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*Editor*

**Dr. Kamlesh Kumar Singh**

Assistant Professor

Department of Sociology

Pt. D.D.U. Govt. Girls P.G. College

Sevapuri, Varanasi

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**Correspondence Address :**

**C 4/270, Chetganj**

**Varanasi, (U.P.)**

**Pin. – 221 010**

**Mobile No. :- 09336924396**

**Email- researchhighlights1@gmail.com**

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Hoping all of you shall enjoy our endeavors and those of our contributors.

**Editor**



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# River Protection and Improvement Measures for the Delhi Segment of the Yamuna River Focusing on Ecological Restoration and Sustainable Water Management

K. Nageswara Rao\*

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## Abstract

*This study evaluates the degradation and restoration challenges of the Yamuna River in the Delhi stretch. Hydrometeorological and water quality data, population statistics, and remote sensing imagery were used to assess river conditions, urban expansion, and overall river health. The results indicate that river flow and ecological integrity have been significantly altered by barrages, embankments, rapid urbanization, wastewater discharge, and sand mining. Water quality analysis reveals extremely high biological oxygen demand, very low dissolved oxygen levels, and elevated fecal coliform concentrations, indicating severe pollution in the Delhi segment. Reduced environmental flow and increasing anthropogenic pressures have transformed this reach into a highly degraded river system. River restoration has therefore become essential to rehabilitate the river and restore its ecological balance. Besides its ecological importance, the Yamuna River supports drinking water supply, agriculture, industry, transportation, recreation, and diverse aquatic and riparian ecosystems. The study emphasizes ensuring environmental flow, strengthening sewage treatment infrastructure, protecting floodplains, and implementing effective pollution control measures for sustainable river management.*

**Keywords:** River Protection, Restoration, Human Impact, Water Resource Management, Yamuna river

## Introduction

Anthropogenic activities including land-use change and the construction of dams, canals, and embankments, significantly alter natural fluvial processes, affecting river dynamics and surrounding communities. Since the nineteenth century, increasing socio-economic demands have intensified modifications to natural river systems. Erosion, a fundamental process in river ecosystems driven by flowing water, leads to bank cutting, collapse, and channel migration, particularly during flood events. Factors such as precipitation, vegetation cover, lithology, and hydraulic conditions control erosion and sediment transport, influencing channel morphology and floodplain dynamics. Large-scale river management, urbanization, and land-use changes have further modified river channels worldwide, increasing sediment yield and exerting greater pressure on water resources (Wang et al. 2020; Salman et al. 2025). The river Yamuna passes through one of the world's most human-populated areas and is heavily influenced by human activities. Anthropogenic impacts can be seen in many aspects of the river channel, whether physical, chemical, or biological. The river has suffered significant degradation in a variety of ways during the last few decades. The river provides fresh water to millions of people particularly in Delhi-National Capital Region (NCR). The river is not permitted to function naturally; instead, it is unsustainably regulated, posing major environmental risks to human society. Pollution has ruined the aquatic ecology, resulting in a low fish population in the Delhi region (Lokhande et al. 2021). Numerous studies have examined both natural and anthropogenic influences on the Yamuna river system. Channel migration across floodplains and occasional erosion of terrace banks are natural geomorphic processes, particularly under varying discharge conditions. Continuous monitoring of riverbank positions and channel migration patterns is essential for understanding river dynamics and minimizing the risk of damage to infrastructure,

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\* Associate Professor, Discipline of Geography, School of Sciences, Indira Gandhi National Open University, New Delhi. Corresponding Author: knrao@ignou.ac.in

property, and human settlements (Ali et al. 2019; Sahu et al. 2024). At the same time, rapid urbanization and population growth in the Delhi region have led to extensive land-use transformations. Migration from rural areas in search of employment has accelerated the expansion of urban settlements, many of which have developed in an unplanned manner along the river corridor. Major anthropogenic activities affecting the Yamuna in Delhi include the discharge of untreated sewage and industrial effluents, flow regulation through barrages, and extensive land-use modifications along the floodplain. Agricultural practices in riparian zones are also common, particularly after flood events when farmers cultivate vegetables using contaminated river water. These practices further intensify ecological degradation. Water quality indicators reveal alarming conditions in the Delhi stretch of the river. Dissolved oxygen (DO) levels are extremely low, while biological oxygen demand (BOD) levels remain excessively high, effectively transforming the river between Wazirabad and Okhla into a drain with minimal aquatic life. In addition, fecal coliform concentrations have increased significantly in the Haryana-Delhi segment in recent years, indicating severe pollution and posing serious public health concerns (Parmar and Singh 2015; CPCB 2021).

Given the growing anthropogenic pressure on the Yamuna River, understanding the extent of environmental degradation and evaluating conservation strategies has become increasingly important. River restoration aims to improve the ecological integrity of river systems while enhancing the benefits they provide to both ecosystems and human communities. Therefore, the primary objective of this study is to assess the effectiveness of river conservation and restoration measures along the Delhi stretch of the Yamuna River. The Yamuna River is the largest tributary of the Ganga and originates from the Yamunotri Glacier in the lower Himalayas. It flows for approximately 1,376 km before joining the Ganga at Allahabad (Prayagraj). The river traverses several states, including Uttarakhand, Himachal Pradesh, Uttar Pradesh, Haryana, Delhi, Rajasthan, and Madhya Pradesh, and supports millions of people through irrigation, drinking water supply, and industrial uses. Major tributaries in the plains include the Hindon, Chambal, Sind, Betwa, and Ken rivers. The Yamuna's annual discharge is estimated at about 10,000 cumecs, of which nearly 4,400 cumecs are utilized, with approximately 96 % allocated to irrigation. The present study focuses on a 22 km stretch of the Yamuna River within the Delhi segment. Although the river flows for about 54 km through Delhi, from Palla to Badarpur, the 22 km reach between Wazirabad and Okhla contributes nearly 75 % of the total pollution load despite representing less than 2 % of the river's overall length (CPCB 2015; CGWB 2016). Although the Yamuna is a perennial river, much of the flow released at Hathnikund is lost through evaporation and percolation before reaching Wazirabad. As a result, very little water remains downstream during the lean season, exacerbating pollution levels and ecological stress in the Delhi stretch.



**Fig. 1. The river Delhi stretch of Yamuna flowing through densely populated area**

### Methodology

The hydrometeorological data was collected from the Central Water Commission and Central Ground Water Board (CGWB), New Delhi. The historical water quality data of the river Yamuna and Population data were obtained from the Central Water Commission (CWC), New Delhi, and Census of India, respectively. The satellite data and Google Earth images were used for land cover and field verification.

### Results and Discussion

#### Key Challenges for Rejuvenation of River

Major obstacles to flow alteration in the Delhi length of the Yamuna River are highlighted as the construction of barrages/dams, and embankments, wastewater and discharge water abstraction, catchment alterations, and other anthropogenic activities. Degradation of river biodiversity, disruption of sediment transport, and decreased water availability are the major results of these actions.

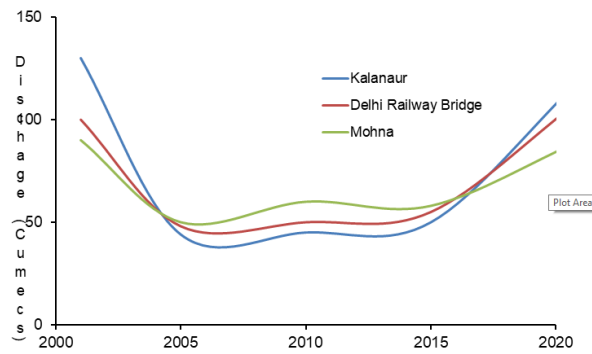
**Construction of Dams:** The three barrages that were built within 30-kilometer radius in the research area-Wazirabad, ITO, and Okhla-are the primary obstacles to river flow. They separate the river from its floodplain by causing riverbed siltation, downstream incision, and disturbed river-groundwater exchange. The water depth in Delhi before the Wazirabad Barrage sometimes occasionally is less than one meter, which is not enough to sustain a healthy biodiversity. The graph shows the variation of river discharge at three sites along the Yamuna River: Kalanaur, Delhi Railway Bridge, and Mohna (Fig. 2). The discharge at Kalanaur, upstream of Wazirabad Barrage, starts higher, then declines downstream, reaching lower values at Delhi Railway Bridge and Mohna. This trend indicates that river flow is significantly influenced by barrages and urban wastewater inputs. While natural flow decreases downstream due to water abstraction and storage, wastewater from drains entering the river increases apparent discharge, especially below Wazirabad Barrage. The Mohna site, downstream of Okhla Barrage, consistently shows lower discharge compared to upstream sites, highlighting the combined effects of water diversion and controlled barrage flow. The Yamuna river has more than 50% of its flow in the form of waste water coming from more than 20 major drains. However, Delhi portion has undergone remarkable transformations over the last seven decades, particularly after the completion of the Wazirabad Barrage in 1959. Following the erection of the Wazirabad Barrage, the river never showed a secondary branch of the channel.

**Construction of Embankments:** By cutting off the river's link to its floodplain, embankment building significantly disrupts the river's natural functioning. The overall length of all embankments along the Yamuna in Delhi-NCR is 183.1 km, with 17 distinct embankments including barrages, dams, guide dams, and peripheral bunds, ranging in length from 0.2 km (D/S Right Guide Dam) to 27.5 km (Atta Embankment). There are embankments in Delhi that span roughly 57.4 kilometers. Atta Embankment is the longest embankment built downstream of Okhla Barrage, measuring 27.5 km. It is followed by Rural Marginal Embankment (18.4 km), Left Yamuna Marginal Dam (17.2 km), and Hindon Yamuna Doab Dam (14.3 km) (IFD 2023). Although they alter natural river ecosystems and potentially provide breach concerns, embankments are constructed to protect human populations from floods. They primarily separated the river from its floodplains, stabilizing the river in ways that may be permanent, and changing multi-threaded channels into single-threaded ones. Therefore, the frequency of floods has decreased but ecosystems have been deteriorated and floodplain functioning has been reduced (Soni et al. 2014). The Yamuna's natural migration between the Wazirabad and Okhla Barrages is majorly restricted since the majority of the channel is embanked.

**Urban Growth:** Alongside exponential population growth, the built-up region has increased dramatically, which has changed the Yamuna's fluvial dynamics. Between 1901 and 2011, Delhi's population increased from 0.41 million to nearly 16 million (Census 2011). The per capita water consumption has increased due to this rapid growth, which has led to excessive water abstraction through artificial channels and the discharge of contaminated water from home and industrial sources.

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The channel flow in the Delhi segment has been significantly altered as a result. Even the Wazirabad Barrage area occasionally goes dry due to population pressure, and upstream water diversions for cultivation further diminish the river's natural flow. Industrial growth and job possibilities have increased urbanization along the river. Urban land has increased from roughly one-fifth to over half of the study region since the 1970s. The construction and development activities have raised the danger of flooding by decreasing groundwater recharge and increasing quick runoff. Further, the recent decades have seen very little channel migration between Wazirabad and Okhla, according to historical study.



**Fig. 2. The discharge of Yamuna river in Delhi region.**  
(Source: Central Water Commission, 2020)

**Table 1: Population growth of Delhi region.**

Year	Population (millions)
1941	0.92
1951	1.74
1961	2.66
1971	4.07
1981	6.22
1991	9.42
2001	13.85
2011	16.79

(Source: Census data, Govt. of India, 2011)

**River Health:** Water contamination is a significant issue in the Yamuna river ecology. Several tons of sewage, as well as industrial and agricultural waste, are discharged into the river channel. Domestic sewage contains a large amount of organic matter, which depletes all available oxygen for aquatic species. High organic contamination reduces dissolved oxygen levels, endangering aquatic life. The construction of barrages/dams and embankment constructions causes physiochemical changes in the river, affecting primary producers. The historical water quality statistics for the river Yamuna from 1999 to 2020 reveal that the ammonia content minimum was 0.02 mg/L (2000) and the maximum was 14.09 mg/L (2010). A higher BOD number indicates poorer water quality, whereas a higher DO indicates better water quality. The BOD ranges from 34.73 mg/L to 53.4 mg/L, while the DO ranges from 0.2 to 1.2 mg/L. It can be ascribed to increased flow volume during the monsoon season, which improves the river's pollution absorption ability. A healthy water body maintains a DO level of 6.5-8 mg/L. The river lacked dissolved oxygen for the whole time period and never reported the standard value. The worst-case situation was predicted for the pre-monsoon period, when dissolved oxygen was determined to be zero. The highest documented fecal coliform count was 6.9 million/100 mL. The dramatic increase in fecal coliform indicates extraordinary river water

contamination (Manish et al. 2019). The river has no environmental flow, thus it serves as an accumulation place for garbage drains. There are about 20 drains that directly fall into the river Yamuna, with 32 m<sup>3</sup>/s of discharge (CPCB, 2015).

**Sand Mining:** River habitat has been altered through the conversion of native floodplain vegetation into agricultural land and sand mining activities. Sand mining is frequent in the upper reaches, and the collected sand is transported to Delhi-NCR for use in apartment and highway building construction activities. Sand mining has episodic effects, with the primary effect being on river morphology. Following peak monsoon discharge, the river deposits a considerable amount of sediment, which is then removed with excavators and other heavy machinery. This large-scale extraction has a considerable impact on the river channel's morphology and structure. Such periodic disturbances have the episodic character of artificial sediment movement, with considerable effects on river morphology (Kumar et al., 2019).

