016/j.resourpol.2021.102144

Shivanna, K. R. (2022). Climate change and its impact on biodiversity and human welfare. *Proceedings of the Indian National Science Academy, 88*(2), 160–171. https://doi.org/10.1007/s43538-022-00073-6

Siyambalapitiya, J., Zhang, X., & Liu, X. (2018). Green human resource management: A proposed model in the context of Sri Lanka's tourism industry. *Journal of Cleaner Production, 201*, 542–555. https://doi.org/10.1016/j.jclepro.2018.07.305

Younas, N., Hossain, M. B., Syed, A., Ejaz, S., Ejaz, F., Jagirani, T. S., & Dunay, A. (2023). Green shared vision: A bridge between responsible leadership and green behavior under individual green values. *Heliyon, 9*(11), e21511. https://doi.org/10.1016/j.heliyon.2023.e21511

Design, Modeling, and Fatigue Life Analysis of a 450 Kg LPG Cylinder

Swikrit Dahal[1], Sanjeev Maharjan*[2,]

[1]*Department of Mechanical and Aerospace Engineering, Pulchowk Campus, Tribhuvan University, Kathmandu, Nepal, Email: dahalswikrit23@gmail.com,https://orcid.org/0009-0001-6463-2272*

[1]*Department of Mechanical and Aerospace Engineering, Pulchowk Campus, Tribhuvan University, Kathmandu, Nepal, Emai: mechsanjeev@ioe.edu.np,https://orcid.org/0000-0003-4841-7465*

Abstract

Liquefied Petroleum Gas (LPG) cylinders play a critical role in industrial energy storage, with increasing demand for large-capacity units such as 450 kg cylinders in commercial applications. However, their structural integrity and fatigue performance under cyclic loading conditions remain less explored. This study aims to design, model, and evaluate the fatigue life of a 450 kg LPG cylinder using a combination of analytical methods and finite element analysis (FEA), in accordance with EN 13445 and ASME standards. The research methodology integrates thin-walled pressure vessel theory for preliminary design with three-dimensional modeling and numerical simulation to assess stress distribution, deformation, and fatigue behavior. Results indicate that while the general cylindrical shell experiences uniform stress within allowable limits, localized stress concentrations occur at nozzle connections, support structures, and welded regions, with a maximum equivalent stress of 573.07 MPa and deformation of approximately 3 mm. Fatigue analysis using the S–N approach and Miner's rule indicates that the cylinder can safely withstand the expected service cycles, with a damage factor less than unity and a minimum fatigue life of approximately 57,515 cycles. The study concludes that although the overall design is structurally adequate, fatigue performance is governed by stress-concentration zones, necessitating geometric optimization. The findings have practical implications for improving the safety, reliability, and standardization of large-capacity LPG storage systems in industrial applications. This work contributes to the limited research on large LPG cylinders by providing a combined analytical and numerical framework for design validation and fatigue assessment.

Keywords: *ASME code, EN 13445, fatigue life, finite element analysis, LPG cylinder, pressure vessel design, and stress concentration*

Volume 1, Issue no. 1, May 2026
Received Date: March 17, 2026
Revised Date: April 15, 2026
Accepted Date: May 11, 2026
ISSN: 3149-7144 (Print)
ISSN: 3149-7152 (Online)

1. Introduction

Liquefied Petroleum Gas (LPG) is widely used as a clean and efficient energy source across residential, commercial, and industrial sectors. In Nepal, it has become one of the primary fuels for cooking and energy use, particularly in urban areas where alternatives remain limited. Over the years, its consumption has steadily increased due to population growth, urbanization, and changing energy demands (International Energy Agency [IEA], 2023). Nepal relies heavily on imports to meet this demand, with petroleum products, including LPG, primarily supplied from neighboring countries. According to the Department of Customs, Nepal (2023), a substantial volume of LPG is imported annually, reflecting the country's growing dependence on this fuel. This reliance makes the safety and reliability of storage and distribution systems critically important, as any failure could pose serious safety risks and disrupt supply. Traditionally, LPG distribution in Nepal has been based on small-capacity cylinders, such as the 14.2 kg units commonly used in households. These cylinders are well-regulated and extensively studied. However, increasing demand from commercial users, including hotels, restaurants, and small industries, has led to a gradual shift toward larger-capacity cylinders, particularly 450 kg units used for bulk storage. While these larger cylinders improve operational efficiency by reducing the need for frequent replacement, they also introduce greater risks due to higher internal pressure and increased stored energy. As pressure vessels, LPG cylinders are designed to withstand significant internal pressure and varying operating conditions. During service, they are subjected to repeated loading cycles associated with filling, transportation, and discharge. Over time, these cyclic loads can lead to fatigue, a primary failure mechanism in such systems (Stephens et al., 2001). International standards such as EN 13445-3 (CEN, 2014) and the ASME Boiler and Pressure Vessel Code (ASME, 2021) provide established guidelines for design and fatigue assessment. However, their application to large-capacity LPG cylinders, particularly under local operating conditions, requires careful evaluation. In recent years, analytical tools such as finite element analysis (FEA) have become essential for understanding stress distribution and identifying critical regions prone to failure. These methods are especially effective in analyzing areas such as supports, nozzles, and welded joints, where stress concentrations are typically high. In parallel, non-destructive testing (NDT) techniques enable inspection and condition assessment without damaging the structure, supporting safer operation and maintenance practices (Hellier, 2013). Despite these advancements, most existing research and design practices focus primarily on smaller LPG cylinders. There is limited work on the structural behavior and fatigue performance of large-capacity cylinders, such as the 450 kg type, particularly in Nepal, where their adoption is still emerging. At the same time, practical challenges persist in commercial applications. Smaller cylinders require frequent replacement, which is inefficient, while alternatives such as LPG banks are sometimes implemented without consistent safety guidelines. This highlights the need for a more reliable and standardized approach to large-scale LPG storage. In this context, a detailed understanding of the structural response and fatigue behavior of large LPG cylinders is essential for ensuring safe and reliable operation. This study focuses on the design, modeling, and fatigue life assessment of a 450 kg LPG cylinder using both analytical methods and finite element analysis in accordance with relevant international standards. The work aims to evaluate stress distribution and deformation characteristics, identify critical regions of stress concentration, and assess fatigue life under cyclic loading conditions. The analytical results are further compared with finite element simulations to validate the modeling approach and provide a more comprehensive understanding of the structural performance of large-capacity LPG cylinders in industrial applications.

2. Review of Literature

Liquefied Petroleum Gas (LPG) is widely recognized as a reliable and efficient energy source for domestic, commercial, and industrial applications due to its high calorific value, clean combustion, and ease of storage in pressurized form. It is primarily composed of propane (C_3H_8) and butane (C_4H_{10}), with minor quantities of other hydrocarbons depending on processing conditions. The proportions of these components vary with climate and supply practices: propane is preferred in colder environments for its superior vaporization characteristics. At the same time, butane is more suitable for warmer regions due to its higher energy density (World LPG Association, 2022).In Nepal, LPG composition typically consists of a propane–butane mixture that varies seasonally with supply sources and climatic conditions (Nepal Oil Corporation, 2021). These variations directly influence vapor pressure inside storage cylinders, making thermophysical properties a key consideration in pressure vessel design.

Table 1: *Physical Properties of Propane and Butane*

Property	Propane	Butane
Chemical Formula		
Boiling Point	-42 °C	−0.5 °C
Density (Liquid)	493 Kg/ m^3	584 Kg/ m^3
Heating Value	46.4 MJ/Kg	45.7 MJ/kg

LPG is stored and transported in cylinders of varying capacities depending on usage. Domestic applications generally rely on small cylinders ranging from 5 kg to 14.2 kg, while the commercial and industrial sectors increasingly depend on larger units, including cylinders ranging from 50 kg to 450 kg (Kumar et al., 2016). The adoption of large-capacity cylinders has grown steadily in sectors such as hospitality, manufacturing, and centralized heating systems due to improved efficiency and reduced handling frequency. These cylinders are essentially pressure vessels designed to safely contain LPG at pressures that may exceed 10–15 bar under operating conditions. Depending on installation requirements, they are typically configured in vertical or horizontal orientations, with horizontal cylinders often preferred for bulk storage due to improved stability and ease of transport. The structural integrity of an LPG cylinder depends on its primary components, including the cylindrical shell, heads, base support, and welded joints. Each component plays a specific role in maintaining pressure containment and structural stability.

Table 2 *: Major Structural Components and Functions*

Components	Function
Cylinder Shell	Main pressure-containing body
Dome/Head	Distributes internal pressure uniformly
Valve	Controls LPG flow in and out of the cylinder
Stand/Base Ring	Supports the cylinder during storage
Protective Cap	Protects the valve from mechanical damage
Weld Joint	Connects the shell and head sections
Lifting Lugs	Used for safe handling and transportation

From an engineering perspective, LPG cylinders fall under the broader category of pressure vessels, which are designed to store fluids at pressures significantly different from ambient conditions. The design of such vessels must account for internal pressure, temperature variations, and mechanical loads during service. As highlighted by Megyesy (2008), cylindrical shells combined with ellipsoidal or hemispherical heads are commonly adopted because they provide a more uniform stress distribution compared to flat geometries. To ensure safe operation, pressure vessel design is governed by established international standards, particularly the ASME Boiler and Pressure Vessel Code and EN 13445. These standards define requirements for material selection, allowable stresses, fabrication methods, inspection procedures, and fatigue assessment. 13445, specifically developed for unfired pressure vessels, provides two primary design approaches: Design by Formula (DBF) and Design by Analysis (DBA) (CEN, 2021). DBF relies on simplified analytical equations derived from classical mechanics, whereas DBA enables more detailed evaluation using numerical methods such as finite element analysis. The standard also defines allowable stress limits based on material strength properties to ensure adequate safety margins. Stress analysis forms the foundation of pressure vessel design. Under internal pressure, cylindrical vessels experience two principal stresses: hoop (circumferential) and longitudinal (axial). For thin-walled cylinders, hoop stress is typically the governing parameter, being approximately twice the longitudinal stress. While analytical expressions provide a useful starting point, real structures often exhibit stress concentrations at discontinuities such as nozzles, supports, and weld joints. These localized effects are critical in fatigue assessment, as they often become initiation points for crack formation. Material selection plays a central role in determining the structural performance and durability of LPG cylinders. Pressure vessel standards recommend materials that provide adequate strength, ductility, and resistance to cyclic loading.

Steels such as P355GH are widely used due to their favorable mechanical properties and weldability (CEN, 2021). In some applications, higher-strength materials such as E450BR are adopted to improve load-bearing capacity and structural efficiency.

Table 3: *Chemical Composition of E450BR*

Grade	%C	%Mn	%S	%P	%Si	CE, max	Mode of Deoxidation
E 450 BR	0.22 max	1.65 max	0.045 max	0.045 max	0.45 max	0.52	Semi-killed/Killed

Table 4: *Mechanical Properties of E450BR*

Grade	UTS MPa min	YS, MPa min	%EL min
E450BR	588	519	38

In addition to the main shell material, components such as nozzles and couplings are often manufactured from low-temperature steels, such as SA-350 LF2, which retain toughness at sub-zero temperatures (ASME, 2021). The use of elliptical heads further enhances structural performance by reducing stress concentration at critical junctions. Manufacturing processes, including plate rolling, welding, heat treatment, and hydrostatic testing, significantly influence cylinder reliability. Among these, welding is particularly critical, as weld regions are more susceptible to defects and fatigue damage (Patil & Yadav, 2019). Beyond material and geometry considerations, pressure vessel failure is often influenced by geometric imperfections and structural discontinuities. EN 13445 identifies issues such as peaking and angular distortion at weld seams, which introduce additional bending stresses not captured by simple analytical models (CEN, 2021). These imperfections can significantly accelerate fatigue crack initiation, especially in large-capacity vessels. Similarly, structural attachments such as supports and lifting lugs introduce localized stress concentrations. These discontinuities can result in secondary stresses that exceed nominal design values, increasing the risk of cyclic plastic deformation and long-term damage. Fatigue behavior is a critical concern in LPG cylinders due to repeated filling and discharge cycles. Even when operating stresses remain below yield strength, cyclic loading can initiate and propagate cracks over time (Stephens et al., 2001). Fatigue life is commonly evaluated using S–N curves, which relate stress amplitude to the number of cycles to failure.