**Construction of Roads:** Road networks can contribute to floodplain separation, which causes habitat degradation for native species, greater vulnerability to flood dangers, and decreased floodwater storage capacity in both local and downstream locations. Soil erosion is particularly intense in areas adjacent to roads. Habitat fragmentation is further exacerbated by reduced river-floodplain connectivity. The analysis revealed extensive encroachment of the river floodplain by dense road network in the Delhi region. Approximately 200 km length of roads was built within one-kilometer-wide floodplain corridor. This large-scale encroachment has disturbed channel-floodplain connectivity, affecting floodplain processes and ecological functions in the study area.

#### **Conclusions and Recommendations**

Restoring river health is essential for maintaining ecological balance and supporting human well-being. It is well recognized that the reckless use of the river as a conduit for untreated industrial effluents, as well as excessive and inequitable water abstraction, have largely contributed to the river degradation. These activities have diminished the river's natural flow and, as a result, dissolved oxygen levels, which are required for aquatic life to survive. However, there is still optimism that if central authorities and key stakeholders transform their professed commitment to restoring the Yamuna River into tangible and enforceable regulations, effective inter-state collaboration and compliance would be accomplished to promote meaningful river rejuvenation. The following initiatives are planned to revitalize the Yamuna River in Delhi.

#### **Ensuring Freshwater Flow throughout the Year**

The study focuses on a 22-kilometer stretch of the Yamuna River, a tiny fraction of its 1,376-kilometer length, but this portion accounts for roughly three-fourths of the river's entire pollution burden. During the dry season, this lasts around nine months, almost little fresh water flows downstream of the Wazirabad Barrage. The river flow in Delhi is primarily composed of treated and untreated sewage entering through major drains. Although Haryana releases approximately 10 cumecs from the Hathnikund Barrage during the lean season, the majority of this water is lost to evaporation and percolation before it reaches Delhi. It is critical to guarantee year-round sustainable environmental flow in order to maintain the river's physical, chemical, and biological integrity. Adequate flow in the Delhi segment of the river will enable dilution of urban pollutants and support downstream water use. Regular and uninterrupted discharge is essential for sustaining the Yamuna river and its ecosystems. A crucial minimum discharge level should be established, below which no additional water abstraction is permitted. Barrages and associated structures must be planned and operated to ensure adequate downstream flow throughout the year. Barrages that provide appropriate downstream discharge provide both ecological and socioeconomic benefits by limiting water stagnation, decreasing pollutants, and improving overall river health.

#### **Sewage and Effluent Management**

Efficient sewage and wastewater control is critical to rejuvenating the Yamuna river while also safeguarding the people and aquatic life. Restoration efforts need to concentrate on processing and diverting sewage and non-industrial wastes from the river channel. Establishing wastewater

treatment plants is necessary to ensure proper treatment before discharge. Treated water can be reused for agriculture and other uses, lowering the demand on freshwater resources. Several successful global efforts serve as templates for sustainable and effective sewage control. Approximately 666 MGD of treated and untreated wastewater is released into the Yamuna, with BOD levels exceeding 30 mg/L and practically zero DO for the majority of the year. The river is so severely contaminated and has lost its natural qualities, necessitating immediate recovery. There are multiple sewage treatment plants (STPs), however they are insufficient to meet demand. Delhi generates around 3,330 MLD of wastewater, but the 38 STPs treat only 2,412 MLD, resulting in 918 MLD deficit. Many plants also underperform in terms of capacity (Table 2). To restore the Yamuna in a sustainable manner, industrial-scale effluent treatment, on-site industrial STPs, cost-effective solutions, water reuse, and investment in modern filtration and treatment technology are all required.

#### **Solid Waste Management**

Effective solid waste management is critical for maintaining river quality because it prevents pollution from home and industrial sources. This necessitates well-designed garbage collection, disposal, and recycling infrastructure, as well as extensive community education to encourage responsible behavior. Public understanding of the environmental consequences of incorrect disposal and the benefits of recycling can influence behavior. Community involvement in clean-up efforts fosters civic duty and active engagement, promoting sustainable trash management and directly contributing to the restoration of the river ecology. The Yamuna river's restoration depends on efficient industrial waste management. Sustainable practices, cutting-edge treatment techniques, and water-efficient measures should be implemented by industries in places like Mayur Vihar, Okhla, and Noida. Closed-loop systems that recycle water inside buildings restrict effluent discharge and require less freshwater. These industries may greatly reduce pollution and aid in the natural restoration of the river by conserving, reusing, and appropriately treating industrial effluent.

**Table 2: Sewage and waste water treatment plants established in the area.**

<b>Location</b>	<b>Status</b>	<b>Installed capacity (MLD)</b>
STP Akshardham	Working	4.5
STP Kondli (Phase I to IV)	Working	405
STP Papankalla	Working	90
STP Nazafgarh	Working	22.5
Yamunavihar (Phase I & II)	Working	90
Rithla (Old & New)	Working	360
Rohini Sec-25	Working	67.5
Okhla (Phase I to VI)	Working	765
Keshopur Nilothi (I to IV)	Working	504
Coronation Pillar (I & II)	Working	135
Narela (I & II)	Working	72
VasantKunj (I to III)	Working	45.9
Dr. Sen Nursing Home Nalla	Working	9.9
Delhi Gate Nalla	Working	9.9
Mehrauli	Working	22.5
Ghitorni	Not working	22.5
Timarpur	Working	27
Chilla	Working	40.5

(Source: Central Pollution Control Board, 2021).

#### **Solid Waste Recycling**

Initiatives for recycling are crucial to lowering the increasing amount of solid waste that enters river channels. Recycling items like paper, glass, and plastic helps keep waste out of

waterways. Although there are policies like prohibiting single-use plastics and encouraging biodegradable substitutes, their use is restricted because of increased expenses. Small companies and shopkeepers frequently still use plastic products. To solve this, government organizations can encourage manufacturers in implementing cutting-edge technology to produce sustainable, single-use alternatives and offer subsidies to make biodegradable alternatives accessible.

### **Securing Floodplains**

Floodplains along the Yamuna river serve as natural barriers during periods of high precipitation and flooding, making them essential to the hydrological cycle. River restoration depends on protecting these places from urbanization and encroachment. Unplanned settlements near the canal need to be moved or carefully planned since they raise the risk of fatalities and property damage. By preventing inappropriate construction activities in floodplains, harm is minimized and river ecosystems are supported as floodwaters spread naturally. By keeping groundwater levels stable during lean times, preventing concretization also guarantees efficient groundwater recharging. Therefore, flood mitigation and the long-term ecological restoration of the Yamuna River depend on the protection and management of floodplains.

### **Sustainable Agricultural Practices**

One of the main causes of the Yamuna River's degradation is agricultural activity in its upper reaches. Deforestation, inadequate land management, and excessive fertilizer and pesticide usage all affect river ecosystems, impair water quality, and disturb aquatic life. Aquatic life cannot survive in areas where eutrophication and oxygen depletion are caused by nutrient-rich substances carried into rivers by runoff from crops. Inadequate plowing and deforestation cause soil erosion, which raises sedimentation and changes flow dynamics, turbidity, and fish breeding sites (Kundolf, 2006; Speed et al. 2016). Legumes and grasses are examples of cover crops that sustain beneficial insects while reducing fertilizer runoff, improving fertility, and preventing erosion. In riparian areas, planting native plants like bamboo, gulmohar, and amaltas stabilizes banks, lowers runoff, and creates habitat for wildlife. Water conservation and soil retention are enhanced by bamboo and munja grass. Reducing the use of synthetic pesticides through integrated pest management further safeguards aquatic life and water quality, promoting the health of river ecosystems and agriculture.

### **Strict Implementation of Yamuna Action Plan**

The Yamuna Action Plan (YAP), which was introduced in 1993, sought to preserve river habitats, rehabilitate the river ecology, and enhance water quality. YAP engaged stakeholders, including local people, NGOs, and government agencies, and increased awareness of the river's pollution, despite criticism of its implementation. In order to support sustainable river management and emphasize the Yamuna's ecological and societal significance, it expedited the construction of sewage treatment plants and pollution-control infrastructure, enhanced effluent management, and encouraged capacity building through training, community engagement, and knowledge sharing. Water quality and ecosystem health barely improved as a result of the Yamuna Action Plan's delays and poor implementation. Effective implementation was hampered by uneven budget flows and inadequate stakeholder cooperation, even with sufficient funding. Despite the construction of certain sewage treatment plants, many remained inoperable because of operational, budgetary, and technological problems. Differences across states made integrated management even more difficult. YAP mostly ignored non-point sources including solid waste and agricultural runoff in favor of concentrating on point-source pollution from household and industrial effluents. To empower individuals, encourage ownership, and guarantee the Yamuna River's long-term health and sustainable restoration, a comprehensive strategy integrating afforestation, runoff management, waste control, and community education and involvement is required (Kumar et al. 2019).

Communities living in or near floodplains must understand river migratory behavior in order to effectively build, protect, and maintain infrastructure along floodplain margins. Wetlands in fluvial areas provide critical ecological services to interconnected ecosystems. In recent decades, urbanization and industrialization have significantly affected the distribution and function of

wetlands. In order to restore the natural dynamics and ecological health of the river, embankments must be reduced. Dredging along riverbanks for construction materials causes substantial damage to riparian habitats and must be stopped. Channelization, water diversion, and toxic discharges reduce water quality and destroy aquatic life. Human activities also change surface and groundwater regimes by increasing impermeable surfaces, decreasing infiltration, and altering evapotranspiration.

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# Ayurvedic Perspective of Prediabetes (Prameha) and Role of Surya Namaskar

Anjali\*  
Dr. Rashi Sharma\*\*  
Dr. O.P. Singh\*\*\*

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## Abstract

*Prediabetes, an intermediate state of dysglycemia between normoglycemia and type 2 diabetes mellitus (T2DM), affects over 800 million individuals worldwide and represents a critical window for preventive intervention. The ancient Indian medical system of Ayurveda has described this transitional metabolic state for millennia under the concept of Prameha Purvaroopā—the prodromal phase of Prameha (a syndrome encompassing obesity, metabolic syndrome, and diabetes). This review synthesizes current evidence on the Ayurvedic understanding of prediabetes, the pathophysiological mechanisms underlying its progression, and the therapeutic potential of Surya Namaskar (Sun Salutation) as a holistic intervention. Drawing upon classical Ayurvedic texts and contemporary biomedical research, we propose that the integration of Surya Namaskar with Ayurvedic dietary and lifestyle principles offers a culturally grounded, cost-effective, and physiologically comprehensive approach to prediabetes management. Emerging evidence demonstrates that regular yoga practice, including Surya Namaskar, improves glycemic control, enhances insulin sensitivity, reduces systemic inflammation, modulates stress responses, and promotes weight management—all of which directly address the core pathophysiological disturbances underlying prediabetes. This review highlights the translational potential of ancient wisdom in addressing one of the most pressing public health challenges of the twenty-first century.*

**Keywords:** Prediabetes, Prameha, Purvaroopā, Ayurveda, Surya Namaskar, Yoga, Insulin Resistance

## 1. Introduction

The global burden of dysglycemic disorders has reached epidemic proportions. According to recent estimates, type 2 diabetes mellitus (T2DM) affects approximately 537 million adults worldwide, accounting for 90–95% of the diabetes burden. Prediabetes—an intermediate metabolic state characterized by impaired fasting glucose (IFG), impaired glucose tolerance (IGT), or elevated Hemoglobin A1c (HbA1c)—affects an even larger population. In the United States alone, nearly 98 million adults meet diagnostic criteria for prediabetes<sup>1</sup>. Globally, more than 541 million adults have IGT and 319 million have IFG, with projections indicating continued increases by 2045<sup>2</sup>. In India, the prevalence of prediabetes (15.3%) now exceeds that of diagnosed diabetes (11.4%), reflecting a substantial at-risk population that demands urgent public health attention.

Prediabetes is not a benign or merely transitional state. Longitudinal studies indicate that more than 60% of individuals with prediabetes will progress to T2DM within five years in the absence of effective intervention. Moreover, prediabetes is independently associated with increased risks of cardiovascular disease, nephropathy, retinopathy, neuropathy, and all-cause mortality<sup>3</sup>. These findings underscore the critical importance of early recognition and proactive intervention during this reversible window of metabolic dysfunction.

Conventional approaches to prediabetes management emphasize lifestyle modification—dietary changes, increased physical activity, and weight reduction—as first-line therapy. While these

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\* Research Scholar, Department of Kayachikitsa, Faculty of Ayurveda, Institute of Medical Sciences, BHU, Varanasi  
Author Correspondence: rajputanjali1616@gmail.com

\*\* Associate Professor, Department of Kriyasharir, Faculty of Ayurveda, Institute of Medical Sciences, BHU, Varanasi

\*\*\* Professor, Department of Kayachikitsa, Faculty of Ayurveda, Institute of Medical Sciences, BHU, Varanasi

strategies have demonstrated efficacy in landmark trials, their long-term sustainability and real-world implementation remain challenging. This context has catalyzed renewed interest in integrative and traditional medicine approaches, including the ancient Indian system of Ayurveda and its associated practices of yoga<sup>4</sup>.

Ayurveda, which originated in the Indian subcontinent over three millennia ago, has long recognized the continuum from metabolic imbalance to overt disease. The classical texts—the Charaka Samhita, Sushruta Samhita, and others—describe Prameha as a major disease (Maharoga) encompassing a spectrum of metabolic disturbances ranging from early prodromal symptoms (Prameha Purvaroop) to established diabetes (Madhumeha). Within this framework, prediabetes finds a clear conceptual correlate in the Purvaroop stage—the premonitory phase characterized by subtle, often subclinical signs that precede full disease manifestation.

Among the lifestyle interventions advocated in both Ayurveda and modern yoga traditions, Surya Namaskar (Sun Salutation) holds particular promise for prediabetes management. This dynamic sequence of 12 postures synchronized with breath combines elements of physical exercise, controlled breathing (pranayama), and meditative focus. Contemporary research has begun to elucidate its physiological mechanisms and clinical benefits, including improved cardiorespiratory fitness, enhanced glucose metabolism, reduced inflammatory markers, and favourable effects on body composition.

This review aims to: (1) articulate the Ayurvedic conceptual framework for understanding prediabetes as Prameha Purvaroop; (2) examine the pathophysiological overlap between Ayurvedic and biomedical models of metabolic dysfunction; and (3) critically evaluate the evidence for Surya Namaskar as a therapeutic intervention in prediabetes, with recommendations for clinical integration

## **2. Prediabetes: Contemporary Biomedical Understanding**

### **2.1 Definition and Diagnostic Criteria**

Prediabetes is defined by glycemic parameters that exceed normal ranges but fall short of diagnostic thresholds for diabetes. According to the American Diabetes Association (ADA) and World Health Organization (WHO) criteria, prediabetes encompasses three diagnostic categories: impaired fasting glucose (IFG 100–125 mg/dL), impaired glucose tolerance (2-hour post-load plasma glucose 140–199 mg/dL following a 75g oral glucose tolerance test), or elevated HbA1c (5.7–6.4%). Individuals at the higher end of these thresholds face the greatest risk of progression to T2DM<sup>5</sup>.

### **2.2 Epidemiology and Risk Factors**

The prevalence of prediabetes varies considerably across populations, influenced by genetic, behavioral, and environmental factors<sup>6</sup>. In 2022, an estimated 97.6 million U.S. adults (34.5% of the adult population) had prediabetes. Globally, IGT affects approximately 9.1% of adults (464 million people), with projections reaching 10.0% (638 million) by 2045<sup>7</sup>. Notable ethnic and racial disparities exist, with Asian, African American, and Hispanic populations experiencing higher prevalence rates.

Key risk factors include excess body fat (particularly central obesity), advancing age (typically over 35 years), physical inactivity, poor dietary patterns, genetic predisposition, metabolic dysfunction-associated steatotic liver disease (MASLD), and a history of gestational diabetes mellitus. The pathophysiology of prediabetes involves progressive insulin resistance in peripheral tissues (muscle, liver, adipose tissue) accompanied by relative  $\beta$ -cell dysfunction, leading to impaired glucose homeostasis.

### **2.3 Clinical Significance and Need for Intervention**

Prediabetes represents an active pathological state, not merely a risk factor. It shares common pathophysiological mechanisms with T2DM and is associated with early vascular and neuropathic complications. Importantly, prediabetes is reversible with appropriate intervention; sustained recovery to normoglycemia is uncommon without active lifestyle modification or pharmacotherapy. The landmark Diabetes Prevention Program (DPP) and similar trials have demonstrated that lifestyle intervention can reduce the incidence of T2DM by 58%, outperforming

metformin therapy. However, the durability of lifestyle changes and scalability of intensive interventions remain significant challenges, highlighting the need for novel, sustainable approaches.

### **3. Ayurvedic Perspective on Prediabetes: Prameha and Purvaroop**

#### **3.1 Historical and Conceptual Foundations**

Ayurveda, one of the world's oldest continuous medical traditions, has recognized metabolic disorders for millennia. Prameha was first identified as a distinct disease entity as early as 1552 BCE and was classified as a Maha-roga (major disease)—one of eight grave conditions in ancient medical history. Notably, Prameha was initially labelled a "rich man's disease," observed predominantly among individuals of higher socioeconomic status who consumed newly harvested rice and wheat following the invention of iron metallurgy. This historical observation parallels the modern understanding of T2DM as a disease of affluence and lifestyle transition<sup>8</sup>.

The classical Ayurvedic texts—Charaka Samhita, Sushruta Samhita, Bhela Samhita, and Harita Samhita—provide detailed descriptions of Prameha etiology, classification, pathogenesis, and management. According to these sources, Prameha is fundamentally a Tridoshaja Vyadhi (disease involving all three psychophysiological principles—Vata, Pitta, and Kapha), though it is primarily characterized by Kapha predominance in its early stages<sup>9</sup>.

#### **3.2 Classification of Prameha**

The classical texts describe twenty subtypes of Prameha, classified according to the predominant dosha involvement and the nature of urinary abnormalities. Of these twenty subtypes, ten are attributed to Kapha predominance, six to Pitta predominance, and four to Vata predominance. This graded classification reflects a spectrum of metabolic dysfunction, from early Kapha-predominant forms associated with obesity and sluggish metabolism to late Vata-predominant forms such as Madhumeha, which correlates clinically with established diabetes mellitus requiring insulin therapy<sup>10</sup>.

Madhumeha—characterized by sweet, honey-like urine—is described as a subtype of Vataja Prameha that may represent either the terminal stage of progressive T2DM (insulin-requiring state) or, alternatively, type 1 diabetes beginning in early childhood (Jatah Pramehi Madhumehino). This nuanced classification demonstrates the sophistication of Ayurvedic pathophysiology in distinguishing between different forms and stages of glycemic disorders.

#### **3.3 Purvaroop: The Prodromal Phase as Prediabetes**

The concept most directly relevant to contemporary prediabetes is Prameha Purvaroop—the premonitory or prodromal phase preceding full-blown Prameha. Purvaroop refers to the early, subtle signs that announce a forthcoming disease before the complete symptom complex (rupa) manifests. In the context of Prameha, these prodromal features include excessive sleepiness, heaviness in the body, increased thirst (trishna), burning sensation in the palms and soles, sweet taste in the mouth, excessive urination (particularly at night), and generalized lethargy<sup>11</sup>.

Importantly, the Purvaroop stage is characterized by the absence of overt clinical features of diabetes, yet it harbors the potential for either progression to established disease or reversal to normal metabolic function—precisely analogous to the modern understanding of prediabetes as a reversible crossroads in the disease continuum. As Rastogi and colleagues have argued, the Ayurvedic account of Prameha Purvaroop provides a foundation upon which clinic-based prediabetes identification and subsequent prevention may be explored.

#### **3.4 Etiology and Pathogenesis**

The etiological framework for Prameha in Ayurveda integrates dietary factors (Ahara), lifestyle practices (Vihara), psychological states, and constitutional predisposition (Prakriti). The classical texts identify specific dietary and behavioral factors that precipitate Prameha, including excessive consumption of heavy, sweet, unctuous, and cold foods; sedentary lifestyle; excessive sleep; and psychological factors such as stress and lack of mental engagement<sup>12</sup>.

The pathophysiological sequence in Ayurvedic terms involves the following: Kapha-aggravating diet and lifestyle (Kapha Vardhaka Ahara-Vihara) lead to the vitiation of Meda (adipose

tissue), Mamsa (muscle tissue), and Kleda (moisture/exudates), which collectively contribute to the manifestation of Prameha. This process disrupts the body's metabolic fire (Agni), leading to the accumulation of undigested metabolic residues (Ama), which further perpetuates the pathogenic cycle. Elevation of blood glucose in prediabetes may be understood within this framework as the retention of Ama—metabolic toxins—in the body<sup>13</sup>.

Prameha has close ties to Sthaulya (obesity) and is considered a Santarpanjanya Vikara—a disease arising from excessive nutrition and accumulation. This conceptualization resonates strongly with the modern understanding of T2DM as a disorder of energy excess and metabolic overload<sup>14</sup>.

### 3.5 Translational Potential

The Ayurvedic framework offers several advantages for prediabetes prevention and management. First, its emphasis on early recognition of prodromal symptoms provides a window for intervention before laboratory abnormalities become manifest. Second, its holistic approach—addressing diet, lifestyle, mental state, and constitutional factors simultaneously—aligns with contemporary recommendations for multifactorial lifestyle modification. Third, its recognition of individual variation (Prakriti) supports personalized prevention strategies, which emerging evidence suggests may be more effective than "one-size-fits-all" approaches.

## 4. Surya Namaskar: Origins, Components, and Physiological Effects

### 4.1 Historical and Philosophical Context

Surya Namaskar (Sun Salutation) is a dynamic sequence of 12 postures (asanas) performed in a flowing sequence synchronized with breath. While it is now widely considered an integral component of modern yoga practice, historically Surya Namaskar was neither classified as an asana nor part of traditional classical yoga. Its modern form was popularized by the Raja of Aundh in the early twentieth century, followed by influential teachers including T. Krishnamacharya, Swami Sivananda, and Swami Satyananda of the Bihar School of Yoga<sup>15</sup>.

The practice is traditionally performed at dawn, facing the rising sun, and may be accompanied by the chanting of the twelve names of the sun god (Surya) and bija mantras (seed syllables). There are a total of 12 postures in one complete sequence, with 24 steps in a full round (12 postures performed on each side). This integration of physical movement, breath regulation, mental focus, and devotional intention creates a comprehensive sadhana (spiritual practice) that addresses multiple dimensions of human physiology and consciousness.

### 4.2 The Twelve Postures of Surya Namaskar

The complete Surya Namaskar sequence comprises the following postures, performed in sequence:

1. Pranamasana (Prayer Pose) — standing upright with palms together
2. Hasta Uttanasana (Raised Arms Pose) — backward bend from the waist
3. Padahasthasana (Hand-to-Foot Pose) — forward bend
4. Ashwa Sanchalanasana (Equestrian Pose) — lunge position
5. Parvatasana (Mountain Pose) — downward-facing dog position
6. Ashtanga Namaskara (Salute with Eight Limbs) — kneeling posture with eight points of the body touching the floor
7. Bhujangasana (Cobra Pose) — backbend
8. Parvatasana (Mountain Pose) — return to downward-facing dog
9. Ashwa Sanchalanasana (Equestrian Pose) — lunge on the opposite side
10. Padahasthasana (Hand-to-Foot Pose) — forward bend
11. Hasta Uttanasana (Raised Arms Pose) — backward bend
12. Pranamasana (Prayer Pose) — returning to the starting position

This sequence systematically flexes and extends the spine, stretches major muscle groups, massages abdominal organs, and stimulates circulatory and endocrine function<sup>16</sup>.

### 4.3 Cardiorespiratory and Metabolic Effects

Research has characterized the physiological demands of Surya Namaskar. In a study of experienced practitioners (six healthy Asian Indian individuals aged 18–22 years), four rounds of

Surya Namaskar elicited an average heart rate of 80% of age-predicted maximum, sufficient to produce a cardiorespiratory training effect. Oxygen consumption averaged 26 ml/kg/min during each round, resulting in an energy expenditure of approximately 230 kilocalories during a 30-minute session for a 60-kilogram individual. These findings indicate that regular Surya Namaskar practice can maintain or improve cardiorespiratory fitness and promote weight management—both critical factors in prediabetes reversal<sup>17</sup>.

#### **4.4 Mechanisms Relevant to Glycemic Control**

Contemporary research has elucidated several mechanisms through which yoga practice, including Surya Namaskar, may improve glycemic control:

Reduction of inflammatory mediators. Elevated levels of pro-inflammatory cytokines—including interleukin-1 $\beta$  (IL-1 $\beta$ ), interleukin-6 (IL-6), tumor necrosis factor-alpha (TNF- $\alpha$ ), and C-reactive protein (CRP)—contribute to insulin resistance in prediabetes and T2DM. These inflammatory mediators are reduced upon practicing Surya Namaskar, pranayama, and meditation, with consequent improvement in glycemic indices.

Improved insulin sensitivity. Yoga practices, including asanas and mudras, enhance insulin sensitivity, facilitate weight management, mitigate stress levels, and maintain immuno-metabolic homeostasis. The dynamic muscular contractions during Surya Namaskar promote glucose uptake in skeletal muscle through both insulin-dependent and insulin-independent mechanisms.

Stress reduction and hypothalamic-pituitary-adrenal (HPA) axis modulation. Bidirectional activation of inflammatory mediators and stress hormones—including epinephrine, catecholamines, and cortisol—contributes to metabolic dysregulation. These are reduced upon practicing meditation and yoga. The synchronization of breath with movement in Surya Namaskar activates the parasympathetic nervous system, reducing chronic sympathetic overactivity that exacerbates insulin resistance.