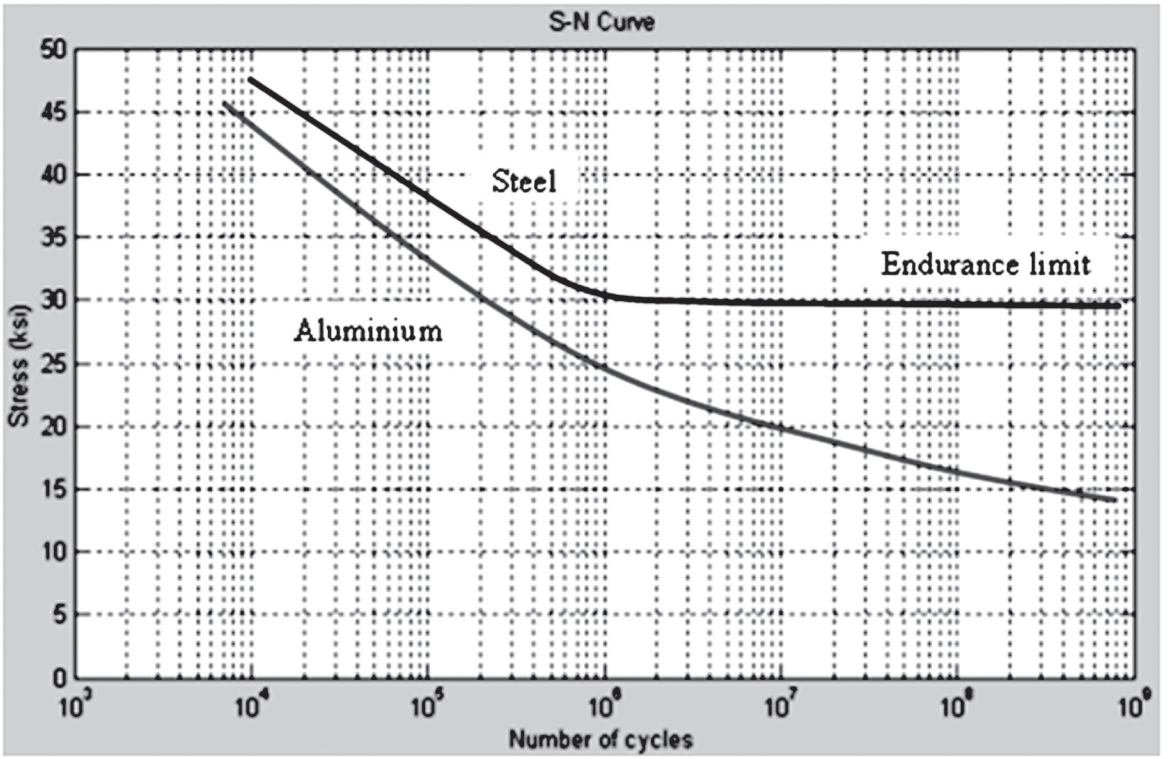


Figure 1: *S–N Curve for Steel & Aluminium*

Standards such as EN 13445 require fatigue analysis when the number of pressure cycles exceeds a defined threshold, typically around 500 full cycles (CEN, 2021). The evaluation involves comparing calculated stress ranges with standardized fatigue design curves. Similarly, ASME Section VIII Division 2 provides a structured approach to fatigue assessment, including stress evaluation, calculation of alternating stress, and cumulative damage analysis using Miner's rule. A design is considered safe when the cumulative damage factor remains below unity (ASME, 2021). As pressure vessel design becomes increasingly complex, numerical methods such as finite element analysis (FEA) have become essential tools. FEA enables detailed evaluation of stress distribution across complex geometries and helps identify critical regions prone to failure. For LPG cylinders, these regions often include weld joints, supports, and nozzle connections. To ensure accuracy, analytical calculations based on classical theory are often used alongside FEA results. This combined approach improves confidence in predictions and helps identify any inconsistencies in modeling assumptions. Despite extensive research on LPG cylinders, most existing studies focus on small and medium-capacity units. There is comparatively limited work addressing large-capacity cylinders, particularly the 450 kg type used in industrial applications. This gap becomes more significant in contexts such as Nepal, where the adoption of such systems is increasing alongside the gradual implementation of international standards like EN 13445. A more detailed understanding of stress distribution, fatigue behavior, and structural reliability in large LPG cylinders is therefore necessary. Addressing this gap through combined analytical and numerical approaches can contribute to safer design practices and more reliable industrial applications.

3. Research Methodology

3.1 Introduction

Liquefied Petroleum Gas (LPG) storage systems require pressure vessels that can safely withstand internal pressure and cyclic loading during service. In practical applications, LPG cylinders undergo repeated pressurization and depressurization during filling, transportation, and discharge. These cyclic effects can lead to fatigue damage, which may compromise structural integrity if not properly addressed during design. This study presents the design, structural evaluation, and fatigue assessment of a 450 kg (≈1 m³) LPG storage cylinder**.** The methodology integrates analytical pressure-vessel design calculations with finite element analysis (FEA) to evaluate stress distributions and fatigue performance. The design approach follows EN 13445-3:2021 and the ASME Boiler and Pressure Vessel Code Section VIII Division 2, which provide standardized procedures for thickness design, stress analysis, and fatigue evaluation (American Society of Mechanical Engineers [ASME], 2021; European Committee for Standardization [CEN], 2021).

3.2 Determination of Cylinder Capacity and Geometry

The design process begins by determining the required internal volume based on the LPG storage capacity. The filling ratio method is used to relate the mass of LPG to the water capacity of the cylinder:

$$F = \frac{\text{Mass of LPG}}{\text{Water Capacity}}$$

Using a typical filling ratio of 0.425 kg/L, the required water capacity for storing 450 kg of LPG is approximately 1.06 m³**.** This ensures sufficient vapor space for the liquid's thermal expansion. The LPG cylinder is modeled as a vertical cylindrical vessel with 2:1 ellipsoidal heads, which provide efficient stress distribution and are commonly used in industrial applications (Moss & Basic, 2013).

The total internal volume is expressed as:

$$V = V_{\text{shell}} + 2V_{\text{head}}$$

where the cylindrical shell volume and ellipsoidal head volume are given by:

$$V_{\text{shell}} = \frac{\pi D_i^2}{4} L \text{and} V_{\text{head}} = \frac{\pi}{24} D_i^3$$

Based on these relations, the shell length is determined to satisfy the required total volume.

3.3 Design Parameters and Material Selection

The design parameters are selected based on operating conditions and code requirements. The cylinder is designed for an internal pressure of 1.76 MPa and a design temperature of 65°C. A joint efficiency of 0.85 and a corrosion allowance of 0.5 mm are considered. The selected material is E450BR structural steel (IS, 2062), which offers high yield strength, good weldability, and adequate toughness. The allowable stress used in the design is 245 MPa, consistent with code-based limits for pressure vessel materials (CEN, 2021).

3.4 Analytical Pressure Vessel Design

The analytical design is carried out using thin-walled pressure vessel theory, which is valid since the thickness-to-diameter ratio is significantly less than 0.1 (Budynas & Nisbett, 2020).

3.4.1 Cylindrical Shell Thickness

he hoop stress in a thin cylindrical pressure vessel is expressed as:

$$\sigma_h = \frac{PD}{2t}$$

The required shell thickness is calculated using EN 13445-3:

$$t = \frac{PD}{2f\eta - P}$$

Based on the design parameters, the minimum required shell thickness is 4.2 mm. A higher thickness is selected to account for corrosion allowance and manufacturing considerations.

3.4.2 Ellipsoidal Head Thickness

The thickness of the 2:1 ellipsoidal head is determined according to EN 13445-3 by considering three criteria: membrane stress, knuckle yielding, and buckling resistance. The governing thickness is selected as the maximum value obtained from these criteria, including corrosion allowance. Based on this approach, the required head thickness is approximately 5.3 mm**,** and a standard thickness of 5.5 mm is adopted.

3.5 Stress Verification

The stresses developed in the cylindrical shell are evaluated to ensure they remain within allowable limits. The hoop and longitudinal stresses are calculated using thin cylinder theory, and the equivalent stress is determined using the von Mises criterion:

$$\sigma_v = \sqrt{\sigma_h^2 + \sigma_l^2 - \sigma_h \sigma_l}$$

The calculated equivalent stress is found to be lower than the material's allowable stress, confirming the safety of the design.

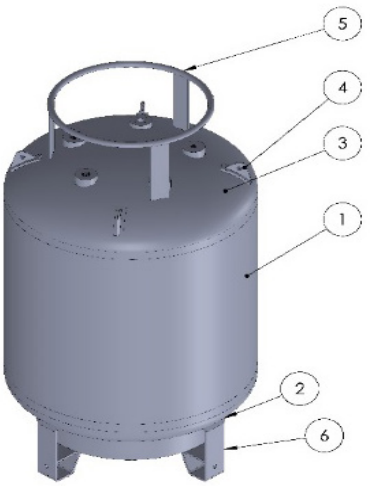
3.6 Geometric Modeling of LPG Cylinder

A three-dimensional geometric model of the 450 kg LPG cylinder was developed to represent the actual configuration used in industrial applications. The model consists of a cylindrical shell with two 2:1 ellipsoidal heads, which are commonly used for their improved stress distribution. The complete geometric model is shown in Figure 2.



Figure 2: *Three-dimensional CAD model of the LPG cylinder*

The internal diameter and shell length were determined from the volume requirement, while the thickness of the shell and heads was obtained from analytical design calculations. Additional features such as nozzles, supports, and end connections were incorporated into the model to capture realistic boundary conditions and stress concentrations. A detailed view of these geometric features is presented in Figure 3.



ITEM NO.	PART NUMBER	QTY.
1	LPG CYLINDER MIDDLE PART	1
2	LPG CYLINDER BOTTOM PART	1
3	LPG CYLINDER TOP PART	1
4	LIFTING HOOK	4
5	VALVE GUARD	1
6	LEG SUPPORT	4

Figure 3 : *Detailed view of 450 kg LPG cylinder*

The modeling was carried out using SolidWorks. Proper geometric continuity was maintained at the junctions between the cylindrical shell and ellipsoidal heads to avoid artificial stress discontinuities. Special attention was given to critical regions such as the head-to-shell junction, nozzle intersections, and support attachments, as these locations are highly susceptible to stress concentration and play a significant role in fatigue behavior. The final geometry was exported in a standard format (e.g., STEP/IGES) and imported into ANSYS Workbench for further finite element analysis.

3.6 Finite Element Analysis

To capture localized stress concentrations, a three-dimensional finite element model of the LPG cylinder is developed. The model includes the cylindrical shell, ellipsoidal heads, nozzles, and support structures. The mesh is generated using a combination of tetrahedral and hexahedral elements, with refinement applied in critical regions such as nozzle connections and head-to-shell junctions. Appropriate boundary conditions are applied to simulate actual operating conditions, including internal pressure, self-weight, and external loads on nozzles, enabling detailed evaluation of stress distribution and identification of critical regions that may influence fatigue life (Cook et al., 2002).

3.7 Fatigue Assessment

Fatigue behavior is evaluated using both the stress-life (S–N) approach and the ASME fatigue methodology.

The stress amplitude is defined as:

$$S_a = \frac{\Delta S}{2}$$

The S–N relationship is expressed using the Basquin equation:

$$\sigma_a = AN^b$$

In the absence of experimental data, the S–N curve is constructed using empirical relations based on the material's ultimate tensile strength (Budynas & Nisbett, 2020; Dowling, 2013). Additionally, fatigue life is estimated using ASME Section VIII Division 2 procedures. The alternating stress obtained from FEA is used to determine fatigue parameters, and the allowable number of cycles is calculated.

Cumulative fatigue damage is evaluated using Miner's rule:

$$D_f = \frac{n}{N}$$

The calculated damage factor is less than unity, indicating that the cylinder can safely withstand the expected number of service cycles.

3.8 Analytical Validation

To validate the numerical results, analytical calculations of stress and deformation are performed using the thin cylinder theory. The radial deformation is estimated using elasticity relations and compared with FEA predictions. Although slight differences are observed due to localized stress effects and modeling assumptions, the results show reasonable agreement, confirming the reliability of the analysis.

4. Results

4.1 Stress Distribution

The finite element analysis was performed to evaluate the stress distribution in the 450 kg LPG cylinder under combined loading conditions. The stress state was assessed using the von Mises equivalent stress criterion. The stress contour obtained from the simulation is presented in Figure 4. The results show that the maximum equivalent stress is 574.66 MPa, occurring at localized regions such as Nozzle connections, Base support attachments, and welded junctions. In contrast, the majority of the cylindrical shell experiences relatively uniform stress in the range of 127 MPa to 191 MPa.