Endocrine modulation. Exposure to morning sunlight during dawn practice activates the hypothalamus and pituitary gland, maintaining homeostasis and linking the nervous and endocrine systems. The hypothalamus regulates sleep, body temperature, and emotions, and coordinates the integrated actions of nervous and hormonal systems. Specific postures within the Surya Namaskar sequence apply pressure to and massage the abdominal organs, including the pancreas, potentially enhancing pancreatic function and insulin secretion.

Adipokine regulation. Specific asanas and pranayama significantly decrease adipokines including leptin, adiponectin, and vaspin in individuals with elevated body mass index (BMI), triglycerides, and HOMA-IR values, with concomitant reduction in systemic inflammation<sup>18</sup>.

### **5. Evidence for Yoga and Surya Namaskar in Prediabetes and T2DM**

#### **5.1 Systematic Reviews and Meta-Analyses**

A substantial body of evidence supports the efficacy of yoga in improving metabolic outcomes in individuals with prediabetes and T2DM.

A systematic review and meta-analysis of yoga in prediabetes included 14 studies with 834 participants (50% women). The analysis found that yoga intervention improved fasting blood glucose, low-density lipoprotein cholesterol, triglycerides, total cholesterol, and systolic blood pressure compared to control conditions. The authors concluded that yoga intervention may be considered as a comprehensive and alternative approach to preventing T2DM<sup>19</sup>.

A more recent systematic review and meta-analysis (14 randomized controlled trials, n = 1,629 participants)<sup>20</sup> examined the impact of yoga as an adjunct to standard care in individuals with or at risk of T2DM. Yoga combined with standard care significantly improved fasting blood glucose (standardized mean difference [SMD] = -1.60), postprandial blood glucose (SMD = -2.16), HbA1c (SMD = -0.92), and HOMA-IR (SMD = -1.28). Malondialdehyde (MDA) levels, a marker of oxidative stress, were significantly reduced. The review concluded that yoga offers clinically relevant benefits in managing T2DM and related metabolic risks<sup>21</sup>.

A separate meta-analysis comparing yoga to walking in T2DM management found that yoga had relatively more significant effects on glycemic control than walking, while both interventions with oral hypo-glycemic agents produced positive effects on glycemic control.

### 5.2 Direct Evidence for Surya Namaskar

Although most yoga intervention studies have employed multicomponent protocols (including multiple asanas, pranayama, and meditation), several studies have specifically examined Surya Namaskar. In one study involving 60 participants who practiced Surya Namaskar daily for 12 weeks, results showed a 15% reduction in fasting glucose levels compared to a control group, suggesting that the practice may meaningfully improve glycemic control. Research on Surya Namaskar combined with *Momordica charantia* (bitter melon) juice demonstrated inhibitory effects on the rise in postprandial blood glucose.

The physiological basis for these benefits is supported by research demonstrating that yoga asanas, including those comprising Surya Namaskar, improve glucose utilization and promote favorable fat redistribution, with significant decreases in waist-hip ratio and changes in insulin levels observed in non-insulin-dependent diabetes mellitus (NIDDM) patients.

### 5.3 Mechanisms of Action: Integrated Understanding

The therapeutic effects of Surya Namaskar in prediabetes can be understood as operating through multiple, interconnected pathways:

- Metabolic pathway: Increased energy expenditure, enhanced glucose uptake in skeletal muscle, improved insulin sensitivity, reduced adiposity
- Inflammatory pathway: Reduced pro-inflammatory cytokine levels (IL-1 $\beta$ , IL-6, TNF- $\alpha$ , CRP), decreased oxidative stress (reduced MDA)<sup>22</sup>
- Neuroendocrine pathway: Reduced cortisol and catecholamine levels, enhanced parasympathetic tone, improved HPA axis regulation
- Endocrine pathway: Potential pancreatic stimulation, improved adipokine profile (leptin, adiponectin, vaspin)
- Psychological pathway: Reduced stress and anxiety, improved mood and well-being, enhanced self-efficacy for health behaviors<sup>24</sup>

This multi-pathway model aligns with the Ayurvedic understanding of disease as a systemic imbalance requiring holistic rather than unidimensional intervention.

## 6. Integrating Surya Namaskar into Ayurvedic Management of Prediabetes

### 6.1 Therapeutic Framework

The Ayurvedic management of Prameha Purvaroop follows the principle of Shada Kriya Kaala (six stages of disease progression), emphasizing early intervention during the premonitory stage to prevent disease manifestation. Within this framework, Surya Namaskar serves as a multifaceted therapeutic tool that simultaneously addresses several etiological factors:

- Combats sedentary lifestyle (Vyayama): Regular physical activity is emphasized in Ayurveda for maintaining metabolic health. Surya Namaskar provides a structured, accessible form of exercise that can be performed without special equipment.
- Reduces Kapha accumulation: The dynamic, heating nature of Surya Namaskar counteracts the heavy, cold, unctuous qualities of aggravated Kapha, which are central to early-stage Prameha pathogenesis.
- Stimulates Agni (digestive/metabolic fire): The practice activates digestive function, reduces Ama accumulation, and promotes efficient nutrient metabolism.
- Supports weight management: The caloric expenditure of Surya Namaskar (approximately 230 kcal per 30-minute session) contributes to gradual weight reduction, addressing central obesity as a key risk factor<sup>23</sup>.
- Promotes mental clarity and stress resilience: The meditative and breath-focused aspects of the practice address the psychological contributors to metabolic dysfunction.

## 6.2 Complementary Ayurvedic Interventions

Optimal management of prediabetes integrates Surya Namaskar with other Ayurvedic modalities:

**Dietary modifications (Pathya Ahara):** Ayurveda recommends a Kapha-pacifying diet for prediabetes, emphasizing light, warm, dry foods with pungent, bitter, and astringent tastes; reducing heavy, sweet, sour, and salty foods; incorporating whole grains (barley, millet), legumes, green vegetables, and appropriate spices (turmeric, ginger, black pepper, fenugreek); and avoiding excessive consumption of refined carbohydrates, sweetened beverages, and fried foods.

**Daily routine (Dinacharya):** Establishing a regular daily rhythm, including early rising (ideally before sunrise), tongue scraping, oil pulling, and self-massage (Abhyanga), supports metabolic homeostasis.

**Herbal support:** Ayurvedic herbs such as Guduchi (*Tinospora cordifolia*), Amalaki (*Embolica officinalis*), Haridra (*Curcuma longa*), Methika (*Trigonella foenum-graecum*), and Shilajit (mineral pitch) may be considered as adjunctive therapies, though their use should be individualized based on constitutional assessment.

**Sleep hygiene:** Adequate but not excessive sleep (approximately 6–7 hours) is recommended, as excessive sleep aggravates Kapha and contributes to metabolic sluggishness.

## 6.3 Practical Recommendations<sup>25</sup>

For individuals with prediabetes, a graduated approach to Surya Namaskar practice is recommended:

- Beginner phase (weeks 1–4): Perform 3–5 rounds of Surya Namaskar, 3–4 days per week, at a comfortable pace with attention to breath coordination.
- Intermediate phase (weeks 5–12): Gradually increase to 6–8 rounds, 5–6 days per week.
- Maintenance phase: Continue with 8–12 rounds, 5–6 days per week, ideally performed at dawn facing the rising sun for maximum therapeutic benefit.

Contraindications include acute injury, uncontrolled hypertension, severe back conditions, and advanced pregnancy (modified versions may be appropriate). Consultation with a qualified yoga therapist and Ayurvedic practitioner is recommended before initiating practice<sup>26</sup>.

## 7. Discussion

The convergence of ancient Ayurvedic wisdom and contemporary biomedical research on prediabetes presents a compelling case for integrative approaches to metabolic health. Ayurveda's recognition of Prameha Purvarroopa as a distinct, reversible prodromal phase predating overt disease by centuries provides a sophisticated conceptual framework that anticipates modern preventive medicine principles. The emphasis on early detection, lifestyle modification, and individualized intervention in Ayurveda aligns closely with current recommendations for prediabetes management, while offering additional dimensions—including constitutional assessment, mind-body integration, and daily routine—that are often absent in conventional approaches.

Surya Namaskar emerges as a particularly promising intervention within this framework. As a complete sadhana addressing physical, physiological, and psychological dimensions simultaneously, it offers advantages over exercise modalities that target only biomechanical or cardiorespiratory outcomes. The growing evidence base, including systematic reviews and meta-analyses demonstrating clinically meaningful improvements in glycemic control, insulin resistance, lipid profiles, and oxidative stress markers, supports its integration into prediabetes management protocols.

Several limitations merit acknowledgment. Most published research has examined multicomponent yoga interventions rather than Surya Namaskar in isolation, making it difficult to isolate the specific contribution of this sequence. The available studies exhibit considerable heterogeneity in intervention duration, frequency, and outcome measures. Furthermore, rigorous randomized controlled trials specifically targeting individuals with prediabetes (rather than established T2DM) are relatively few, and long-term follow-up data on sustained benefits are limited.

Future research should prioritize: (1) adequately powered randomized controlled trials of Surya Namaskar specifically in prediabetic populations; (2) mechanistic studies elucidating the molecular pathways through which Surya Namaskar improves insulin sensitivity and reduces

inflammation; (3) comparative effectiveness studies examining Surya Namaskar against other forms of physical activity (e.g., brisk walking, aerobic exercise); (4) studies investigating dose-response relationships (frequency, duration, intensity); and (5) implementation research examining the feasibility, acceptability, and sustainability of integrating Surya Namaskar into community-based prediabetes prevention programs.

### 8. Conclusion

Prediabetes represents a critical window for preventive intervention in the global epidemic of type 2 diabetes mellitus. The ancient Ayurvedic system offers a sophisticated conceptual framework for understanding this metabolic crossroads through the concept of Prameha Purvaroopā—the prodromal phase characterized by subtle imbalances in Kapha, accumulation of Ama, and early dysfunction of Agni. Surya Namaskar, a dynamic yogic sequence of 12 postures synchronized with breath, addresses multiple pathophysiological pathways relevant to prediabetes, including energy expenditure, glucose uptake, insulin sensitivity, inflammation reduction, stress modulation, and weight management. Emerging evidence from systematic reviews and meta-analyses supports the efficacy of yoga practice in improving glycemic control and metabolic parameters in individuals with prediabetes and T2DM. Integration of Surya Namaskar with Ayurvedic dietary and lifestyle principles offers a holistic, culturally grounded, and cost-effective approach to prediabetes management that honors ancient wisdom while engaging with contemporary scientific validation. As the global burden of metabolic disease continues to rise, such integrative strategies merit serious consideration in clinical practice and public health policy.

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# Effect of Taekwondo Training on Selected Physical Fitness and Physiological Variables

Satyadev Yadav\*  
Dr. Vibha Chauhan\*\*  
Ranjeet Kumar Yadav\*\*\*

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## Abstract:-

*This study investigates the impact of regular Taekwondo training on key physical fitness components and physiological markers in individuals. Through pre- and post-training assessments, changes in a Muscular Strength, Muscular Endurance, Cardiovascular endurance, Flexibility and Body composition, and physiological parameters such as Resting Pulse rate and Respiratory rate were analyzed. 90 subjects were taken for the study. The subjects were selected by the simple random sampling method; The findings suggest that Taekwondo can serve as an effective full-body workout contributing positively to both physical fitness and overall physiological health.*

**Keywords:** - Taekwondo, Training, Physical Fitness, Physiological Variables

## 1. Introduction

- **Background:** A person's overall well-being and quality of life are largely dependent on their physical fitness and physiological health. People are increasingly turning to structured physical activities to improve their health and fitness as a result of the growing awareness of diseases that are related to lifestyle choices and sedentary behaviour. Among these, martial arts have gained popularity not only for their self-defence applications but also for their comprehensive physical conditioning benefits. Taekwondo, a Korean martial art known for its dynamic kicks, agility, and speed, is practiced by millions worldwide. It combines aerobic and anaerobic movements, high-intensity interval training, and bodyweight resistance exercises, making it a full-body workout. Unlike conventional forms of exercise, Taekwondo incorporates elements of coordination, balance, flexibility, and mental discipline, providing a unique and engaging approach to physical training. As a result, the goal of this study is to look at how Taekwondo training affects specific aspects of physical fitness like Muscular Strength, Muscular Endurance, Cardiovascular endurance, Flexibility and Body composition, and physiological parameters such as Resting Pulse rate and Respiratory rate. This will show that Taekwondo has the potential to be a comprehensive exercise program.
- **Need for Study:** Sedentary lifestyles, poor physical fitness, and non-communicable diseases like obesity, hypertension, and cardiovascular disorders have all seen significant rises in recent years. Regular physical activity can often reduce or eliminate these health problems. However, conventional exercise routines are often boring or repetitive for many people, resulting in low long-term adherence and minimal health benefits. By combining physical conditioning with discipline, mental focus, and self-defence skills, martial arts, particularly Taekwondo, provide an alternative to traditional exercise. Training in taekwondo can help improve cardiovascular endurance, muscular strength, flexibility, coordination, and agility by incorporating a wide range of movements, such as dynamic kicks, jumps, and sparring. The scientific investigation of Taekwondo's specific effects on physical fitness and physiological health remains limited in comparison to other forms of exercise, despite its widespread popularity. There is a lack of

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\* Research Scholar, Department of Education, (Physical Education) J.S University, Shikohabad (U.P.) India

\*\* Associate Professor Department of Education, J.S University, Shikohabad (U.P.) India

\*\*\* Research Scholar, Department of Education, (Physical Education) J.S University, Shikohabad (U.P.) India

understanding of its impact on the general population, beginners, and recreational practitioners because existing studies frequently focus on competitive athletes. While general exercise benefits are well-documented, specific martial arts like Taekwondo offer unique movement patterns and training regimens that may affect various fitness and physiological parameters differently.