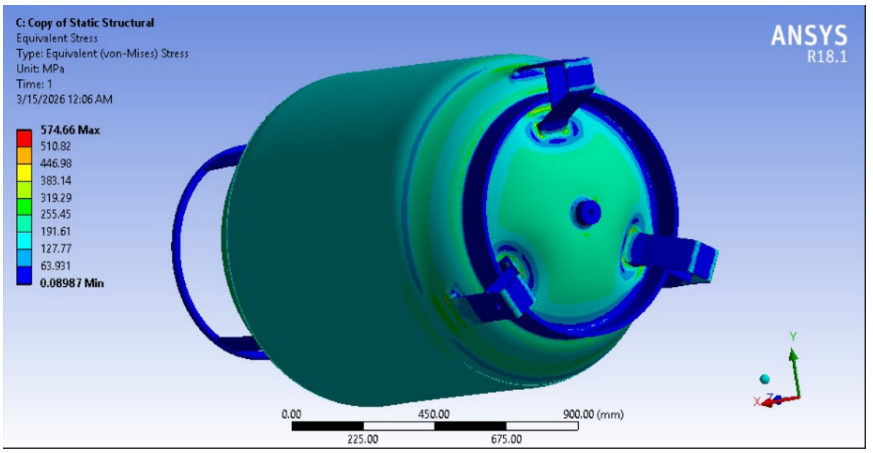


Figure 4: *Maximum Equivalent Stress*

4.2 Deformation Results

The total deformation of the LPG cylinder under applied loads is shown in Figure 5

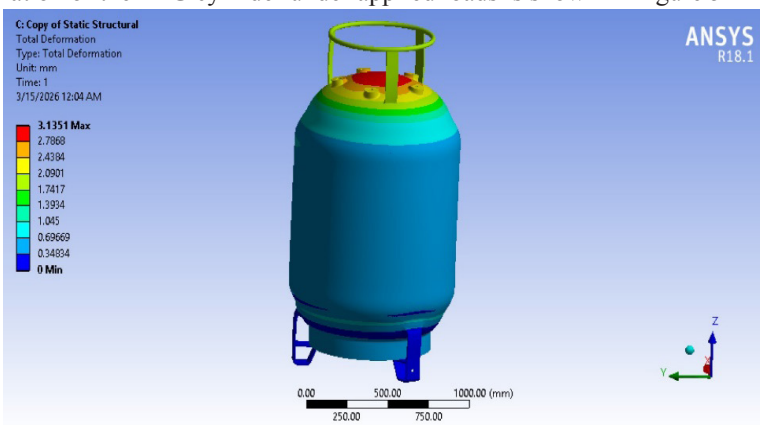


Figure 5: *Total deformation of the LPG cylinder*

The simulation results indicate a maximum deformation of approximately 3 mm. The deformation is primarily concentrated near the support structures and nozzle regions, while the cylindrical body shows relatively uniform displacement.

4.3 Identification of Critical Regions

The finite element results highlight several critical regions of stress concentration. These regions are shown in Figure 6

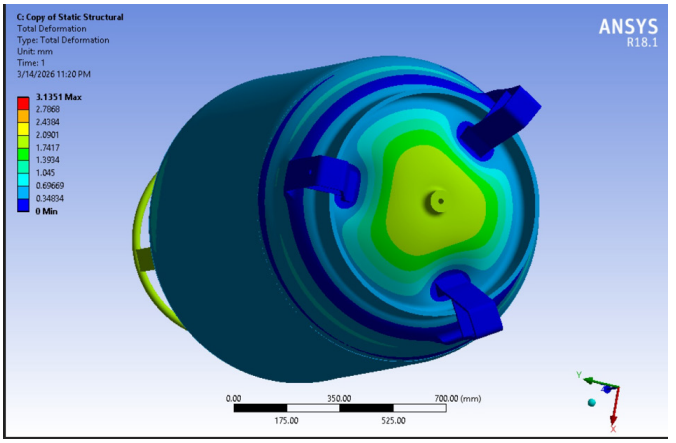


Figure 6: *Stress concentration in critical regions of the LPG cylinder*

4.4 Fatigue Analysis Results (Analytical Method)

The fatigue analysis was carried out in accordance with ASME Section VIII, Division 2 procedures. Based on the stress range obtained from FEA, the effective alternating stress amplitude was calculated as approximately 286 MPa.

The number of cycles to failure was determined as:

$$N = 3.085 \times 10^4 \, cycle$$

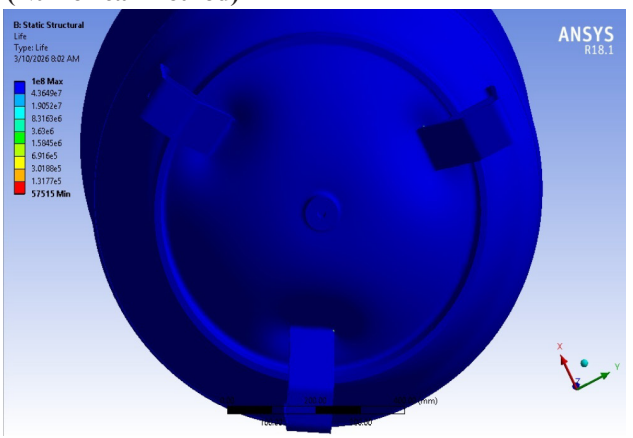
4.5 Fatigue Damage Factor

The fatigue damage factor was evaluated using Miner's rule. For an expected operating life of 12,000 cycles, the damage factor is:

$$D_f = 0.3889$$

Since the value is less than unity, the design satisfies fatigue safety requirements.

4.6 Fatigue Life Results (Numerical Method)



Fatigue life prediction was also performed using ANSYS Workbench. The fatigue life contour is shown in Figure 7.

Figure 7: Fatigue life distribution of the LPG cylinder

The results indicate:

- Minimum fatigue life ≈ 57,515 cycles
- Maximum fatigue life ≈ 1×10^8 cycles

The minimum life occurs near the base support regions, indicating these areas are critical for fatigue performance.

5. Discussion

The results demonstrate that the overall LPG cylinder design is structurally adequate; however, localized stress concentrations significantly influence performance.

Although the cylindrical shell experiences stress within acceptable limits, the maximum stress of 573.07 MPa exceeds the allowable stress, indicating that certain regions are highly stressed. These high stresses are confined to small areas and are primarily caused by geometric discontinuities such as nozzles and support attachments. The deformation obtained from FEA (3 mm) is considerably higher than the analytical prediction (~0.3 mm). This difference arises because analytical methods assume ideal geometry and loading, whereas the numerical model incorporates realistic conditions, including supports, nozzles, and gravity effects.

Fatigue analysis shows that the cylinder can withstand the expected number of cycles, as the calculated damage factor is less than unity. However, fatigue life is governed by stress-concentration regions rather than by the main cylindrical body. The numerical fatigue results further confirm that the support structures are the most critical components, with the lowest fatigue life observed at their inner radius. This indicates that the design is safe under pressure loading but may require improvements to the support geometry. To enhance performance and reliability, the following design improvements are recommended:

- Introduction of fillets at sharp geometric transitions
- Optimization of support structure design
- Reduction of stress concentration at nozzle connections

Overall, the study highlights the importance of combining analytical design with finite element analysis to evaluate the structural and fatigue behavior of LPG cylinders accurately.

6. Conclusion

This study presented the design, structural analysis, and fatigue assessment of a 450 kg LPG storage cylinder using a combination of analytical methods and finite element analysis. The analytical design, based on pressure-vessel theory, provided baseline dimensions and confirmed that the general shell structure meets

strength requirements under internal pressure. Finite element analysis enabled detailed evaluation of stress distribution and revealed localized stress concentrations at nozzle connections, support attachments, and geometric discontinuities. While the majority of the cylindrical shell experienced stresses within acceptable limits, peak stresses were observed in critical regions, highlighting the limitations of analytical approaches in capturing localized effects. The fatigue assessment, performed using both analytical procedures and numerical methods, indicates that the cylinder can safely withstand the expected number of operating cycles. The calculated fatigue damage factor remained below unity, confirming the adequacy of the design under cyclic loading conditions. However, fatigue life was found to be governed by stress concentration regions, particularly near support structures.

Overall, the study demonstrates that integrating analytical design with numerical simulation provides a more realistic and reliable evaluation of LPG cylinder performance. The findings also emphasize the importance of addressing geometric discontinuities to improve structural integrity and fatigue life.

References

American Society of Mechanical Engineers. (2021a). *ASME boiler and pressure vessel code: Section II, Part D – Properties (customary)*. ASME.

American Society of Mechanical Engineers. (2021b). *ASME boiler and pressure vessel code: Section VIII, Division 2: Rules for construction of pressure vessels*. ASME. https://www.asme.org/codes-standards

Bai, Y., & Jin, W. L. (2016). *Marine structural design*. Butterworth-Heinemann.

Budynas, R. G., & Nisbett, J. K. (2020). *Shigley's mechanical engineering design* (11th ed.). McGraw-Hill Education.

Cook, R. D., Malkus, D. S., Plesha, M. E., & Witt, R. J. (2002). *Concepts and applications of finite element analysis* (4th ed.). Wiley.

Dong, P. (2001). Structural stress definition and fatigue evaluation of welded joints. *International Journal of Fatigue, 23*(10), 865–876. https://doi.org/10.1016/S0142-1123(01)00058-4

Dowling, N. E. (2013). *Mechanical behavior of materials: Engineering methods for deformation, fracture, and fatigue* (4th ed.). Pearson.

European Committee for Standardization. (2021). *EN 13445-3: Unfired pressure vessels – Part 3: Design*. https://standards.cen.eu

International Organization for Standardization. (2013). *ISO 4706: Refillable welded steel cylinders for liquefied petroleum gas (LPG)*.

Kumar, S., & Singh, R. (2018). Fatigue analysis of pressure vessels under cyclic internal pressure. *International Journal of Pressure Vessels and Piping, 165*, 1–9. https://doi.org/10.1016/j.ijpvp.2018.03.001

Makwana, P., & Patel, K. (2017). Finite element analysis of LPG cylinder under internal pressure loading. *International Journal of Mechanical Engineering Research, 7*(3), 45–52.

Megyesy, E. F. (2008). *Pressure vessel handbook* (14th ed.). Pressure Vessel Publishing.

Moss, D. R., & Basic, M. (2013). *Pressure vessel design manual* (4th ed.). Elsevier.

National Fire Protection Association. (2020). *NFPA 58: Liquefied Petroleum Gas Code*.

Patel, H., & Makwana, V. (2016). Structural evaluation of pressure vessels using finite element techniques. *Engineering Failure Analysis, 59*, 487–495. https://doi.org/10.1016/j.engfailanal.2015.12.010

Shariati, M., & Janghorban, M. (2017). Fatigue life prediction of cylindrical pressure vessels using finite element analysis. *Engineering Structures, 148*, 102–112. https://doi.org/10.1016/j.engstruct.2017.06.034

Stephens, R. I., Fatemi, A., Stephens, R. R., & Fuchs, H. O. (2000). *Metal fatigue in engineering* (2nd ed.). Wiley.

Zhang, Y., Li, X., & Wang, H. (2019). Stress and fatigue analysis of pressure vessels with nozzle connections. *Journal of Pressure Vessel Technology, 141*(5), 051204. https://doi.org/10.1115/1.4043342

Emotional Intelligence and Employee Performance in Nepalese Commercial Banks

Bikram Kumar Shrestha

Lecturer, Public Youth Campus, Thamel, Kathmandu, Email:vikramxone@gmail.com, https://orcid.org/0009-0008-0968-8354

Abstract

Emotional Intelligence has increasingly been recognized as a crucial predictor of workplace behavior and performance, especially in service-oriented industries such as banking. In Nepalese commercial banks, where employees frequently interact with clients and navigate high-pressure environments, EI may play a vital role in shaping employee outcomes. This study investigates the impact of three key dimensions of emotional intelligence: self-awareness, empathy, and stress management, on employee performance in Class 'A' commercial banks in Nepal. It aims to identify which emotional competencies are most influential in enhancing workplace effectiveness. The study used a descriptive and explanatory research design and adopted a quantitative approach. Data were collected through structured questionnaires using a 5-point Likert scale, distributed to bank employees via Google Forms and print copies. Out of 600 distributed questionnaires, 398 valid responses were analyzed using SPSS and AMOS. Reliability, validity, and model fitness were assessed using composite reliability, AVE, and structural equation modeling.

The findings reveal that empathy and stress management have significant positive effects on employee performance, while self-awareness does not show a statistically significant influence. Among the constructs, empathy emerged as the strongest predictor of employee performance, suggesting the importance of interpersonal sensitivity in the banking context. Emotional intelligence, particularly empathy and stress management, plays a significant role in shaping employee performance. However, self-awareness alone may not be sufficient to drive performance outcomes without supportive organizational or behavioral mechanisms. The results underscore the need for banks to integrate emotional intelligence training, especially in empathy and stress regulation, into employee development programs. Organizations should also consider emotional competence in recruitment and leadership development. This study provides novel insights into the domain-specific role of emotional intelligence in the Nepalese banking sector. It offers empirical evidence from a developing-country context, where such research remains relatively limited.

Keywords: *Emotional Intelligence, Employee Performance, Self-Awareness, Empathy, Stress Management, Commercial Banks, Nepal*

Volume 1, Issue no. 1, May 2026
Received Date: March 19, 2026
Revised Date: April 16, 2026
Accepted Date: May 12, 2026
ISSN: 3149-7144 (Print)
ISSN: 3149-7152 (Online)

1. Introduction

Emotional intelligence (EI), popularized by Goleman (1995) and conceptually developed by Salovey and Mayer (1990), refers to the ability to perceive, understand, regulate, and utilize emotions in oneself and others. In organizational contexts, EI has been recognized as a critical competency that influences employees' attitudes, behavior, and performance. This is particularly relevant in the banking sector, where employees operate in high-pressure, service-intensive environments characterized by performance targets, regulatory demands, and continuous customer interaction. Empirical evidence consistently links EI with improved job performance, teamwork, stress management, and organizational commitment (Carmeli, 2003; Sy & Côté, 2004; Radha & Aithal,2023). Recent studies further indicate that organizations investing in EI development report gains in collaboration, leadership effectiveness, and productivity (Shah & Sah, 2024; Dahir, 2025). Collectively, this literature suggests that EI complements technical competence by enhancing adaptability and interpersonal effectiveness capabilities that are increasingly vital in dynamic financial markets.

Despite extensive international research, empirical attention to the role of EI in Nepal's commercial banking sector remains limited, even though it operates in a rapidly evolving and competitive environment. Employee development practices in many Nepalese banks continue to emphasize technical expertise and tenure over emotional and behavioral competencies (Dahal et al., 2025). Given increasing workplace stress, service expectations, and organizational change, neglecting EI may constrain employee effectiveness and overall performance. Accordingly, a contextual gap exists between established global findings and the limited evidence from Nepalese commercial banks. This study addresses that gap by assessing the levels of emotional intelligence and employee performance in Nepalese commercial banks and examining the direct impact of EI on employee performance.

2. Review of Literature

EI refers to the capacity to recognize, understand, manage, and influence one's own emotions and the emotions of others (Goleman, 2020). Goleman's model identifies five key components of EI: self-awareness, self-regulation, motivation, empathy, and social skills that together enable individuals to navigate complex social environments and contribute more effectively to organizational goals. Bar-On (2006) defined EI as an array of emotional and social abilities that impact an individual's overall functioning, including their ability to adapt to challenges and manage stress.

Employee performance refers to how effectively an employee fulfills their job responsibilities and contributes to achieving organizational objectives (Organ, Podsakoff, & Mackenzie, 2006). Performance is not only determined by technical skills but also by emotional intelligence, which influences an employee's ability to collaborate, manage stress, and adapt to changing work environments (Miao, Humphrey, & Qian, 2017). High-performing employees are distinguished by their ability to consistently deliver high-quality results, work effectively within teams, and navigate organizational challenges (Mahmood, Uddin, & Fan, 2018).

Bar-On's Emotional-Social Intelligence Model (1997) offers a comprehensive framework for understanding emotional intelligence as a combination of emotional and social competencies that enables individuals to manage and adapt to environmental demands effectively. The model posits that EI is not a singular ability but a set of interrelated skills that individuals can develop to improve both personal and professional success. Bar-On's model identifies five key components: intrapersonal skills, interpersonal skills, adaptability, stress management, and general mood (Bar-On, 1997). These components collectively contribute to an individual's ability to navigate social and emotional challenges, fostering better performance in both work and life.

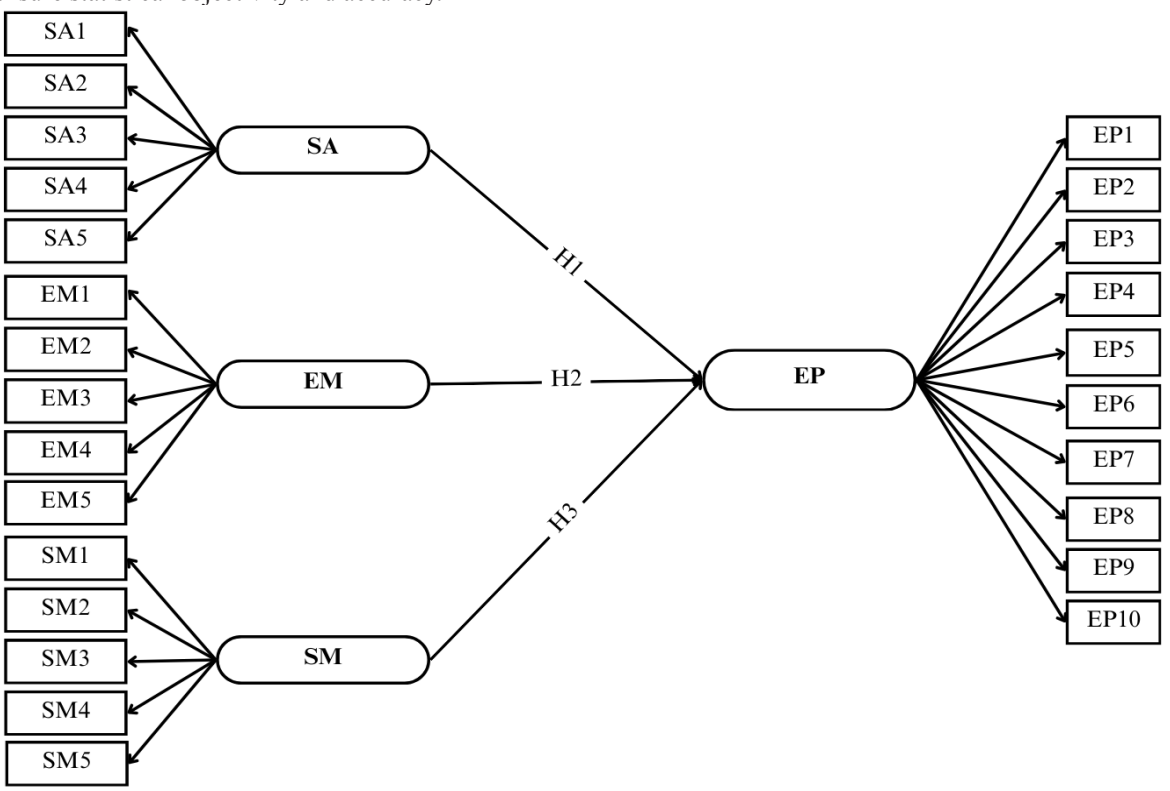
The empirical literature on the relationship between emotional intelligence and employee performance consistently shows a positive correlation. Emotional Intelligence, which includes the ability to recognize, understand, and regulate one's own emotions and the emotions of others, has been found to improve various aspects of employee performance, such as stress management, empathy, communication, adaptability, and collaboration (Miao, Humphrey, & Qian, 2017; Mahmood, Uddin, & Fan, 2018). Research indicates that employees with higher EI perform better due to enhanced interpersonal skills, emotional regulation, and decision-making abilities, which contribute to improved teamwork, job satisfaction, and productivity (Mahbub & Barhate, 2025).

One key component of emotional intelligence, self-awareness, is particularly important in enhancing employee performance. Self-aware employees tend to have higher job productivity, better interpersonal relationships, and increased job satisfaction. These employees can manage their emotions, set realistic goals, and adapt to challenges effectively (Mahbub & Barhate, 2025). Self-awareness also plays a critical role in emotional regulation, allowing employees to handle pressure and perform well in dynamic work environments (Ashkanasy & Dorris, 2017). Another vital emotional intelligence component, empathy, is linked to improved job performance through better communication, conflict resolution, and collaboration. Empathetic employees build stronger relationships with colleagues, leading to a more supportive work environment and enhanced teamwork. Research has also shown that empathy is associated with higher job satisfaction and motivation, both of which are crucial for performance (Rahman, Ferdausy, & Uddin, 2012). Empathy also contributes to effective leadership, with empathetic leaders fostering a more engaged and motivated workforce (Ashkanasy & Dorris, 2017).

Stress management, another important EI factor, has a significant impact on employee performance. Employees who manage stress effectively tend to be more productive, adaptable, and satisfied with their jobs. They are better equipped to handle workplace challenges, maintain focus under pressure, and engage with colleagues in positive ways (Ashkanasy & Dorris, 2017). Effective stress management also improves physical and mental health, reducing burnout and absenteeism, which further enhances job performance (Mahmood, Uddin, & Fan, 2018; Santos, Wang, & Lewis, 2018).

3. Research Methodology

This study adopts a descriptive and explanatory research design. The descriptive component assesses employees' perceptions of EI, while the explanatory component investigates causal relationships among EI components, self-awareness, empathy, stress management, and employee performance. A quantitative approach is used to ensure statistical objectivity and accuracy.



Source: Gupta & Singhal (2020)

Figure 1 Conceptual Framework

Results

The Chi-square value (CMIN = 1034.325, d.f. = 247, p < .001) remained statistically significant, which is typical in large sample sizes (Byrne, 2010). Following the removal of the poorly performing item EP_7, the measurement model of Emotional Intelligence (EI) and Employee Performance (EP) demonstrated improved, though still moderate, overall fit. However, the Chi-square to degrees of freedom ratio (CMIN/DF = 4.188) fell within the acceptable threshold of less than 5, indicating a tolerable level of model fit (Marsh & Hocevar, 1985). Incremental fit indices showed a notable improvement over the previous model. The Comparative Fit Index (CFI = .849), Incremental Fit Index (IFI = .850), and Normed Fit Index (NFI = .812) all approached or met the minimum recommended threshold of 0.80, suggesting that the revised model offers an acceptable approximation to the observed data (Hu & Bentler, 1999; Kline, 2016). The Tucker-Lewis Index (TLI = .832) further supports the model's moderate adequacy.

However, the RMSEA = .090; 90% CI = .084–.095, remained at a mediocre level, as values below .08 are preferred for good model fit (Browne & Cudeck, 1993). The p-close value was .000, indicating that the model does not meet the criteria for a close fit. While the model still does not meet ideal fit standards, the improvements in key incremental indices suggest that removing item 7 from employee performance (EP_7) enhanced the model's structural integrity. This aligns with the recommendation by Hair et al. (2019), who emphasize the importance of refining measurement models by eliminating indicators with weak standardized loading to improve construct validity and overall model fit.

All constructs demonstrate strong internal consistency, as indicated by composite reliability values exceeding the recommended threshold of 0.70 (Hair et al., 2019). Specifically, the composite reliabilities are 0.859 for Self-Awareness, 0.855 for Empathy, 0.902 for Stress Management, and 0.873 for Employee Performance. These results confirm that the items within each construct consistently measure the intended latent variables.

Table 1 : *Reliability and Validity Analysis*

	Composite Reliability	**AVE**	**Mean (SD)**
Self- Awareness	0.859	0.552	2.73 (0.908)
Empathy	0.855	0.543	3.41 (0.90)
Stress Management	0.902	0.510	3.75 (0.88)
Employee Performance	0.873	0.579	3.59 (0.75)

Among the three dimensions of emotional intelligence, self-awareness, empathy, and stress management emerged as the most positively perceived by employees. This indicates that respondents generally consider themselves capable of effectively managing workplace pressures, maintaining emotional control, and handling stress-inducing situations with resilience and composure.

Empathy also received a relatively favorable assessment from participants. This suggests that employees believe they can understand and respond to others' emotions, demonstrating concern, compassion, and sensitivity in interpersonal interactions. Such a perception is critical in collaborative environments like commercial banks, where teamwork, communication, and customer service are fundamental to organizational success. Employee performance was similarly rated positively, reflecting employees' confidence in their productivity, adaptability, and contributions to team effectiveness. This implies a general self-perception of being competent in fulfilling job responsibilities, adjusting to changing work conditions, and working well with others to achieve organizational objectives.

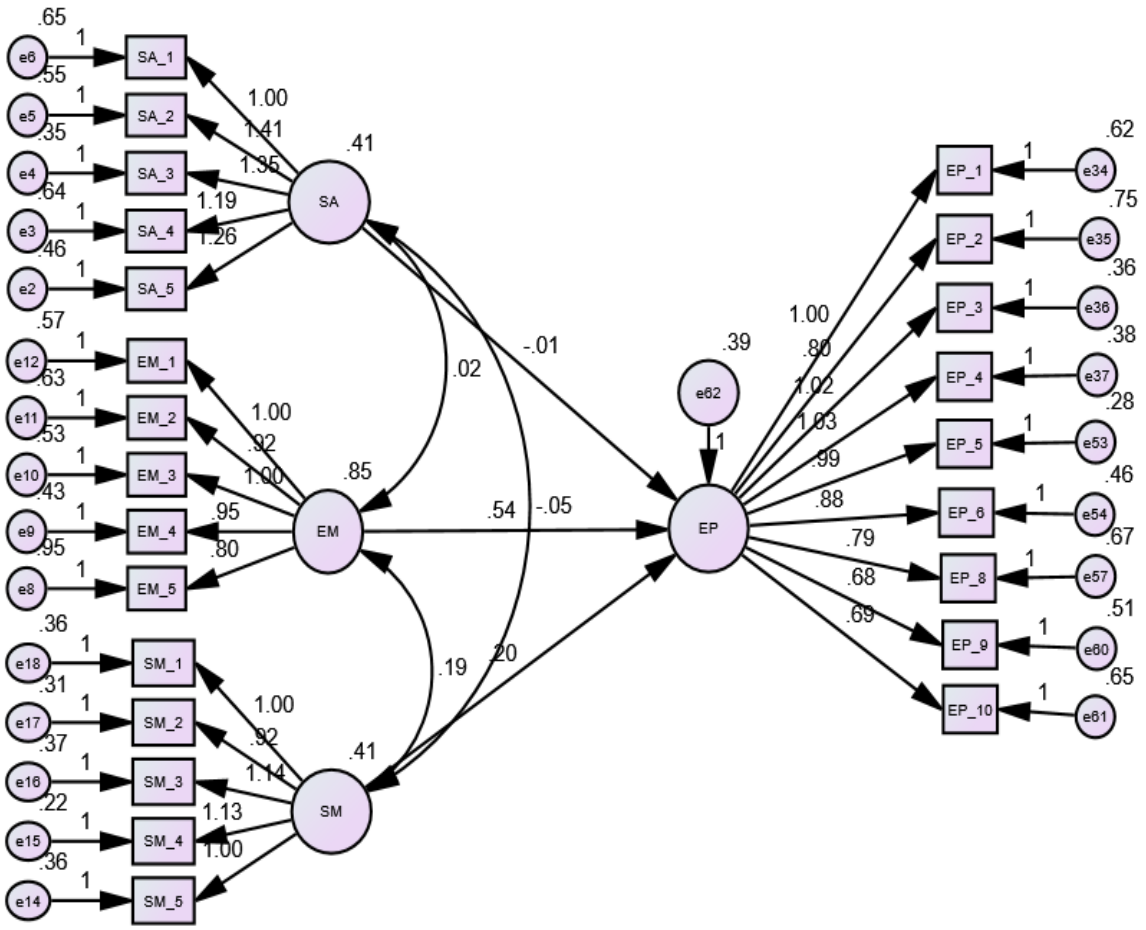
In contrast, self-awareness was the least positively rated dimension among the constructs studied. This finding points to a potential area for development, as it suggests that employees may not be fully aware of their emotions, strengths, weaknesses, or of how their behavior influences others. A lower level of self-awareness could limit reflective thinking, emotional regulation, and personal growth, all of which are essential for effective decision-making and leadership.