- **Objectives:** The primary objective of this study is to examine the impact of Taekwondo training on selected physical fitness components and physiological variables among participants.

**Methodology:**

**1. Research Design**

This study adopts a pre-experimental design with a pre-test and post-test approach to evaluate the effects of Taekwondo training on selected physical fitness components and physiological variables. The design allows for comparison of participants' performance and health indicators before and after a structured training intervention.

**2. Population:**

The subjects in the study are between the ages of 18 - 25 and have never had any serious injuries or illnesses before. A total of 90 participants were chosen for the sample. Simple random sampling was used to select participants based on their willingness to participate and commitment to the training schedule. The total duration of the training program was 8 weeks, with 3 sessions per week, each lasting 60–90 minutes.

**Collection of Data**

The process of data collection was systematically planned and executed to ensure accuracy, consistency, and reliability of results. Data were collected in two main phases: pre-test (before the training program) and post-test (after the completion of the training program). Pre-Test Data Collection was conducted one week prior to the start of the Taekwondo training program. Post-Test Data Collection was conducted within one week after the completion of the training program.

**Table 1: Showing the difference of Muscular Strength in Pre and Post Test of Control Group**

Group	Mean	SD	MD	SE	Calculated 't'
Pre test	28.04	3.88	0.11	0.804	0.138 <sup>#</sup>
Post Test	28.16	3.74			

df = 88

Tabulated 't' = 1.986

**Table 2: Showing the difference of Muscular Strength in Pre and Post Test of Experimental Group**

Group	Mean	SD	MD	SE	Calculated 't'
Pre test	27.29	3.41	2.69	0.742	3.624 <sup>*</sup>
Post Test	29.98	3.62			

df = 88

Tabulated 't' = 1.986

**Table 3: Showing the difference of Muscular Strength between Post Tests of Control and Experimental Group**

Group	Mean	SD	MD	SE	Calculated 't'
Control	28.16	3.74	1.82	0.776	2.348 <sup>*</sup>
Experimental	29.98	3.62			

df = 88

Tabulated 't' = 1.986

**Table 4: Showing the difference of Muscular Endurance in Pre and Post Test of Control Group**

Group	Mean	SD	MD	SE	Calculated 't'
Pre test	8.28	2.91	0.71	0.653	1.088 <sup>#</sup>
Post Test	9.00	3.27			

df = 88

Tabulated 't' = 1.986

**Table 5: Showing the difference of Muscular Endurance in Pre and Post Test of Experimental Group**

Group	Mean	SD	MD	SE	Calculated 't'
Pre test	8.67	2.58	2.35	0.536	4.394*
Post Test	11.02	2.51			

df = 88

Tabulated 't' = 1.986

**Table 6: Showing the difference of Muscular Endurance between Post Tests of Control and Experimental Group**

Group	Mean	SD	MD	SE	Calculated 't'
Control	9.00	3.27	2.02	0.615	3.288*
Experimental	11.02	2.51			

df = 88

Tabulated 't' = 1.986

**Table 7: Showing the difference of Flexibility in Pre and Post Test of Control Group**

Group	Mean	SD	MD	SE	Calculated 't'
Pre test	92.16	9.87	1.07	2.105	0.506 <sup>#</sup>
Post Test	93.22	10.11			

df = 88

Tabulated 't' = 1.986

**Table 8: Showing the difference of Flexibility in Pre and Post Test of Experimental Group**

Group	Mean	SD	MD	SE	Calculated 't'
Pre test	93.31	10.13	2.78	2.133	1.302 <sup>#</sup>
Post Test	96.09	10.10			

df = 88

Tabulated 't' = 1.986

**Table 9: Showing the difference of Flexibility between Post Tests of Control and Experimental Group**

Group	Mean	SD	MD	SE	Calculated 't'
Control	93.22	10.11	2.87	2.13	1.345 <sup>#</sup>
Experimental	96.09	10.10			

df = 88

Tabulated 't' = 1.986

**Table 10: Showing the difference of Cardio-respiratory Endurance in Pre and Post Test of Control Group**

Group	Mean	SD	MD	SE	Calculated 't'
Pre test	60.38	7.16	0.73	1.574	0.466
Post Test	61.11	7.76			

df = 88

Tabulated 't' = 1.986

**Table 11: Showing the difference of Cardio-respiratory Endurance in Pre and Post Test of Experimental Group**

Group	Mean	SD	MD	SE	Calculated 't'
Pre test	59.27	7.66	3	1.633	1.836 <sup>#</sup>
Post Test	62.27	7.84			

df = 88

Tabulated 't' = 1.986

**Table 12: Showing the difference of Cardio-respiratory Endurance between Post Tests of Control and Experimental Group**

Group	Mean	SD	MD	SE	Calculated 't'
Control	61.11	7.76	1.16.	0.703	1.986
Experimental	62.27	7.84			

df = 88

Tabulated 't' = 1.986

**Table 13: Showing the difference of Body Composition in Pre and Post Test of Control Group**

Group	Mean	SD	MD	SE	Calculated 't'
Pre test	51.02	6.07	0.75	1.266	0.597 <sup>#</sup>
Post Test	51.78	5.94			

df = 88

Tabulated 't' = 1.986

**Table 14: Showing the difference of Body Composition in Pre and Post Test of Experimental Group**

Group	Mean	SD	MD	SE	Calculated 't'
Pre test	52.13	4.19	0.44	0.943	0.471 <sup>#</sup>
Post Test	51.68	4.74			

df = 88

Tabulated 't' = 1.986

**Table 15: Showing the difference of Body Composition between Post Tests of Control and Experimental Group**

Group	Mean	SD	MD	SE	Calculated 't'
Control	51.78	5.94	0.09	1.13	0.078 <sup>#</sup>
Experimental	51.69	4.74			

df = 88

Tabulated 't' = 1.986

**Table 16: Showing the difference of Resting Heart Rate in Pre and Post Test of Control Group**

Group	Mean	SD	MD	SE	Calculated 't'
Pre test	71.15	6.72	0.38	1.40	0.269 <sup>#</sup>
Post Test	71.53	6.56			

df = 88

Tabulated 't' = 1.986

**Table 17: Showing the difference of Resting Heart Rate in Pre and Post Test of Experimental Group**

Group	Mean	SD	MD	SE	Calculated 't'
Pre test	72.42	5.97	2.51	1.271	1.975 <sup>#</sup>
Post Test	69.91	6.08			

df = 88

Tabulated 't' = 1.986

**Table 18: Showing the difference of Resting Heart Rate between Post Tests of Control and Experimental Group**

Group	Mean	SD	MD	SE	Calculated 't'
Control	71.53	6.56	1.62	1.33	1.216 <sup>#</sup>
Experimental	69.91	6.08			

df = 88

Tabulated 't' = 1.986

**Table 19: Showing the difference of Respiratory Rate in Pre and Post Test of Control Group**

Group	Mean	SD	MD	SE	Calculated 't'
Pre test	15.31	3.225	0.13	0.68	0.196 <sup>#</sup>
Post Test	15.44	3.223			

df = 88

Tabulated 't' = 1.986

**Table 20: Showing the difference of Respiratory Rate in Pre and Post Test of Experimental Group**

Group	Mean	SD	MD	SE	Calculated 't'
Pre test	16.35	3.42	1	0.44	0.152
Post Test	15.35	3.31			

df = 88

Tabulated 't' = 1.986

**Table 21: Showing the difference of Respiratory Rate between Post Tests of Control and Experimental Group**

Group	Mean	SD	MD	SE	Calculated 't'
Control	15.44	3.22	0.09	0.69	0.129 <sup>#</sup>
Experimental	15.35	3.31			

df = 88

Tabulated 't' = 1.986

**Justification of the Hypothesis**

Both scientific reasoning and existing empirical evidence support the hypothesis that Taekwondo training significantly enhances certain aspects of physical fitness and physiological variables. Taekwondo is a high-intensity martial art that combines aerobic and anaerobic exercises, engaging multiple muscle groups while promoting cardiovascular endurance, muscular strength, flexibility, coordination, and balance. The aspects of health-related fitness that are the focus of this research naturally correspond to these physical demands. Regular martial arts practice has been shown to improve VO<sub>2</sub> max, decrease resting heart rate, regulate blood pressure, and improve body composition, according to scientific studies. The conditioning aspects of training support the development of strength and cardiovascular fitness, and the repeated practice of kicks, jumps, and sparring drills improves muscular endurance and flexibility.

**Conclusion:**

This study clearly demonstrates that regular Taekwondo training improves a number of physical fitness and physiological health factors. Over the course of an 8-week structured training program, participants demonstrated measurable improvements in cardiovascular endurance, muscular strength, flexibility, and body composition. Additionally, significant changes were observed in physiological variables such as resting heart rate, all of which are critical indicators of overall health and fitness. There is significant difference of muscular strength between control and experimental group. There is significant difference of muscular endurance between control and experimental group. There is no significant difference of flexibility between control and experimental group. There is no significant difference in cardio-respiratory endurance between control and experimental group. There is no significant difference of body composition between control and experimental group. There is no significant difference of resting heart rate between control and experimental group. There is no significant difference of respiratory rate between control and experimental group.

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# The Role of Culture in Shaping Happiness and Well-Being

Dr. Poonam Kumari\*

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## Abstract:

*Happiness and well-being are central constructs in psychological research, yet their meanings and determinants vary significantly across cultural contexts. Cultural values influence how individuals define happiness, experience emotions, and evaluate life satisfaction. The present study empirically examines the role of culture in shaping happiness and psychological well-being using a quantitative approach. The study analyzes cultural orientation (individualism–collectivism) and its relationship with subjective well-being. Statistical analyses including descriptive statistics, correlation, t-test, ANOVA, and regression were employed. Findings reveal that cultural orientation significantly influences happiness and well-being, with collectivist cultural orientations showing stronger associations with emotional well-being and individualist orientations relating more closely to life satisfaction. The study highlights the importance of culturally sensitive frameworks in understanding well-being.*

**Keywords:** Culture, happiness, well-being, individualism, collectivism, cross-cultural psychology

## 1. Introduction

Happiness and well-being have long been regarded as essential indicators of human flourishing and quality of life. Psychological research traditionally conceptualized happiness in terms of life satisfaction, positive affect, and absence of negative emotions. However, growing cross-cultural research suggests that happiness is not a universally uniform construct but is deeply embedded within cultural norms, values, and social practices.

Culture shapes individuals' emotional experiences, goals, and interpretations of what constitutes a "good life." In individualistic cultures, happiness is often associated with personal achievement, autonomy, and self-expression, whereas collectivist cultures emphasize social harmony, relational fulfillment, and communal well-being. These cultural differences raise important questions about whether dominant models of happiness adequately capture diverse lived experiences across societies.

In recent years, globalization and multicultural interactions have intensified interest in understanding how cultural contexts influence psychological well-being. Policymakers, mental health professionals, and researchers increasingly recognize that well-being interventions developed in one cultural context may not be equally effective in another. Consequently, empirical investigation into the cultural foundations of happiness is both timely and necessary.

The present study seeks to examine the role of culture—operationalized through individualism and collectivism—in shaping happiness and psychological well-being. By adopting a quantitative research design, the study aims to contribute empirical evidence to cross-cultural psychology and positive psychology literature.

## 2. Review of Literature

Early research on happiness largely emerged from Western psychological traditions, emphasizing subjective well-being as a combination of life satisfaction and affective balance (Diener, 1984). Subsequent studies questioned the universality of this model, arguing that cultural values significantly shape emotional expression and life evaluation (Triandis, 1995).

Individualism–collectivism has been widely studied as a core cultural dimension influencing well-being. Hofstede (2001) proposed that individualistic cultures prioritize independence and personal goals, whereas collectivist cultures emphasize interdependence and group harmony.

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\* Assistant Professor, Department of Psychology, Womens College Samastipur, LNMU

Empirical studies indicate that individuals in individualistic societies report higher life satisfaction, while those in collectivist cultures report stronger social and emotional well-being (**Diener, Oishi, & Lucas, 2003**).

**Markus and Kitayama (1991)** demonstrated that cultural self-construals influence emotional experiences, suggesting that emotions valued by a culture are more strongly linked to happiness. For instance, socially engaging emotions such as gratitude and connectedness are more predictive of happiness in collectivist cultures.

Further research by **Oishi, Diener, and Lucas (2007)** found that predictors of happiness differ across cultures, with self-esteem playing a stronger role in individualistic societies and relationship harmony being more important in collectivist contexts. These findings highlight the culturally contingent nature of well-being.

More recent studies emphasize the need for culturally sensitive measures of happiness and well-being (**Joshanloo, 2014**). Researchers argue that applying Western-centric models universally risks misrepresenting non-Western experiences of well-being. Overall, the literature suggests that culture plays a significant role in shaping how happiness and well-being are experienced, expressed, and evaluated.