The results presented in Table 2 of the structural equation modeling evaluated three dimensions of EI: self-awareness, empathy, and stress management to determine their predictive influence on employee performance. Among these, empathy emerged as the strongest predictor, with a significant positive effect on employee

performance (β = 0.539, p < 0.001). Hypothesis 2 (H2) tested this relationship, signifying that employees who exhibit higher levels of empathy, such as understanding others' emotions and responding appropriately, are more likely to perform effectively in the workplace. Similarly, stress management demonstrated a significant positive relationship with performance (β = 0.203, p = 0.002), supporting Hypothesis 3 (H3), suggesting that the ability to manage emotional pressure and maintain composure under stress contributes meaningfully to improved job outcomes.

Table 2 : *Path Analysis*

	Coeff.	Critical Ratio	*P*-Values	Result
Self-Awareness → EP(H1)	-0.01	9.729	0.848	Not Supported
Empathy → OC (H2)	0.54	1.831	< 0.001	Supported
Stress Management → OC (H3)	0.20	4.725	0.002	Supported



In contrast, self-awareness did not have a statistically significant impact on employee performance (β = -0.011, p = 0.848), suggesting that while self-awareness is an important personal trait, it may not directly translate into improved performance without complementing other emotional competencies, such as empathy or emotion regulation. Here, H1 is not supported, suggesting that self-awareness alone does not have a direct or meaningful effect on employees' performance of their duties. This may imply that while awareness of one's emotions is valuable, it may not translate directly into improved job outcomes unless coupled with other emotional or behavioral competencies among employees of Nepalese commercial banks.

Discussion

The significant positive relationship between empathy and employee performance indicates that effectiveness in banking is inherently relational. Employees routinely engage with clients facing financial concerns, colleagues managing operational demands, and supervisors enforcing performance targets. Empathy likely enhances trust, reduces interpersonal friction, and improves service responsiveness, thereby strengthening both individual and team outcomes. While Goleman (1998) and Bar-On (1997) conceptualize empathy as central to social effectiveness, the present findings suggest that, in banking, empathy operates as a practical performance driver by directly shaping communication quality and customer relations. Similarly, the positive association between emotional regulation and performance reflects the regulatory and performance pressures characteristic of banking roles. Employees who can manage emotional reactions and maintain composure under stress are less susceptible to performance disruptions caused by conflict or emotional exhaustion. Emotional regulation appears to function as a stabilizing resource, preserving decision-making capacity and professional conduct in demanding situations. This interpretation is consistent with Boyatzis (2017) and Cherniss (2010), who argue that self-regulation sustains effectiveness in high-pressure environments. In this context, emotional control translates into sustained productivity and service consistency.

In contrast, self-awareness did not demonstrate a significant direct relationship with performance. Although prior research identifies self-awareness as foundational to emotional intelligence and performance (Goleman, 2020; Mahmood et al., 2018; Miao et al., 2017), the present findings suggest its influence may be indirect. Self-awareness involves internal recognition of strengths, weaknesses, and emotional states; however, performance metrics in commercial banks are largely outcome-based, emphasizing target achievement and procedural compliance. Without corresponding behavioral adaptation, self-awareness alone may not produce observable performance gains. Organizational and cultural dynamics may further explain this result. In hierarchical environments with limited developmental feedback, opportunities to convert self-insight into performance-enhancing behavior may be constrained. In collectivist workplace settings, externally visible competencies such as empathy and emotional restraint may carry greater weight in performance evaluation than introspective capacities.

Conclusion

Employees demonstrate relatively stronger competencies in stress management and interpersonal sensitivity, while self-awareness appears comparatively less developed. This pattern suggests that employees are generally capable of coping with workplace pressure and maintaining functional relationships, both of which are critical in a service-intensive banking environment. The analysis further indicates that emotional intelligence does not operate uniformly across its dimensions. Empathy and stress management significantly contribute to employee performance. In commercial banking, where client interaction, teamwork, and performance targets are central, these competencies directly influence observable workplace behavior. Empathy enhances service quality and collaboration, while emotional regulation supports consistency and effectiveness under pressure.

In contrast, self-awareness does not directly influence performance outcomes. Although conceptually foundational, self-awareness alone may not translate into measurable results unless accompanied by behavioral adaptation. In structured and performance-driven organizational settings, externally expressed emotional competencies appear to be more practically relevant than introspective awareness.

Limitations and Directions for the Study

This study has limitations, including its focus on Nepalese commercial banks, reliance on self-reported data, and a cross-sectional design, which may affect the generalizability and causal interpretation of results. Future research should span different industries and cultures, use multiple data sources, and employ longitudinal or experimental methods better to understand the influence of emotional intelligence on employee performance. Additionally, exploring contextual factors and how self-awareness translates into effective behavior could provide deeper insights.

Acknowledgement

The author would like to thank the anonymous respondents and the individuals who made this study possible.

Conflict of Interest

The author declares no conflict of interest while preparing this article.

References

Ashkanasy, N. M., & Dorris, A. D. (2017). Emotions in the workplace. *Annual Review of Organizational Psychology and Organizational Behavior, 4*, 67–90. https://doi.org/10.1146/annurev-orgpsych-032516-113231

Bar-On, R. (1997). *The emotional quotient inventory (EQ-i): A test of emotional intelligence*. Multi-Health Systems.

Bar-On, R. (2006). The Bar-On model of emotional-social intelligence (ESI). *Psicothema, 18*(Suppl.), 13–25.

Boyatzis, R., Rochford, K., & Cavanagh, K. V. (2017). Emotional intelligence competencies in engineers' effectiveness and engagement. *Career Development International, 22*(1), 70–86. https://doi.org/10.1108/CDI-08-2016-0136

Browne, M. W., & Cudeck, R. (1993). Alternative ways of assessing model fit. In K. A. Bollen & J. S. Long (Eds.), *Testing structural equation models* (pp. 136–162). Sage Publications.

Carmeli, A. (2003). The relationship between emotional intelligence and work attitudes, behavior, and outcomes: An examination among senior managers. *Journal of Managerial Psychology, 18*(8), 788–813. https://doi.org/10.1108/02683940310511881

Cherniss, C. (2010). Emotional intelligence: Toward clarification of a concept. *Industrial and Organizational Psychology: Perspectives on Science and Practice, 3*(2), 110–126. https://doi.org/10.1111/j.1754-9434.2010.01231.x

Dahal, R., Kharel, S., Karki, D., Ghimire, B., & Joshi, S. (2025). Employee retention in Nepal's banking sector: A social exchange perspective on prestige, development, and work-life balance. *Journal of Logistics Informatics and Service Science, 12*, 1–22. https://doi.org/10.33168/JLISS.2025.0701

Dahir, M. (2025). The importance of emotional intelligence in leadership. *Journal of Human Resource & Leadership, 9*, 114–123. https://doi.org/10.53819/81018102t4351

Goleman, D. (1995). *Emotional intelligence: Why it can matter more than IQ for character, health, and lifelong achievement*. Bantam Books.

Goleman, D. (1998). *Working with emotional intelligence*. Bloomsbury Publishing.

Goleman, D. (2020). *Emotional intelligence*. Bloomsbury Publishing.

Hair, J. F., Risher, J. J., Sarstedt, M., & Ringle, C. M. (2019). When to use and how to report the results of PLS-SEM. *European Business Review, 31*, 2–24. https://doi.org/10.1108/EBR-11-2018-0203

Mahbub, A., & Barhate, B. (2025). Emotional intelligence at the workplace: Why is it crucial for employees? *International Journal of Business, Economics and Management, 12*, 17–27. https://doi.org/10.18488/62.v12i2.4226

Mahmood, M., Uddin, M., & Fan, L. (2018). Influence of transformational leadership on employees' creative process engagement: A multi-level analysis. *Management Decision, 57*. https://doi.org/10.1108/MD-07-2017-0707

Miao, C., Humphrey, R., & Qian, S. (2017). A meta-analysis of emotional intelligence and work attitudes. *Journal of Occupational and Organizational Psychology, 90*. https://doi.org/10.1111/joop.12167

Motowidlo, S. J., & Van Scotter, J. R. (1994). Evidence that task performance should be distinguished from contextual performance. *Journal of Applied Psychology, 79*(4), 475–480. https://doi.org/10.1037/0021-9010.79.4.475

Organ, D. W., Podsakoff, P. M., & MacKenzie, S. B. (2006). *Organizational citizenship behavior: Its nature, antecedents, and consequences*. SAGE Publications. https://doi.org/10.4135/9781452231082

Radha, P., & Aithal, P. S. (2023). A study on the performance of employees in the banking sector and its impact on organizational health. *International Journal of Management, Technology, and Social Sciences (IJMTS), 8*(4), 119–127. https://doi.org/10.5281/zenodo.10071215

Rahman, M., Ferdausy, S., & Uddin, M. (2012). Examining the relationships between emotional intelligence and the components of transformational leadership. *ABAC Journal, 32*, 45–59.

Salovey, P., & Mayer, J. D. (1990). Emotional intelligence. *Imagination, Cognition and Personality, 9*(3), 185–211. https://doi.org/10.2190/DUGG-P24E-52WK-6CDG

Santos, A., Wang, W., & Lewis, J. (2018). Emotional intelligence and career decision-making difficulties: The mediating role of career decision self-efficacy. *Journal of Vocational Behavior, 107*, 295–309. https://doi.org/10.1016/j.jvb.2018.05.008

Shah, B., & Sah, K. (2024). The impact of emotional intelligence in the workplace on productivity. *International Journal of Business and Management, 13*, 69–76. https://doi.org/10.35629/8028-13106976

Sy, T., & Côté, S. (2004). Emotional intelligence: A key ability to succeed in the matrix organization. *Journal of Management Development, 23*, 437–455. https://doi.org/10.1108/ 02621710410537056

Digital Transformation Adoption Among SMEs in Developing Economies: Evidence from Nawalparasi District, Nepal

Kanhaiya Gupta

Lecturer, Tribhuwan Campus, Belatari, Email: kanhaiya.gupta141@gmail.com, https://orcid.org/0009-0006-3250-6104

Abstract

Small and medium-sized enterprises play a vital role in economic development in developing countries, yet structural, institutional, and organizational challenges often constrain their progress toward digital transformation. This study examines the factors influencing the adoption of digital transformation among SMEs in Nawalparasi, focusing on four dimensions: business environment, innovation, digital capabilities, and digital tools. The study is grounded in the Technology–Organization–Environment framework, the Technology Acceptance Model, and Innovation Diffusion Theory. Using a quantitative cross-sectional survey design, data were collected from 237 SME owners, managers, and employees. Yamane's sampling formula was applied to determine the sample size from a population of 27,300 registered SMEs, and the data were analyzed using descriptive statistics, Pearson correlation, and multiple linear regression with IBM SPSS Statistics 27.

The findings indicate that digital tools and innovation are the two significant predictors of digital transformation adoption among SMEs. Digital tools emerged as the strongest predictor, demonstrating that firms with greater access to and use of digital technologies are more likely to adopt digital transformation practices. Innovation also showed a positive and significant influence, suggesting that organizations with a stronger culture of experimentation and openness to change are more inclined to adopt digital technologies. In contrast, the business environment and digital capabilities did not independently predict firm-level adoption. Although digital capabilities were statistically not significant in the regression model, they had the lowest mean, highlighting major deficiencies in digital strategy, workforce training, and organizational readiness among SMEs in Nawalparasi. A notable finding of the study is the paradox between organizational preparedness and perceived outcomes. Despite weaknesses in strategic capability and training, respondents expressed strong satisfaction with the outcomes of digital transformation. This suggests that SMEs are experiencing the immediate benefits of digitalization while still lacking the deeper organizational infrastructure required for sustainable transformation.