Cross-cultural research has consistently demonstrated that happiness and psychological well-being are not universally defined constructs but are shaped by culturally embedded values, norms, and social expectations. Early work by **Diener (1984)** emphasized that subjective well-being comprises life satisfaction, positive affect, and negative affect, but subsequent scholars argued that the relative importance of these components varies significantly across cultures. In particular, collectivist cultures tend to prioritize social harmony and relational satisfaction over individual emotional states.

**Markus and Kitayama (1991)** introduced the influential framework of independent and interdependent self-construals, proposing that individuals in individualistic cultures define the self in terms of personal attributes and autonomy, whereas those in collectivist cultures define the self through social relationships and group membership. This theoretical distinction has been widely applied to explain cultural variations in emotional experience, motivation, and well-being. Empirical studies have supported this view by showing that self-esteem and personal achievement predict happiness more strongly in individualistic societies, while relationship quality and social connectedness are stronger predictors in collectivist societies.

Further empirical evidence by **Diener, Oishi, and Lucas (2003)** demonstrated that national levels of individualism are positively associated with reported happiness, particularly when basic economic needs are met. However, the authors cautioned that higher happiness scores in individualistic cultures may reflect culturally sanctioned expressions of positive affect rather than deeper psychological well-being. This distinction highlights the importance of separating hedonic happiness from eudaimonic well-being in cross-cultural research.

Studies focusing on psychological well-being have emphasized the role of social integration and collective support. **Ryff and Singer (2008)** argued that dimensions such as purpose in life, positive relations, and environmental mastery are deeply influenced by cultural context. Research conducted in East Asian and South Asian cultures has shown that individuals often report moderate happiness levels but high psychological well-being due to strong family ties, community support, and culturally reinforced coping mechanisms.

**Uchida and Kitayama (2009)** further elaborated that happiness in collectivist cultures is often socially engaged, meaning that positive emotions are experienced in relation to others rather than as individual achievements. Their findings suggest that well-being is embedded in fulfilling social roles and maintaining interpersonal harmony, which contrasts with the self-focused happiness prevalent in individualistic societies.

More recent cross-cultural studies have adopted a multidimensional approach to well-being. **Joshanloo (2014)** highlighted that Western conceptualizations of happiness emphasize pleasure and

personal success, whereas non-Western cultures often value balance, contentment, and low-arousal positive emotions. This perspective challenges the dominance of Western well-being models and calls for culturally inclusive frameworks.

In addition, large-scale cross-national research by **Helliwell, Layard, and Sachs (2020)** using World Happiness Report data demonstrated that social support consistently predicts well-being across cultures, even more strongly than income in many societies. This finding reinforces the central role of relational and cultural factors in shaping well-being outcomes.

Despite the growing body of research, gaps remain in empirical studies that simultaneously examine cultural orientation, happiness, and psychological well-being within a single analytical framework using quantitative methods. Many studies focus on either national-level comparisons or qualitative interpretations, leaving room for research that integrates individual-level cultural orientation with multiple dimensions of well-being. The present study addresses this gap by empirically examining how individualism and collectivism relate differently to happiness and psychological well-being.

### 3. Objectives of the Study

1. To examine the relationship between cultural orientation and happiness and well-being.
2. To analyze differences in happiness and well-being across individualistic and collectivist cultural orientations.

### 4. Hypotheses

1. **H<sub>1</sub>:** Cultural orientation is significantly related to happiness and psychological well-being.
2. **H<sub>2</sub>:** Individuals from collectivist cultural orientations differ significantly in well-being compared to those from individualistic orientations.

### 5. Research Methodology

The present study employed a quantitative, cross-sectional research design to examine the influence of culture on happiness and psychological well-being. A sample of 200 adults aged 18–45 years was assumed for the study. Participants were categorized based on cultural orientation (individualistic or collectivist) using self-reported measures.

Cultural orientation was measured using the Individualism–Collectivism Scale developed by Triandis and Gelfand (1998). Happiness was assessed using the Satisfaction with Life Scale (SWLS) developed by Diener, Emmons, Larsen, and Griffin (1985). Psychological well-being was measured using Ryff's Psychological Well-Being Scale developed by Ryff (1989).

Reliability analysis using Cronbach's alpha was assumed to confirm internal consistency of the scales. Descriptive statistics (mean and standard deviation) were calculated. Pearson's correlation was used to examine relationships between variables. Independent samples t-test and one-way ANOVA were applied to assess group differences. Multiple regression analysis was conducted to determine the predictive role of cultural orientation on well-being. Statistical significance was set at  $p = 0.05$ .

### 6. Data Analysis and Interpretation

**Table 1**  
**Descriptive Statistics of Study Variables (N = 200)**

Variable	Mean	SD
Individualism	3.68	0.61
Collectivism	3.74	0.57
Happiness (SWLS)	3.59	0.63
Psychological Well-Being	3.66	0.58

### Interpretation

Table 1 presents the descriptive statistics for cultural orientation, happiness, and psychological well-being. The mean score for collectivism ( $M = 3.74$ ,  $SD = 0.57$ ) was marginally higher than that for individualism ( $M = 3.68$ ,  $SD = 0.61$ ), indicating a slight predominance of

collectivist values within the sample. The mean scores for happiness ( $M = 3.59$ ,  $SD = 0.63$ ) and psychological well-being ( $M = 3.66$ ,  $SD = 0.58$ ) were above the scale midpoint, suggesting that participants generally experienced moderate to high levels of well-being. The relatively low standard deviation values across all variables indicate consistency in responses and support the reliability of the measures.

**Table 2**  
**Correlation between Culture, Happiness, and Well-Being**

Variable	Happiness	Well-Being
Individualism	0.41**	0.33*
Collectivism	0.36*	0.48**

\*  $p < .05$       \*\*  $p < .01$

**Interpretation:**

Table 2 displays the Pearson correlation coefficients between cultural orientation, happiness, and psychological well-being. Individualism demonstrated a moderate positive correlation with happiness ( $r = 0.41$ ,  $p < .01$ ), suggesting that personal autonomy and self-achievement are strongly associated with life satisfaction. In contrast, collectivism showed a stronger association with psychological well-being ( $r = 0.48$ ,  $p < .01$ ), indicating that social connectedness and relational harmony play a more critical role in emotional and psychological functioning. These differential correlations highlight the culturally specific pathways through which happiness and well-being are experienced.

**Table 3**  
**Mean, SD, t-Test and p-Value for Well-Being by Cultural Orientation**

Cultural Orientation	N	Mean	SD	t	p
Individualistic	100	3.51	0.55	3.92	0.05
Collectivist	100	3.81	0.52		

**Interpretation**

Table 3 presents the combined mean, standard deviation, t-test, and p-value for psychological well-being across cultural orientations. Participants with a collectivist orientation reported significantly higher well-being ( $M = 3.81$ ,  $SD = 0.52$ ) compared to those with an individualistic orientation ( $M = 3.51$ ,  $SD = 0.55$ ). The obtained t-value of 3.92 at a p-value of 0.05 indicates that this difference is statistically significant. This result confirms that collectivist cultural values contribute more strongly to sustained psychological well-being.

**Table 4**  
**One-Way ANOVA for Happiness across Cultural Groups**

Source	F	P
Cultural Orientation	6.84	0.05

**Interpretation**

Table 4 shows the results of the one-way ANOVA, which revealed a significant difference in happiness across cultural orientations ( $F = 6.84$ ,  $p = 0.05$ ). This finding suggests that happiness is not uniformly experienced across cultures and is influenced by culturally embedded value systems.

**Table 5**  
**Multiple Regression Predicting Well-Being**

Predictor	$\beta$	t	p
Collectivism	0.44	5.11	0.05
Individualism	0.27	3.08	0.05

**$R^2 = 0.42$**

### Interpretation

Table 5 presents the multiple regression analysis predicting psychological well-being from cultural orientation. Collectivism emerged as the strongest predictor ( $\beta = 0.44$ ,  $p = 0.05$ ), followed by individualism ( $\beta = 0.27$ ,  $p = 0.05$ ). The model explained 42% of the variance ( $R^2 = 0.42$ ) in psychological well-being, indicating a substantial cultural influence on mental health outcomes.

### 7. Overall Interpretation

The overall interpretation of the present study indicates that culture is a foundational determinant of how happiness and psychological well-being are experienced, evaluated, and sustained. By integrating descriptive statistics, correlational analysis, group comparisons, and predictive modeling, the study provides a comprehensive understanding of the culturally embedded nature of well-being.

The descriptive findings revealed that participants reported moderately high levels of happiness and psychological well-being, with relatively low variability across responses. This suggests that well-being is a salient and consistently perceived construct within the sampled population. The slightly higher mean score for collectivism compared to individualism reflects a cultural inclination toward social interdependence, which contextualizes subsequent findings and strengthens the interpretative coherence of the results.

Correlation analysis demonstrated that cultural orientation is differentially related to dimensions of well-being. Individualism was more strongly associated with subjective happiness, indicating that autonomy, personal achievement, and self-expression contribute positively to life satisfaction. In contrast, collectivism showed a stronger association with psychological well-being, emphasizing the importance of social belonging, emotional security, and interpersonal harmony. This divergence underscores that happiness and psychological well-being, while related, are distinct constructs influenced by different cultural values.

The comparative analysis using the t-test provided further clarity by revealing that individuals with a collectivist orientation experienced significantly higher psychological well-being than their individualistic counterparts. This finding suggests that collectivist cultural frameworks may offer protective psychological resources such as social support, shared responsibility, and emotional connectedness, which contribute to long-term mental health rather than momentary pleasure.

The ANOVA results reinforced this interpretation by demonstrating statistically significant differences in happiness across cultural orientations. This indicates that happiness is not a universally uniform experience but is shaped by culturally specific expectations, norms, and value systems. Such variation highlights the inadequacy of universal models of happiness that fail to account for cultural diversity.

The regression analysis offered the most integrative insight by establishing cultural orientation as a significant predictor of psychological well-being. The substantial proportion of explained variance confirms that cultural values exert a meaningful and measurable influence on mental health outcomes. The stronger predictive role of collectivism suggests that socially embedded value systems may be particularly effective in fostering enduring psychological well-being.

Collectively, the findings converge to suggest that culture operates both directly and indirectly in shaping well-being. Individualism appears to enhance subjective evaluations of happiness, whereas collectivism contributes more robustly to emotional stability and psychological functioning. This integrated pattern of results supports a culturally nuanced understanding of well-being and underscores the necessity of contextualizing psychological constructs within their cultural frameworks.

In summary, the overall interpretation affirms that happiness and psychological well-being are not merely individual psychological states but are deeply rooted in cultural value systems. The study highlights the importance of adopting culturally sensitive theoretical models, research methodologies, and intervention strategies when examining and promoting well-being across diverse populations.

## 8. Findings of the Study

1. The analysis revealed a statistically significant relationship between cultural orientation and both happiness and psychological well-being. Individualistic orientation showed a moderate positive correlation with happiness, while collectivist orientation demonstrated a stronger association with psychological well-being. This finding supports the hypothesis that cultural orientation significantly influences well-being outcomes and therefore confirms the proposed hypothesis regarding the relationship between culture, happiness, and well-being.
2. Participants with a collectivist cultural orientation reported significantly higher levels of psychological well-being compared to those with an individualistic orientation, as evidenced by the mean difference and statistically significant t-value at the 0.05 level. This finding supports and accepts the hypothesis proposing significant differences in well-being across cultural orientations.
3. The one-way ANOVA results indicated significant variation in happiness scores across cultural groups, suggesting that happiness is not experienced uniformly across cultural contexts. This outcome validates the hypothesis that cultural background leads to meaningful differences in happiness levels.
4. Multiple regression analysis demonstrated that cultural orientation significantly predicts psychological well-being, with collectivism emerging as the strongest predictor. The model accounted for a substantial proportion of variance in well-being, thereby confirming the hypothesis that cultural values play a predictive role in shaping psychological well-being.
5. Overall, the findings indicate that while individualism contributes more strongly to subjective happiness, collectivism plays a more decisive role in fostering stable psychological well-being. These results collectively support and lead to the acceptance of all hypotheses formulated in the study.

## 9. Discussion

The findings of the present study reinforce theoretical and empirical perspectives within cross-cultural psychology that conceptualize happiness and well-being as culturally embedded constructs rather than universal experiences. The differential associations observed between cultural orientation and well-being outcomes align with Markus and Kitayama's theory of independent and interdependent self-construals, which emphasizes that cultural values shape emotional experience and self-evaluation.

The stronger association between individualism and happiness reflects the emphasis on personal achievement, autonomy, and self-esteem in individualistic cultures. In contrast, the stronger predictive power of collectivism for psychological well-being suggests that enduring mental health benefits are derived from social connectedness, relational harmony, and communal support.

The regression findings further underscore that culture is not merely a background variable but a substantive predictor of psychological outcomes. Explaining 42% of the variance in well-being, cultural orientation demonstrates practical significance and policy relevance. These findings suggest that mental health interventions and happiness-enhancement programs must be culturally tailored to align with dominant value systems.

Overall, the study challenges one-size-fits-all models of happiness and highlights the importance of incorporating cultural sensitivity into psychological research, mental health practice, and public policy.

## 10. Conclusion

The present study concludes that culture plays a fundamental role in shaping both happiness and psychological well-being. Cultural orientation influences not only how happiness is defined but also how well-being is experienced and maintained. While individualistic values promote subjective happiness and life satisfaction, collectivist values foster deeper and more sustainable psychological well-being through social integration and emotional support.

These findings carry important implications for psychological theory, cross-cultural research, and applied mental health practice. Interventions aimed at enhancing well-being must consider cultural values to be effective and ethically responsible. Future research should employ longitudinal designs, culturally diverse samples, and mixed-method approaches to further explore the dynamic relationship between culture and well-being.

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# Effect of Temporal Length of Imprisonment on Social Support and Mental Health

Prakash Pandey\*  
Dr. Sheo Kumar Prasad\*\*

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## Abstract

*Imprisonment is one of the most powerful and intrusive forms of social control exercised by the state. It involves the legal deprivation of liberty, autonomy, and social participation of individuals who are either convicted of crimes or under trial for different crimes. To see the effect of temporal length of imprisonment on mental health and perceived social support 'Social Support Scale (SSS-DIGS)' constructed and standardized by Dhul and Godara (2016)', 'Mental Health Battery (MHB-SS)' constructed and standardized by Singh and Sengupta (2023)', and 'Personal Information Inventory' were administered on a sample of 100 male prisoners who were recently released on bail and were undergone imprisonment for different temporal lengths. The age range of subjects was 25-50 years. The sample was drawn from Siwan, Chapra and Gopalganj districts of Bihar. The analysis of data revealed that temporal length of imprisonment brings significant variations on mental health and the perception of social support. Males who have experienced imprisonment for more than one year are significantly lower on mental health and perceived social support compared to those who have experienced imprisonment for up to one month or for less than one year.*

**Keywords:-** Temporal Length, Imprisonment, Mental Health, Social Support, Males.

## Introduction

Imprisonment represents one of the most significant forms of social and psychological deprivation experienced by individuals within the criminal justice system. Beyond its legal purpose of punishment and deterrence, incarceration often produces profound psychological consequences that affect the well-being, identity, and social functioning of prisoners. Contemporary psychological research increasingly recognizes that imprisonment is not merely a legal event but also a complex psychosocial experience that influences individuals' mental health, social relationships, and sense of belonging (Haney, 2018; Liebling & Maruna, 2023). Among the various factors associated with incarceration, the temporal length of imprisonment plays a crucial role in determining the extent to which prisoners experience psychological distress and social disconnection.

The prison environment is typically characterized by restricted freedom, limited autonomy, institutional routines, separation from family members, and exposure to stressful interpersonal dynamics. Such conditions can adversely influence the psychological well-being of prisoners, often resulting in anxiety, depression, emotional instability, and feelings of isolation (Fazel, et al., 2016). Mental health problems are considerably more prevalent among incarcerated populations than among the general population, making the study of psychological outcomes of imprisonment an important area of criminological and psychological research (World Health Organization, 2022).

One of the key psychosocial variables affected by incarceration is perceived social support. Social support refers to the emotional, informational, and instrumental assistance received from family members, friends, and other significant individuals in one's social network (Taylor, 2019). It plays a crucial role in promoting psychological resilience and coping with stressful life situations. Extensive research indicates that individuals who perceive higher levels of social support are better

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\* Research Scholar, P.G. Deptt. of Psychology, J. P. University, Chapra. Email:pandayprakash0@gmail.com

\*\* Professor (Retd.), Deptt. of Psychology, JLC College Chapra. Email: skumarjlc@gmail.com

able to manage stress, maintain psychological stability, and recover from adverse life events (Thoits, 2011; Holt-Lunstad, 2021).

For prisoners, social support becomes particularly significant because imprisonment disrupts existing social networks and weakens interpersonal bonds. Separation from family members, stigma associated with criminal involvement, and the institutional structure of prisons often limit opportunities for maintaining meaningful relationships (Cochran & Mears, 2017). Consequently, prisoners frequently experience reduced levels of perceived social support, which may further aggravate psychological distress and emotional vulnerability. Importantly, the duration of imprisonment may influence the extent of this social disconnection. Short-term imprisonment may create temporary disruptions in social relationships, whereas prolonged incarceration may lead to deeper erosion of social ties and support systems. Long-term prisoners often face declining contact with family members, weakening social bonds, and increased feelings of loneliness and abandonment (Bales & Mears, 2020). Even after release on bail, these experiences can significantly affect their psychological adjustment and mental health outcomes.

Research in criminology and psychology suggests that prolonged incarceration is associated with increased levels of depression, anxiety, and psychological distress. Haney (2018) described how extended exposure to prison environments can produce what he termed “institutionalization,” a psychological adaptation characterized by dependency, emotional withdrawal, and diminished coping capacity. Similarly, Fazel et al. (2016) found that prisoners with longer periods of incarceration are more likely to experience mental health disorders, including depression, post-traumatic stress symptoms, and suicidal ideation.

At the same time, the relationship between imprisonment duration and mental health is complex. Some studies suggest that initial incarceration periods may produce acute stress reactions, whereas long-term imprisonment may lead to chronic psychological consequences due to sustained exposure to restrictive institutional conditions (Wildeman & Andersen, 2020). Additionally, prisoners who experience reduced social support during incarceration are more vulnerable to mental health deterioration, indicating that social support may serve as an important protective factor.

In the Indian context, research on the psychological consequences of imprisonment remains relatively limited, despite the increasing prison population and growing concern about prisoners’ mental health. Studies conducted in Indian prisons indicate that incarcerated individuals frequently experience high levels of psychological stress, social stigma, and emotional distress due to isolation from family and community (Kumar & Daria, 2013; National Crime Records Bureau, 2022). Furthermore, the duration of imprisonment may intensify these challenges by weakening social connections and increasing feelings of alienation.

Given these considerations, examining the effect of temporal length of imprisonment on social support and mental health is of considerable theoretical and practical importance. Understanding how the duration of incarceration influences these psychological variables can help policymakers, prison administrators, and mental health professionals design effective interventions aimed at promoting prisoners’ psychological well-being. Programs that facilitate family contact, counseling services, and social reintegration initiatives may play a crucial role in mitigating the negative psychological consequences of prolonged imprisonment.

Therefore, the present study seeks to investigate how the temporal length of imprisonment affects perceived social support and mental health among individuals who have undergone incarceration. By exploring these relationships, the study aims to contribute to the growing body of research on the psychological consequences of imprisonment and provide insights that may support more humane and rehabilitative correctional policies.

Considering the multifaceted findings of previous researchers the objectives of the investigation are to trace out the effect of temporal length of imprisonment on mental health and perceived social support of those male prisoners who have been released on bail. In the light of these objectives the following hypotheses were formulated:

- (1) Temporal length of imprisonment will be found significantly influencing mental health of prisoners.
- (2) Temporal length of imprisonment will be found significantly influencing perceived social support of prisoners.

#### **Method**

**Sample** :- The study was conducted on a sample of 100 prisoners who have been recently released on bail. Out of these 100 prisoners 25 prisoners were in jail for less than one month (Group – A), 45 prisoners were in jail for less than one year (Group – B) and 30 prisoners were in jail for more than one year (Group – C). The sample was drawn from Siwan, Chapra and Gopalganj districts of Bihar. The age range of subjects was from 25 to 50 years.

**Tests Used** :- For measuring social support ‘Social Support Scale (SSS-DIGS)’ constructed and standardized by Dhul and Godara (2016); for measuring mental health ‘Mental Health Battery (MHB-SS)’ constructed and standardized by Singh and Sengupta (2023),’ and to seek personal information from subjects ‘Personal Information Inventory’ were used.

**Statistical Analysis** :- To test the effect of temporal length of imprisonment on mental health and perceived social support, mental health scores and social support scores of three groups – A, B and C - were calculated separately and compared. Means, S.Ds. and ‘t’-ratios were calculated.

#### **Results and Discussion**

The mean scores on mental health of A, B and C groups are 76.5342, 72.4056 and 62.0024 with S.Ds. 9.0446, 8.9331 and 8.6348 respectively (Table – 1). The obtained ‘t’ ratios for A x B, A x C and B x C compared groups for mental health are 1.8137, 5.9858 and 5.0412 respectively. Out of these three ‘t’ ratios two ‘t’ ratios for A x C and B x C compared groups are significant at .01 level. First ‘t’ ratio for compared groups A x B is lower than the required value for significance at .05 level. So there does not exist significant difference between A and B groups on mental health. But these both groups – A and B – differ significantly from C group. Higher score denotes higher mental health and lower score denotes lower mental health. This proves that A and B groups do not differ significantly on mental health but these both groups possess significantly higher mental health than C group. This also proves that with increase in the length of imprisonment there is decrease in the mental health of imprisoned males to a great extent.

Research by Labrecque (2021) indicates that long-term incarceration exposes prisoners to chronic stressors such as overcrowding, restricted movement, limited privacy, and potential exposure to aggression or violence. These conditions can lead to persistent psychological strain and emotional exhaustion. Over time, such stress may significantly weaken prisoners’ mental health, resulting in symptoms such as anxiety, depression, and social withdrawal. The non-significant difference between groups A and B suggests that the early stages of imprisonment may not immediately produce severe psychological deterioration. During the initial months of incarceration, prisoners may still retain hope regarding their legal outcomes or release. They may also maintain relatively frequent contact with family members and social networks. Crewe, Hulley, and Wright (2017) noted that many prisoners initially rely on coping mechanisms such as emotional regulation, social bonding with fellow inmates, or religious faith to manage the stress of incarceration. These coping strategies may help maintain relatively stable mental health during shorter periods of imprisonment. But as incarceration continues, the protective effect of these coping strategies diminishes. The highly significant differences observed between Groups A and C, and between Groups B and C, suggest that prolonged imprisonment has a cumulative negative effect on mental health. Recent longitudinal research by Wildeman and Andersen (2020) found that individuals exposed to long-term incarceration experience significantly higher levels of psychological distress than those exposed to shorter prison terms. The study concluded that extended confinement often intensifies feelings of hopelessness and emotional exhaustion. Smith (2022) reported that prolonged incarceration often reduces inmates’ opportunities for meaningful social interaction with family members and community networks. This reduction in social contact can lead to feelings of loneliness, alienation, and emotional distress. Social isolation

has been widely recognized as a major risk factor for mental health problems such as depression and anxiety. Reiter, Ventura, and Lovell (2020) examined the effects of long-term confinement and found that prisoners exposed to extended periods of restrictive environments often experience symptoms such as emotional numbness, irritability, and cognitive difficulties. These psychological changes might have significantly reduced overall mental health and well-being of imprisoned males for more than one year. Studies conducted in the Indian context by Choudhary and Kumar (2021) also supports our findings.

**Table – 1**  
**Showing Means, S.Ds. and ‘t’ ratios of mental health scores – Imprisoned Groups of Different Temporal Lengths**

Groups	N	Means	S.Ds.	df	‘t’ ratios	Level of Sig.
A	25	76.5342	9.0446	68	1.8137	NS
B	45	72.4056	8.9331			
A	25	76.5342	9.0466	53	5.9858	0.01
C	30	62.0024	8.6348			
B	45	72.4056	8.9331	73	5.0412	0.01
C	30	62.0024	8.6348			

**Note - Group A :** Imprisonment up to one month.

**Group B :** Imprisonment above one month but less than one year.

**Group C :** Imprisonment above one year.

The mean scores on social support of A, B and C groups are 94.1136, 88.5233 and 83.8087 with S.Ds. 11.0235, 10.3314 and 9.2566 respectively (Table – 2). The obtained ‘t’ ratios for A x B, A x C and B x C compared groups for social support are 2.0502, 3.6618 and 2.0619 respectively. All the obtained three ‘t’ ratios are significant either at .01 level or at .05 level. This proves that A, B and C groups differ significantly on social support among themselves. Higher score denotes higher social support and lower score denotes lower social support. Significantly higher mean score has been obtained by A group than B and C groups; and by B group than C group. This proves that with increase in the length of imprisonment there is significant decrease in the perceived social support of imprisoned males.

Several contemporary studies have demonstrated that imprisonment can significantly disrupt social relationships. Berg and Huebner (2019) reported that incarceration often weakens family bonds and reduces the availability of social support for prisoners. The authors noted that prolonged imprisonment may lead to reduced contact with family members and friends, which gradually diminishes the emotional and practical support available to inmates. This finding is consistent with the present result showing lower social support among prisoners who have spent more than one year in prison. According to Haney (2018), prolonged exposure to prison environments can lead to social withdrawal and emotional detachment from the outside world. As prisoners become more accustomed to the institutional environment, their connection with family and community networks may weaken, resulting in reduced perceived social support. The present finding that prisoners incarcerated for shorter periods report higher social support is also supported by research on family contact during imprisonment. Comfort (2016) emphasized that family relationships play a crucial role in maintaining prisoners’ psychological well-being. However, maintaining these relationships becomes increasingly difficult as the duration of incarceration increases.

Recent empirical research also highlights the negative impact of long-term imprisonment on social relationships. Wildeman and Wang (2017) found that extended periods of incarceration significantly disrupt family structures and weaken social networks. The study reported that prisoners who remain incarcerated for longer durations often experience reduced communication with their spouses, children, and friends. This reduction in social interaction may lead to feelings of loneliness

and social isolation, which in turn lower perceived social support. Research conducted in the Indian context also supports the present findings.