Keywords: *Business environment, digital capabilities, digital transformation, digital tools, developing economy, innovation, SMEs.*

Volume 1, Issue no. 1, May 2026
Received Date: March 20, 2026
Revised Date: April 17, 2026
Accepted Date: May 13, 2026
ISSN: 3149-7144 (Print)
ISSN: 3149-7152 (Online)

1. Introduction

Small and medium-sized enterprises (SMEs) are central to economic growth, employment, and innovation in both developed and developing economies (OECD, 2021). As global markets undergo rapid digitalization, digital transformation, defined as the systematic integration of technologies such as cloud computing, artificial intelligence, and digital marketing into core business operations (Matt et al., 2015), has become a strategic imperative for SMEs seeking sustained competitiveness and viability (Vial, 2019). However, this transition is far from uniform. SMEs in developing-country contexts face compounding barriers: limited digital infrastructure, insufficient financial resources, low organizational digital literacy, and persistent resistance to change (Morakanyane et al., 2020). These conditions make digital transformation adoption substantially more complex than it appears in high-resource settings.

Despite growing scholarly interest in digital transformation, empirical research targeting SMEs in low-resource contexts, particularly Nepal, remains critically limited (Vrontis et al., 2022; Amaral & Peçasb, 2020). Existing literature disproportionately catalogs barriers such as cost, digital ignorance, and organizational inertia (Khan & Siddiqui, 2023; Arifia, 2024), while neglecting the enabling conditions of government support, digital literacy programs, and technology partnerships that could meaningfully accelerate adoption (Jiang, 2024). In Nawalparasi District, where SMEs underpin local employment and economic activity, this gap is particularly consequential. External factors, including infrastructure quality, market dynamics, and regulatory frameworks, further mediate whether adoption is enabled or constrained (Nambisan et al., 2019). However, their interaction with firm-level vulnerabilities in this context has not been systematically examined.

To rigorously address this gap, the study integrates three complementary frameworks. The Technology–Organization–Environment (TOE) framework (Tornatzky & Fleischer, 1990) provides an overarching structural lens for explaining how technological availability, organizational readiness, and environmental pressures jointly shape adoption decisions. The Technology Acceptance Model (TAM; Davis, 1989) captures the cognitive and attitudinal dimensions of adoption, showing how perceived usefulness and perceived ease of use, both of which are critically constrained by low digital literacy in Nawalparasi, determine whether SME owners and managers embrace or resist digital tools. Innovation Diffusion Theory (IDT; Rogers, 2003) completes the framework by attending to social and systemic dynamics: low observability of digital success cases and poor compatibility with informal business practices are expected to slow diffusion, while peer networks and demonstration initiatives could enhance relative advantage and accelerate uptake.

2. Review of Literature

Four interrelated dimensions shape the adoption of digital transformation among SMEs: the business environment, innovation capacity, digital capabilities, and digital tool accessibility. Externally, market competition, regulatory requirements, and government financial incentives create the conditions under which SMEs either embrace or resist digital solutions (Bhuiyan et al., 2024; Kahveci, 2025). Access to foundational infrastructure, particularly internet connectivity and cloud computing services, further determines whether the transition to digital operations is practically achievable (OECD, 2021). Internally, SMEs that cultivate an innovation-oriented culture demonstrate a greater willingness to adopt digital tools, and those that do consistently outperform peers on competitiveness and market reach (Cannas, 2021; Rogers, 2021). This innovation-adoption relationship is bidirectional: digital technologies simultaneously respond to and stimulate organizational innovation, reinforcing broader growth (Vrontis et al., 2022). However, the realization of these gains is contingent on digital capabilities, specifically, the technical literacy and IT competency of both staff and leadership (Bhuiyan et al., 2024). Where capability gaps persist, structured training and executive commitment become decisive enablers (Ghanim et al., 2022; Scuotto et al., 2017). At the operational level, tools such as cloud computing, artificial intelligence, ERP systems, CRM platforms, and digital marketing technologies translate transformation ambitions into measurable efficiency and customer engagement gains, though budget constraints and data security concerns remain persistent barriers to full utilization (Philbina et al., 2022; Bhuiyan et al., 2024).

These four dimensions are theoretically anchored in two complementary frameworks. The Technology–Organization–Environment framework (Tornatzky & Fleischer, 1990) provides the overarching structural lens, positing that digital adoption is jointly determined by three contexts: the technological context — encompassing the availability and perceived usefulness of digital tools (Zhu et al., 2006); the organizational context covering leadership commitment, digital literacy, financial capacity, and culture (Low et al., 2011; Vial, 2019); and the environmental context reflecting competitive market pressures, consumer expectations, and regulatory frameworks (Baker, 2012; OECD, 2020). Complementing TOE at the social and perceptual level, Rogers's (2003) Diffusion of Innovation (DOI) theory explains how the rate of digital adoption within SME communities is shaped by five innovation attributes: relative advantage, compatibility, complexity, trialability, and observability. In the context of Nawalparasi, the low observability of digital success cases and poor compatibility with established informal business practices are expected to slow diffusion. At the same time, government-supported demonstration initiatives and peer knowledge exchange could meaningfully accelerate uptake (Jiang, 2024).

Nepalese empirical studies validate these theoretical expectations while underscoring the depth of remaining challenges. Adhikari and Molla (2024) found that digitalization significantly improved decision-making, customer responsiveness, and internal collaboration among Nepalese SMEs, confirming the operational value of digital tools when effectively deployed. At the intervention level, a UNCDF- and SDC-supported program enhanced the digital and financial capacities of over 4,000 Nepalese SMEs, particularly women-led enterprises, by facilitating access to digital markets and targeted capacity building, thereby directly operationalizing TOE's organizational context (UNCDF, 2023). District-level digital literacy training delivered by FWEAN across Nawalparasi, Ilam, and Palpa further reduced capability gaps and expanded market access for participating entrepreneurs (Chapagain, 2023).

3. Research Methodology

This study used a quantitative, descriptive research design to examine the factors influencing the adoption of digital transformation among SMEs in Nawalparasi District (Aervina Misron et al., 2025; Pratamansyah, 2024). A cross-sectional survey approach is employed, enabling simultaneous data collection across a diverse sample of SME owners, managers, and employees at a single point in time. This design is well-suited to the study's objective of assessing how four independent variables, business environment, innovation, digital capabilities, and digital tools, collectively influence the dependent variable of digital transformation adoption. The quantitative approach ensures that relationships between variables are measured with statistical precision, producing findings that are both replicable and generalizable to the broader SME population in the district.

Primary data were collected directly from key organizational informants, specifically SME owners, managers, and senior employees, who possess firsthand knowledge of their firms' digital practices and strategic orientations. This approach is consistent with established precedent. Rupeika-Apoga et al. (2022) prioritized organizational decision-makers when examining digital capability in transformation adoption, whereas Teng et al. (2022) employed comparable data-sourcing strategies in their investigation of innovation as an adoption driver. Targeting respondents with direct organizational authority ensures that responses accurately reflect firm-level realities rather than peripheral or secondhand perceptions.

The study population comprises all registered SMEs in Nawalparasi District, spanning three operational categories: manufacturing, retail, and tourism, with an estimated total of 27,300 enterprises (Economic Survey, 2080/81, Ministry of Industry, Commerce and Supplies). To determine an adequate and statistically defensible sample size, Yamane's (1967) formula was applied at a 5% margin of error. This calculation yielded a required sample size of 394, sufficient to ensure statistical significance and representativeness across the SME population. Respondents were selected using convenience sampling, a non-probability method chosen for its practical efficiency, given the study's resource and time constraints, a technique widely employed in SME research operating under similar field conditions. Data were collected using a structured questionnaire comprising 25 items, measured on a five-point Likert scale, developed from validated scales in prior empirical

research. A total of 410 questionnaires were administered using a dual-mode approach: Google Forms for digital distribution and printed copies for respondents who preferred physical formats, to maximize accessibility and response rates. Of the 410 distributed, 243 responses were returned, yielding a response rate of approximately 59%. Following rigorous screening for completeness and internal consistency, 237 questionnaires were deemed valid and retained for analysis, constituting the final analytical sample.

Three analytical techniques are applied to the 237 valid responses using IBM SPSS Statistics 27 at a significance level of .05. First, descriptive statistics, including frequencies, percentages, means, and standard deviations, summarize the demographic profile of respondents and reveal the central tendencies and distributional patterns within each variable. Second, Cronbach's Alpha assesses the internal consistency and reliability of all measurement scales, with $\alpha > .70$ adopted as the benchmark for acceptable reliability, thereby confirming that each construct consistently measures its intended dimension (Hair et al., 2019). Third, and most centrally, multiple linear regression analysis is employed to test the directional relationships between the four independent variables, business environment, innovation, digital capabilities, and digital tools, and the dependent variable of digital transformation adoption.

4. Results

Among the independent variables, Innovation recorded the highest overall mean score, with a mean of 3.75, indicating that SMEs generally perceive innovation as a strong contributor to digital transformation, particularly in enabling innovative products and services, which achieved a mean of 3.83 and a standard deviation of 0.914. Digital Tools achieved a mean of 3.51, while Business Environment recorded a mean of 3.47, both scoring above the midpoint of the scale and suggesting above-average support from technological resources and external environmental conditions. Within the Business Environment construct, government policies encouraging digital innovation received the highest rating, with a mean of 3.61 and a standard deviation of 1.063. In contrast, digital infrastructure adequacy received a lower rating, with a mean of 3.31 and a standard deviation of 1.176. In contrast, Digital Capabilities produced the lowest overall mean score of 2.89, falling below the midpoint and indicating insufficient internal digital readiness among SMEs. Employee digital skills and competencies achieved the highest score within this construct, with a mean of 3.11 and a standard deviation of 1.279. In contrast, the presence of a clear digital transformation strategy received the lowest score, with a mean of 2.68 and a standard deviation of 1.251. The dependent variable, Digital Transformation Adoption, achieved the highest overall mean score in the study, with a mean of 4.38 and relatively low standard deviation values ranging from 0.616 to 0.750, reflecting strong and consistent agreement among respondents that digital transformation initiatives have been successfully implemented and have generated measurable organizational benefits, including increased revenue and profitability.

Table 1 presents the Pearson correlation matrix among the study variables. Digital Tools demonstrated the strongest significant positive relationship with digital transformation adoption (ADT), with a correlation coefficient of 0.355 and a significance level below 0.01, indicating that greater use of digital tools is associated with higher levels of ADT. Innovation also showed a significant positive correlation with ADT ($r = 0.278$, $p < 0.01$), suggesting that innovative practices contribute positively to digital transformation efforts.

Table 1 : *Pearson Correlation Matrix Among Study Variables (n = 237)*

Variable	ADT	BE	DC	I	DT
ADT Digital Transformation Adoption	1				
BE Business Environment	.006	1			
DC Digital Capabilities	.083	.018	1		
I Innovation	.278**	-.132*	.284**	1	
DT Digital Tools	.355**	-.078	.507**	.431**	1

*** p < .01 (2-tailed); * p < .05 (2-tailed).*

In contrast, Digital Capabilities exhibited a weak, statistically non-significant relationship with ADT (r = 0.083, p> 0.05), while Business Environment showed an almost negligible, non-significant correlation (r = 0.006). Additionally, a strong positive intercorrelation was observed between Digital Tools and Digital Capabilities, with a correlation coefficient of 0.507 and a significance level below 0.01, indicating the possibility of multicollinearity that required further examination in the regression analysis. Furthermore, Business Environment and Innovation showed a significant negative correlation (r = -0.132, p < 0.05), suggesting that certain external environmental conditions may hinder rather than encourage innovation within SMEs.

Table 2 shows the overall model fit statistics and the regression coefficients. The regression model was statistically significant, indicating that the set of predictors collectively had a meaningful effect on digital transformation adoption. The model explained 16.5% of the variation in digital transformation adoption. At the same time, the adjusted value showed that about 15.0% of the variance remained explained after accounting for the number of predictors included in the model.

Table 2 : *Regression Model Summary and Coefficients*

Model Fit: R = .406, R^2 = .165, Adjusted R^2 = .150, F(4, 232) = 11.429, p < .001					
Predictor	**B**	**SE**	**β**	**t**	**p**
(Constant)	14.204	1.408	—	10.086	< .001
Business Environment	.043	.043	.060	.993	.322
Digital Capabilities	-.087	.040	-.151	-2.153	.032
Innovation	.138	.054	.173	2.574	.011
Digital Tools	.321	.066	.362	4.869	< .001

Among the predictors, Digital Tools emerged as the strongest and most significant factor influencing digital transformation adoption. This indicates that organizations that used digital tools more extensively were more likely to adopt digital transformation practices. Innovation was also found to have a positive and significant effect, suggesting that firms with stronger innovative practices tend to adopt digital transformation more actively.

Digital Capabilities showed a statistically significant but negative relationship with digital transformation adoption. This negative effect is most likely due to suppression effects caused by the strong correlation between Digital Capabilities and Digital Tools, rather than indicating that digital capabilities genuinely reduce adoption. In other words, the overlap between these two variables may have distorted the sign of the coefficient in the regression model. Business Environment was the only predictor that did not have a statistically significant effect. This suggests that external factors, such as market conditions and regulatory influences, do not independently determine the adoption of digital transformation when internal organizational factors are taken into account.

Table 3 presents the results of all four research hypotheses. The findings showed that Hypothesis 4 received the strongest empirical support, indicating that the availability and use of digital tools are the most important determinants of digital transformation adoption among SMEs in Nawalparasi. This means that firms with better access to and utilization of digital tools are more likely to adopt digital transformation practices.

Table 3 : *Hypothesis Testing Summary*

Hypothesis	**β**	**p**	**Decision**
H1: Business environment has a significant positive relationship with digital transformation adoption.	.060	.322	Not Supported
H2: Innovation has a significant positive impact on the adoption of digital transformation.	.173	.011	Supported
H3: Higher digital capabilities are positively associated with digital transformation adoption.	-.151	.032	Not Supported
H4: Digital tools significantly and positively influence digital transformation adoption.	.362	< .001	Supported

Hypothesis 2 was also supported, confirming that innovation orientation has a significant and positive influence on digital transformation adoption. The result suggests that organizations that encourage innovation and new ideas are more likely to engage in digital transformation activities. Hypothesis 1 was not supported because the business environment did not have an independent effect on digital transformation adoption after accounting for internal organizational variables. This implies that external conditions, such as market competition or regulatory factors, may be less influential than internal organizational factors. Hypothesis 3 was also not supported in the expected direction. Although digital capabilities showed a statistically significant relationship with digital transformation adoption, the coefficient was negative rather than positive. This negative relationship is interpreted as a statistical suppression effect caused by overlap with other predictor variables, rather than indicating that digital capabilities actually reduce digital transformation adoption.

5. Discussion

The findings support earlier studies showing that technologies such as cloud computing, CRM systems, e-commerce platforms, and AI applications significantly improve operational efficiency, customer engagement, and organizational performance (Bhuiyan et al., 2024; Philbina et al., 2022). The study confirmed that SMEs with greater access to and use of digital tools were more likely to adopt digital transformation practices. However, although respondents rated IT support quality and tool user-friendliness highly, the use of advanced technologies such as ERP, CRM, and AI systems remained relatively low. This suggests that many SMEs are still limited to basic digitalization rather than comprehensive digital transformation. Consistent with the Technology–Organization–Environment (TOE) framework, the findings indicate that technological resources may exist in principle but are difficult to implement fully due to financial and capability constraints (Tornatzky & Fleischer, 1990; Zhu et al., 2006). Innovation emerged as the second significant predictor of digital transformation adoption. This finding aligns with previous research showing that innovation-oriented organizations are more willing to experiment with and adopt digital technologies (Cannas, 2021; Rogers, 2021). Respondents acknowledged that innovation supports creativity and the development of new products and services. However, innovation's contribution to competitive advantage was rated comparatively lower. This contrasts with findings by Vrontis et al. (2022), who reported that digital innovation often produces visible competitive benefits. The weaker perception of competitive advantage in this study may reflect the early stage of digital transformation among SMEs in Nawalparasi, where innovation benefits are experienced internally but have not yet translated into clear market differentiation. The business environment produced a non-significant result despite being positively perceived by respondents. This finding differs from earlier studies that identified competitive pressure, government incentives, and regulatory frameworks as important drivers of digital adoption (Baker, 2012; Premkumar, 2003). The likely explanation is that SMEs within the district operate under similar environmental and infrastructural conditions, reducing the variability needed for environmental factors to predict adoption. Therefore, internal organizational factors appear to play a more decisive role than external conditions in explaining differences in adoption among firms. Digital capabilities showed a statistically significant but negative relationship with digital transformation adoption. This result contradicts prior studies that identified digital literacy, technical competency, and leadership commitment as essential drivers of digital transformation (Bhuiyan et al., 2024; Scuotto et al., 2017; Vial, 2019). However, the negative coefficient is interpreted as a statistical suppression effect arising from the strong interrelationship between digital capabilities and digital tools, rather than a genuine inhibitory relationship. Despite this statistical issue, the findings revealed substantial capability gaps among SMEs, particularly in strategic planning and employee training.

6. Conclusion

Grounded in the TOE framework, the Technology Acceptance Model, and Innovation Diffusion Theory, the findings demonstrate that digital transformation is driven more by internal organizational dynamics than by external environmental conditions. In particular, digital tools emerged as the strongest predictor of adoption, while innovation orientation also showed a significant positive influence. These findings reinforce the argument

that SMEs adopt digital transformation not simply because technology is available, but because firms possess the willingness and organizational culture needed to integrate technology into business operations. At the same time, the study reveals a critical structural contradiction within the digitalization process. Although SMEs reported strong satisfaction with the outcomes of digital transformation, the organizational foundations needed to sustain it remain weak. Advanced digital technologies such as ERP, CRM, and AI systems were still underutilized, and many firms lacked formal digital strategies and structured employee training programs. This suggests that current digital adoption in Nawalparasi is relatively shallow and operational rather than deeply strategic. The findings, therefore, challenge overly optimistic assumptions that technology adoption alone guarantees transformation success. Instead, they highlight that digital transformation is an ongoing organizational capability-building process rather than a one-time technological shift.

The non-significant effect of the business environment also contributes an important theoretical refinement to existing literature. While prior studies frequently identify regulatory support, infrastructure, and competitive pressure as major drivers of adoption, this study demonstrates that environmental factors may lose explanatory power when firms operate under relatively homogeneous conditions. This suggests that external factors may function more as background enablers than as direct firm-level differentiators in geographically concentrated contexts. Consequently, the study refines the TOE framework by emphasizing that the predictive role of environmental conditions may depend heavily on contextual variability. Another analytically important finding is the negative coefficient for digital capabilities, which is interpreted as a statistical suppression effect rather than a substantive negative relationship. However, beneath this statistical artifact lies a deeper practical issue: SMEs continue to face significant capability deficits in strategic planning, digital literacy, and workforce preparedness. The findings, therefore, expose a "capability–tool paradox," in which firms recognize the value of digital technologies but lack the organizational readiness to exploit them fully. This paradox is particularly characteristic of developing-economy SMEs, where digitalization often advances faster than the development of institutions and human capacity.

Limitations and Directions for Future Research

Like all empirical studies, this research is subject to a number of limitations that should be considered when interpreting its findings and that collectively point toward productive directions for future inquiry. This study adopts a cross-sectional design, meaning data were collected at a single point in time. While this approach is appropriate for identifying patterns and associations, it does not permit causal inference or capture the evolution of digital transformation adoption over time. Future studies should consider longitudinal designs that track SMEs across multiple time periods, enabling researchers to observe whether adoption deepens, stalls, or reverses as organizational conditions and the broader digital ecosystem change.

The geographic scope of this study is limited to Nawalparasi District, a deliberate boundary that allowed for contextual depth but constrains the generalizability of the findings. The non-significance of the business environment as a predictor is itself partly a product of this boundary; within a single district, regulatory, infrastructural, and market conditions are too uniform to generate sufficient variability for predictive analysis. Expanding the sampling frame to include multiple districts or provinces across Nepal, or conducting comparative analyses across districts with varying levels of digital infrastructure, would substantially strengthen the external validity of the findings and enable environmental factors to be more rigorously tested as predictors of adoption.

This study relies exclusively on self-reported perceptual data gathered through a structured questionnaire. While the measurement scales were drawn from validated instruments and Cronbach's Alpha confirmed acceptable reliability across all constructs, self-report data are inherently susceptible to social desirability bias, particularly on questions concerning organizational competence and strategic readiness. Future research would benefit from triangulating survey data with qualitative methods, such as in-depth interviews with SME owners and managers or case-study analyses of firms at different stages of digital adoption, to add interpretive richness and reduce reliance on single-source measures.

Acknowledgement

The author would like to thank the anonymous respondents and the individuals who made this study possible. Their willingness to participate and share their organizational experiences provided the empirical foundation for this research.

Conflict of Interest

The author declares no conflict of interest in the preparation and publication of this article.

References

Adhikari, S. N., & Molla, N. (2024). Navigating the digital shift: Exploring the impact of technology on management practices in small and medium enterprises (SMEs) in Nepal. *Nepalese Journal of Management and Technology*, *2*(2), 91–109. https://doi.org/10.3126/njmt.v2i2.68730

Aervina Misron, A. A., Belhaj, F. A., Saifuddin, S. G., Hashim, S. R., Nordin, J. A., & Bayahya, W. Y. (2025). The role of digital economy engagement in enhancing the performance of local SMEs: An examination of digital adoption and government support. *Journal of Infrastructure, Policy and Development*, *9*(1), 85–94. https://doi.org/10.24294/jipd8545

Amaral, A., & Peçasb, P. (2020). *SMEs and Industry 4.0: Two case studies of digitalization for a smoother integration*. Elsevier. https://doi.org/10.1016/j.compind.2020.10333

Arifia, A. R. (2024). Adoption of digitalization in SMEs using the TOE framework and advanced analyses. *Journal of Economic Business Innovation*, *1*(2), 180–194. https://doi.org/10.69725/jebi.v1i2.174

Baker, J. (2021). The technology–organization–environment framework. *Information Systems Theory*, *1*, 231–245. https://doi.org/10.1007/978-1-4419-6108-2_12

Bhuiyan, M. R., Faraji, M. R., Rashid, M., Bhuyan, M. K., Hossain, R., & Ghose, P. (2024). Digital transformation in SMEs: Emerging technological tools and technologies for enhancing the SME's strategies and outcomes. *Journal of Ecohumanism*, *3*(4), 211–224. https://doi.org/10.62754/joe.v3i4.3594

Cannas, R. (2021). Exploring digital transformation and dynamic capabilities in agrifood SMEs. *Journal of Small Business Management*, *61*(4), 1611–1637. https://doi.org/10.1080/00472778.2020.1844494

Chapagain, B. (2023). *Digital literacy for entrepreneurs was launched to boost international market access and quality for small businesses.* Republica. https://myrepublica.nagariknetwork.com/news/digital-literacy-for-entrepreneurs-launched-to-boost-international-market-access-and-quality-for-small-businesses/

Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly*, *13*(3), 319–340. https://doi.org/10.2307/249008

Ghanim, Y., Labib, S. S., & ElSeddawy, A. B. (2022). Setting a research framework for the role of digital transformation in enabling successful entrepreneurship in Egypt. In *Proceedings of the Federated Africa and Middle East Conference on Software Engineering* (pp. 8–17).https://doi.org/10.1145/3531056.3531069

Ghimire, A., Jaiswal, B., Shrestha, J., Shrestha, K., & Shrestha, S. (2023). COVID-19 and digitization of SMEs: The impact and way forward. *New Perspective: Journal of Business and Economics*, *6*(1), 83–90. https://doi.org/10.3126/npjbe.v6i1.58918

Jiang, J. (2024). A study on the digital transformation trends in financial services. *International Journal of Global Economics and Management*, *3*(1), 355–363. https://doi.org/10.62051/ijgem.v3n1.42

Kahveci, E. (2025). Digital transformation in SMEs: Enablers, interconnections, and a framework for sustainable competitive advantage. *Administrative Sciences, 15*(3), 107. https://doi.org/10.3390/admsci15030107

Khan, M. E., & Siddiqui, M. Z. (2023). Evaluating the impact of digital transformation and innovation management strategies on SMEs' performance in the emerging economies. *Journal of Social Sciences and Development*, *2*(2), 297–305. https://doi.org/10.53664/jssd/02-02-2023-14-297-305

Low, C., Chen, Y., & Wu, M. (2011). Understanding the determinants of cloud computing adoption. *Industrial Management & Data Systems*, *111*(7), 1006–1023. https://doi.org/10.1108/02635571111161262

Matt, C., Hess, T., & Benlian, A. (2015). Digital transformation strategies. *Business & Information Systems Engineering*, *57*(5), 339–343. https://doi.org/10.1007/s12599-015-0401-5

Ministry of Industry, Commerce, and Supplies. (2080/81). *Economic survey*. Government of Nepal.

Morakanyane, R., O'Reilly, P., & McAvoy, J. (2020). Determining digital transformation success factors. *Proceedings of the 53rd Hawaii International Conference on System Sciences*. https://hdl.handle.net/10125/64274

Nambisan, S., Wright, M., & Feldman, M. (2019). The digital transformation of innovation and entrepreneurship: Progress, challenges, and key themes. *Research Policy*, *48*(8), 10–16. https://doi.org/10.1016/j.respol.2019.03.018

OECD. (2021). *The digital transformation of SMEs*. OECD Publishing.https://doi.org/10.1787/bdb9256a-en.

Philbina, S., Viswanathan, R., & Telukdarie, A. (2022). Understanding how digital transformation can enable SMEs to achieve sustainable development: A systematic literature review. *Small Business International Review*, *6*(1), 1–25. https://doi.org/10.26784/sbir.v6i1.473

Pratamansyah, S. R. (2024). Transformasi digital dan pertumbuhan UMKM: Analisis dampak teknologi terhadap kinerja usaha kecil dan menengah di Indonesia. *Jurnal Akuntansi, Manajemen, dan Perencanaan Kebijakan*, *2*(2), 17–23. https://doi.org/10.47134/jampk.v2i2.475

Premkumar, G. (2003). A meta-analysis of research on information technology implementation in small businesses. *Journal of Organizational Computing and Electronic Commerce*, *13*(2), 91–121. https://doi.org/10.1207/S15327744JOCE1302_2

Rahrovani, Y. (2020). Platform drifting: When digitalization of work hijacks its spirit. *The Journal of Strategic Information Systems*, *29*(2), 1–26. https://doi.org/10.1016/j.jsis.2020.101615

Rogers, E. M. (2003). *Diffusion of innovations* (5th ed.). Free Press.

Rogers, E. M. (2021). *Diffusion of innovations* (6th ed.). Simon & Schuster.

Rupeika-Apoga, R., & Bule, K. P. (2022). The effect of digital orientation and digital capability on digital transformation of SMEs during the COVID-19 pandemic. *Journal of Theoretical and Applied Electronic Commerce Research*, *17*(2), 669–685. https://doi.org/10.3390/jtaer17020035

Scuotto, V., Santoro, G., Bresciani, S., & Giudice, M. D. (2017). Shifting intra- and inter-organizational innovation processes towards digital business: An empirical analysis of SMEs. *Creativity and Innovation Management*, *26*(3), 247–255. https://doi.org/10.1111/caim.12221

Teng, X., Wu, Z., & Yang, F. (2022). Research on the relationship between digital transformation and innovation. *Sustainability*, *14*(10), 1–17. https://doi.org/10.3390/su14106012

Tornatzky, L. G., & Fleischer, M. (1990). *The processes of technological innovation*. Lexington Books.

UNCDF. (2023). *Leveraging digital solutions for micro, small, and medium enterprises in Nepal*. UNCDF.

Vial, G. (2019). Understanding digital transformation: A review and a research agenda. *Journal of Strategic Information Systems*, *28*(2), 118–144. https://doi.org/10.1016/j.jsis.2019.01.003

Vrontis, D., Chaudhuri, R., & Chatterjee, S. (2022). Adoption of digital technologies by SMEs for sustainability and value creation: Moderating role of entrepreneurial orientation. *Sustainability*, *14*(13), 1–19. https://doi.org/10.3390/su14137949

World Bank. (2020). *Small and medium enterprises (SMEs) finance*. World Bank. https://www.worldbank.org/ext/en/topic/competitiveness/small-and-medium-enterprises-smes-finance

Yamane, T. (1967). *Statistics: An introductory analysis* (2nd ed.). Harper & Row.

Zhu, K., Kraemer, K. L., & Xu, S. (2006). The process of innovation assimilation by firms in different countries: A technology diffusion perspective on e-business. *Management Science*, *52*(10), 1557–1576. https://doi.org/10.1287/mnsc.1060.0556

Authors' Guidelines

The journal accepts the following manuscript types:

Manuscript Type	Description	Typical Length
Original Research Article	New empirical or theoretical contributions	6,000 – 10,000 words
Review Article	Systematic or narrative review of existing literature	8,000 – 12,000 words
Case Study	In-depth analysis of a real-world case	4,000 – 7,000 words
Short Communication	Brief preliminary findings or rapid reports	2,000 – 4,000 words

Manuscript Preparation

Language

All manuscripts must be written in clear, grammatically correct English (British or American, applied consistently throughout). Authors whose first language is not English are strongly encouraged to have their manuscript proofread by a native English speaker or a professional editing service before submission.

File Format

Submit manuscripts as a Microsoft Word document (.doc or .docx) using the official JIETM Paper Template. Do not submit PDFs as the primary manuscript file.

Page Layout & Formatting

The following formatting specifications must be observed throughout the manuscript:

Element	Specification
Paper Size	A4 (210 × 297 mm)
Margins	1 inch (25.4 mm) on all sides: top, bottom, left, and right
Font (Body)	Times New Roman, 10 pt
Line Spacing	1.15 throughout; 1.5 for the References section
Columns	Single column
Alignment	Justified
Page Numbers	Inserted automatically; do not add manually

Title

Font: Times New Roman, 13 pt, Bold.

Capitalize the first letter of each major word. Articles (a, an, the), conjunctions, and prepositions should be in lowercase unless they begin the title. The title should be concise yet descriptive (typically 12–20 words). Avoid abbreviations, jargon, and formulae in the title.

Author Information

- Author names: Times New Roman, 12 pt. List in the order of contribution.
- Affiliations: Times New Roman, 8 pt, italics include department, institution, city, and country.
- Email addresses: include for all authors; designate one corresponding author with an asterisk (*).

Abstract

The abstract must be a single paragraph of 150–250 words written in Times New Roman, 9 pt. It must be structured using the following labeled components (bold labels, followed by the text in the same paragraph):

Component	What to Include
Background	Context and motivation for the study
Purpose	Specific aim(s) of the paper
Research Methodology	Methods, data sources, and analytical approach
Result	Key findings
Conclusion	Primary conclusion drawn from the results
Implications	Practical or theoretical significance
Originality	What is novel about this contribution

Keywords

Provide 4–8 keywords separated by semicolons (;) immediately after the abstract. Keywords should reflect the paper's core topics and aid discoverability. Avoid keywords that merely repeat words in the title.

Article Structure

Manuscripts should follow the structure below. Section headings must be numbered, bold, and 10 pt. Subsection headings should be numbered (e.g., 1.1, 1.2), bold-italic, and 10 pt.

#	Section	Guidance
1	Introduction	State the research problem, objectives, and significance; outline the paper structure.
2	Review of Literature	Critically synthesize relevant prior work; identify the research gap
3	Research Methodology	Describe design, data collection, instruments, and analytical techniques
4	Results	Present findings objectively using tables/figures where appropriate
5	Discussion	Interpret results in light of existing literature; address the research gap.
6	Conclusion	Summarizes key findings and their broader significance
7	Limitations & Future Directions	Acknowledge constraints and suggest future research avenues
8	Acknowledgement	Thank funders, institutions, and individuals who assisted with the work
9	Conflict of Interest	Declare any financial or non-financial conflicts, or state "None."
10	References	APA 7th edition; 10 pt, 1.5 line spacing
	Appendices (optional)	Supplementary material labeled Appendix A, B, …

Tables

- All tables must be numbered consecutively with Arabic numerals (Table 1, Table 2, …).
- Table titles are placed above the table, centered, Times New Roman 8 pt.
- Leave one blank line between the title and the table body.
- Use only vertical lines to delineate columns; add horizontal rules above and below the table and between the header row and data rows. Avoid heavy or decorative borders.
- Tables must be embedded within the text, positioned as close as possible to their first citation.
- Font size inside tables: 8 pt, Times New Roman.
- Avoid tables that merely replicate information presented in the text.

Figures

- All figures, diagrams, graphs, and sketches must be numbered consecutively with Arabic numerals (Figure 1, Figure 2, …).
- Figure captions are placed below the figure, centered, 8 pt, Times New Roman.
- Line drawings must be of high quality, either produced electronically or scanned at a minimum resolution of 300 dpi. Poor-quality scans will not be accepted.
- Embed figures directly into the manuscript; do not submit them as separate files.
- Ensure all lettering and symbols are legible and explained in the caption or a legend within the figure.
- Position figures at the top or bottom of a page, as close as possible to their first mention in the text.
- Color figures are accepted; ensure they are also interpretable in greyscale.

Equations & Formulae

- Type all equations in Microsoft Word's Equation Editor or MathType.
- Number equations consecutively with Arabic numerals in parentheses, right-aligned (e.g., (1), (2), …), only where equations are explicitly cited in the text.
- Refer to equations in the text as Equation (1), Equation (2), etc.
- Define all symbols and variables immediately following the equation in which they first appear.

References

JIETM uses **APA 7th Edition** for all citations and the reference list. References must be listed at the end of the paper in the order they appear in the text (not alphabetically), formatted in Times New Roman, 10 pt, with 1.5 line spacing.

In-text Citations

- Single author: (Smith, 2020)
- Two authors: (Smith & Jones, 2020)
- Three or more authors: (Smith et al., 2020)
- Direct quotation: include page number (Smith, 2020, p. 45)

Common Reference Formats

Journal article:

Author, A. A., & Author, B. B. (Year). Title of article. Journal Name, Volume(Issue), Page–Page. https://doi.org/xxxxx

Book:

Author, A. A. (Year). Title of work: Capital letter also for subtitle. Publisher.

Book chapter:

Author, A. A. (Year). Title of chapter. In E. E. Editor (Ed.), Title of book (pp. xx–xx). Publisher.

Include a DOI or stable URL for all online sources where available. Personal communications and unpublished data should be cited in the text only and not listed in the reference list.

Ethical Requirements

Originality & Plagiarism

All manuscripts submitted to JIETM must be original and must not have been published, or be under consideration for publication, elsewhere (including conference proceedings, unless substantially revised and extended). Authors are responsible for ensuring their work does not infringe any copyright.

JIETM screens all submissions for plagiarism. A similarity index of more than 15% (excluding references and quotations) will result in immediate rejection or a request for substantial revision.

Authorship

All listed authors must have made a substantial contribution to the conception, design, data collection, analysis, interpretation, or drafting of the manuscript, and must have approved the final version. Honorary or guest authorship is not acceptable.

Data Availability

Authors are encouraged to make the research data underlying their findings available in a recognized public repository. Where data cannot be shared, a brief justification should be included in the manuscript.

Research Involving Human Participants

Studies involving human participants, personal data, or identifiable records must comply with applicable ethical standards (e.g., institutional review board approval). They must include a statement confirming ethical approval and informed consent in the manuscript.

Conflict of Interest

All authors must disclose any financial or personal relationships that might influence the research. If no conflict exists, include the statement: "The authors declare no conflict of interest."

Submission Process

Required Submission Files

- Main manuscript file anonymized, following the JIETM template (.doc or .docx)
- Title page separate file with full author names, affiliations, and contact details
- Cover letter addressed to the Editor-in-Chief; briefly describe the paper's contribution and confirm it has not been submitted elsewhere
- Figures: high-resolution images embedded in the manuscript; provide separate files (TIFF/EPS/PNG, ≥ 300 dpi) if requested
- Ethical approval document (if applicable)

Blind Review Policy

JIETM operates a double-masked peer review process. The main manuscript file must be completely anonymized: remove all author names, affiliations, and any identifying acknowledgments before submission. Author details should appear only on the separate Title Page.

Manuscript Status

Corresponding authors will receive an acknowledgment of receipt within 5 working days. Authors may check the status of their submission by contacting the editorial office. The typical turnaround time from submission to first decision is 6–8 weeks.

Peer Review & Revision

All submissions undergo initial editorial screening for scope and formatting compliance before being sent for peer review. A minimum of two independent experts evaluate manuscripts that pass initial screening. Authors will receive one of the following decisions:

- Accept: manuscript is accepted as submitted (minor copyediting may follow)
- Minor Revision: revisions required; re-review is typically not necessary
- Major Revision: substantial revisions required; revised manuscript will be re-reviewed
- Reject: manuscript does not meet the journal's standards for publication

When submitting a revised manuscript, authors must include a point-by-point Response to Reviewers document detailing how each comment has been addressed (or a justification for not making a requested change).

Proofs & Publication

Upon acceptance, manuscripts are copyedited and typeset by the JIETM production team. PDF proofs will be sent to the corresponding author for review. Authors should check proofs carefully for typographical errors; no substantive changes to the content are permitted at the proof stage. Corrected proofs must be returned within 48 hours.

Accepted articles are published in the earliest available issue of JIETM and assigned a volume, issue number, and page range (e.g., Volume 1, Issue 1, May 2026).

Contact & Further Information

Authors with questions about submission requirements, manuscript status, or editorial policy should contact the editorial office. Please cite your manuscript reference number in all correspondence.

JIETM Editorial Office
Himalayan Whitehouse International College, Putalisadak, Kathmandu
ISSN: (to be assigned upon first issue publication)
Volume 1, Issue 1 · May 2026

Pre-Submission Checklist

- Manuscript uses the official JIETM template (Times New Roman, 10 pt body, 1.15 line spacing)
- Title in 13 pt Bold TNR; author names 12 pt; affiliations 8 pt italics
- Abstract is 150–250 words and includes all seven structured components
- 4–8 keywords provided, separated by semicolons
- Sections numbered and ordered correctly (Introduction → … → References)
- All tables numbered, titled above, 8 pt TNR, embedded in text
- All figures numbered, captioned below, 8 pt TNR, high-resolution, embedded
- Equations typed in Equation Editor, numbered in parentheses where cited
- All references in APA 7th edition format, 10 pt, 1.5 line spacing
- Similarity/plagiarism index below 15%
- Main manuscript file fully anonymized (no author names or affiliations)
- Separate Title Page file prepared with full author details
- Cover letter prepared and addressed to Editor-in-Chief
- Conflict of interest statement included
- Ethical approval statement included (if applicable)

Thank you for contributing to JIETM. We look forward to receiving your submission.

Himalayan Whitehouse Internation College
(Affiliated to Purbanchal University)
Ramshahapath, Putalisadak
Ph: 01-5322718 | 01-5322688
info@whitehousecmt.edu.np/
journal@whitehousecmt.edu.np