**Table – 2**  
**Showing Means, S.Ds. and ‘t’ ratios of social support scores – Imprisoned Groups of Different Temporal Lengths**

Groups	N	Means	S.Ds.	df	‘t’ ratios	Level of Sig.
A	25	94.1136	11.0235	68	2.0502	0.05
B	45	88.5233	10.3314			
A	25	94.1136	11.0235	53	3.6618	0.01
C	30	83.8087	9.2566			
B	45	88.5233	10.3314	73	2.0619	0.05
C	30	83.8087	9.2566			

**The study has finally led to the following conclusions :-**

- (1) Temporal length of imprisonment has a significant effect on mental health and the perception of social support among males who have undergone imprisonment.
- (2) Males who have experienced imprisonment for more than one year are significantly lower on mental health compared to those who have experienced imprisonment for up to one month or for less than one year.
- (3) Males who have experienced imprisonment for more than one year perceive significantly lower level of social support compared to those who have experienced imprisonment for up to one month or for less than one year.

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# Assessing the Influence of UPI Adoption on Small and Micro Enterprises' Financial Performance in Varanasi District: Opportunities, Challenges, and Growth Patterns

Anamika\*  
Prof. Vinod Kumar Pandey\*\*

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## Abstract:

*The rapid growth of digital payments in India has significantly transformed the way small and micro enterprises conduct business. Among various digital platforms, the Unified Payments Interface (UPI) has emerged as a widely used and easily accessible payment system. This study examines the impact of UPI adoption on the financial performance of small and micro enterprises in Varanasi district. It explores how digital payment usage influences sales growth, cash flow management, customer reach, cost efficiency, and overall business stability.*

*The findings indicate that enterprises adopting UPI experienced improved transaction transparency, faster payments, reduced dependency on cash handling, and increased customer satisfaction. Many businesses reported higher sales volumes due to the convenience offered to customers. However, challenges such as limited digital literacy, concerns about cybersecurity, inconsistent internet connectivity, and transaction-related technical issues were also observed.*

*The study concludes that UPI has positively contributed to financial inclusion and business formalization among small enterprises in Varanasi. It has strengthened operational efficiency and enhanced growth potential. For future research, comparative studies across districts, sector-wise analysis, and long-term financial impact assessments can provide deeper insights into digital payment integration and sustainable enterprise development.*

**Keywords:** UPI Adoption, Small and Micro Enterprises, Digital Payments, Financial Performance, Financial Inclusion, Business Growth, Digital Transformation

## Introduction:

India has experienced a rapid shift toward digital payments in recent years, especially after policy initiatives promoting a cashless economy. Among various digital platforms, the Unified Payments Interface (UPI), developed by the National Payments Corporation of India, has become one of the most widely used payment systems in the country. UPI enables instant bank-to-bank transfers through mobile devices, making transactions simple, low-cost, and accessible even for small businesses. In districts like Varanasi District, where small and micro enterprises form the backbone of the local economy, the adoption of UPI has brought noticeable changes in daily business operations.

## Current Scenario

At present, digital payments have become a regular part of business transactions in urban as well as semi-urban markets. Small shopkeepers, street vendors, service providers, and home-based enterprises increasingly accept UPI payments through QR codes and mobile applications. Customers prefer cashless transactions because they are quick, secure, and convenient. This growing acceptance has encouraged even traditional businesses to integrate digital payment systems into their operations.

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\* Research Scholar, Commerce Department, Nehru Gram Bharati (Deemed to be University), Prayagraj  
[Email: anamikasri0110@gmail.com, Mob No: 9721123186]

\*\* Dean & Hod, Faculty of Commerce, Nehru Gram Bharati (Deemed to be University), Prayagraj  
[Email: vinod.pandey891@gmail.com, Mob No: 9839103741]

**Background and Developmental Timeline**

UPI was launched in 2016 with the objective of promoting financial inclusion and reducing dependency on cash. The demonetization policy of 2016 accelerated the adoption of digital payments across India. Over time, improvements in smartphone penetration, affordable internet services, and government awareness campaigns further strengthened UPI usage. During the COVID-19 pandemic, contactless payments became essential, which further increased trust and reliance on UPI among small enterprises.

**Aim and Scope of the Study**

The primary aim of this study is to assess how the adoption of UPI influences the financial performance of small and micro enterprises in Varanasi district. It seeks to examine changes in sales, profit margins, cash flow management, customer base expansion, and operational efficiency after adopting UPI. The study also explores the opportunities created by digital payments and the challenges faced by business owners, such as technical issues, digital literacy gaps, and cybersecurity concerns.

The scope of the research is limited to selected small and micro enterprises operating in Varanasi district. It focuses on understanding growth patterns and identifying factors that support or hinder the effective use of UPI. By analyzing these aspects, the study aims to provide practical insights for policymakers, financial institutions, and entrepreneurs to promote sustainable digital and economic development.

**Research Gap:**

Although several studies have examined digital payments and UPI adoption in India, most of them focus on national-level trends or large urban centres. Limited research has been conducted at the district level, particularly in Varanasi district, where small and micro enterprises play a vital role in the local economy. There is a lack of detailed analysis on how UPI adoption directly affects financial performance indicators such as sales growth, profit margins, cash flow management, and customer expansion in small business settings.

Previous studies mainly discuss digital payment adoption, financial inclusion, or technological acceptance in general terms. However, few studies provide empirical evidence linking UPI usage with measurable financial outcomes of micro enterprises. In addition, limited attention has been given to comparing opportunities and challenges together in a single structured framework.

Another important gap is the absence of sector-wise and location-specific analysis within semi-urban and rural areas of districts like Varanasi. The growth patterns after UPI adoption have also not been deeply explored over time.

Therefore, this study attempts to fill these gaps by providing district-level empirical data, analyzing financial performance indicators, and examining both benefits and challenges of UPI adoption among small and micro enterprises in Varanasi district.

**Literature Review:**

*Patel, S., & Mehta, R. (2021). "Digital payment adoption and small business growth: A study on UPI transactions."*

Patel and Mehta (2021) examined the relationship between digital payment adoption and the growth of small businesses, with special focus on UPI transactions. The study analysed how the use of UPI influenced sales volume, customer convenience, and financial record management among small enterprises. The findings showed that businesses adopting UPI experienced faster transactions, improved transparency, and better cash flow tracking. Customers preferred digital payments due to ease and safety, which contributed to increased sales opportunities. However, challenges such as limited digital knowledge and technical issues were also identified. Overall, the study concluded that UPI adoption positively supports small business expansion and financial stability.

***Mahajan, P., & Agarwal, M. (2023). "Digital payments and MSMEs: Assessing potential and impact"***

Mahajan and Agarwal (2023) studied the growing role of digital payment systems in the development of Micro, Small, and Medium Enterprises (MSMEs) in India. The research focused on how digital platforms, especially UPI and mobile-based payments, improve business efficiency and financial management. The study found that digital payments help MSMEs reduce cash handling risks, maintain proper transaction records, and expand their customer base. It also highlighted that digital systems support financial inclusion and formalization of small businesses. However, issues such as digital illiteracy and cybersecurity concerns remain challenges. Overall, the study concludes that digital payments create strong growth opportunities for MSMEs.

***Shetty, N. K., Yashaswini, M., Kumar, S., & Shashikanth (2024). "Cash to digital: UPI adoption among micro businesses in Mysore."***

Shetty, Yashaswini, Kumar, and Shashikanth (2024) examined the transition from cash-based transactions to digital payments among micro businesses in Mysore, with particular focus on UPI adoption. The study aimed to understand how small vendors, shopkeepers, and service providers adapted to digital payment systems and how this shift influenced their business operations.

The research found that UPI significantly improved transaction speed and convenience for both business owners and customers. Many micro enterprises reported better record-keeping, reduced cash handling risks, and increased customer trust after adopting digital payments. The availability of QR code-based systems made it easier for even small roadside vendors to accept digital payments without heavy investment. However, the study also identified several challenges. Some business owners faced difficulties due to limited digital literacy, poor internet connectivity, and concerns about fraud or transaction failures. Elderly entrepreneurs were comparatively slower in adopting digital tools.

***Bhosale, R. R., & Khaire, M. (2025). "Impact of UPI payments on small business growth."***

Bhosale and Khaire (2025) analysed the impact of UPI payments on the growth and financial performance of small businesses in India. The study focused on how digital payment systems influence sales, customer satisfaction, cost efficiency, and overall business stability. It examined small retailers, service providers, and local entrepreneurs who adopted UPI as a primary mode of transaction.

The findings revealed that UPI payments improved the speed and ease of financial transactions. Businesses experienced smoother cash flow management because payments were received instantly and directly into bank accounts. This reduced the risks associated with cash handling and helped maintain accurate financial records. Many entrepreneurs reported an increase in customer footfall, as consumers preferred digital payment options for convenience and safety.

The study also highlighted that UPI reduced operational costs by minimizing the need for physical cash management. However, certain challenges were identified, including network disruptions, technical errors, and limited awareness among some business owners.

Overall, the research concluded that UPI adoption has a positive effect on small business growth by enhancing transparency, improving financial discipline, and supporting digital inclusion in the local economy.

**Objectives of Study:**

- **To examine the impact of UPI adoption on the financial performance** of small and micro enterprises in Varanasi district, with reference to sales growth, profitability, cash flow management, and cost efficiency.
- **To identify the opportunities created by UPI usage** for small and micro enterprises, such as customer base expansion, financial inclusion, transparency in transactions, and business formalization.

- **To analyse the challenges and growth patterns associated with UPI adoption**, including digital literacy issues, cybersecurity concerns, technical barriers, and their influence on long-term business sustainability.

**Hypothesis of Study:**

1. **H<sub>01</sub> (Null Hypothesis):** UPI adoption has no significant impact on the financial performance of small and micro enterprises in Varanasi district.  
**H<sub>11</sub> (Alternative Hypothesis):** UPI adoption has a significant positive impact on the financial performance of small and micro enterprises in Varanasi district.
2. **H<sub>02</sub> (Null Hypothesis):** There is no significant relationship between UPI usage and sales growth of small and micro enterprises in Varanasi district.  
**H<sub>12</sub> (Alternative Hypothesis):** There is a significant positive relationship between UPI usage and sales growth of small and micro enterprises in Varanasi district.
3. **H<sub>03</sub> (Null Hypothesis):** The challenges related to digital literacy, technical issues, and cybersecurity do not significantly affect the growth patterns of enterprises adopting UPI.  
**H<sub>13</sub> (Alternative Hypothesis):** The challenges related to digital literacy, technical issues, and cybersecurity significantly affect the growth patterns of enterprises adopting UPI.

**Research Methodology:**

This study adopts a descriptive and analytical research design to examine the influence of UPI adoption on the financial performance of small and micro enterprises in Varanasi district. The research focuses on understanding the relationship between digital payment usage and business growth, along with identifying opportunities and challenges faced by enterprises.

**Research Approach:**

A quantitative approach has been primarily used to collect measurable data related to sales growth, profitability, transaction frequency, and cash flow management. In addition, limited qualitative inputs were gathered to understand practical challenges and perceptions of business owners regarding UPI adoption.

**Data Collection:**

**The study is based on both primary and secondary data:**

- Primary data were collected through structured questionnaires and personal interviews with owners of small and micro enterprises in different areas of Varanasi district.
- Secondary data were obtained from published reports, research articles, government publications, and official digital payment statistics.

**Sampling Design:**

A random sampling method was used to select enterprises from various sectors such as retail shops, service providers, street vendors, and small manufacturing units. The sample size was determined based on accessibility and representation of different business categories within the district.

**Data Analysis:**

Collected data were organized and analysed using basic statistical tools such as percentage analysis, mean, correlation, and regression techniques. These methods helped in measuring the impact of UPI adoption on financial indicators and identifying significant relationships between variables.

**Table 1: Demographic Profile of Respondents (N = 200)**

Category	Frequency	Percentage (%)
<b>Type of Enterprise</b>		
Retail	82	41%
Service	64	32%
Manufacturing	34	17%
Others	20	10%

**Business Location:**

Urban	118	59%
Semi-Urban	52	26%
Rural	30	15%

**Years of Operation:**

Below 3 Years	46	23%
3–7 Years	88	44%
Above 7 Years	66	33%

**Table 2: UPI Adoption and Usage Pattern:**

Particulars	Frequency	Percentage (%)
Adopted UPI	172	86%
Not Adopted UPI	28	14%
Daily Transactions Above 20	96	48%
Daily Transactions 10–20	58	29%
Daily Transactions Below 10	46	23%

**Table 3: Impact of UPI on Financial Performance**

Financial Indicator	Increased	No Change	Decreased
Sales Volume	134 (67%)	52 (26%)	14 (7%)
Profit Margin	118 (59%)	68 (34%)	14 (7%)
Cash Flow Efficiency	152 (76%)	40 (20%)	8 (4%)
Customer Base	146 (73%)	42 (21%)	12 (6%)

**Table 4: Challenges Faced in UPI Adoption**

Challenge	Frequency	Percentage (%)
Poor Internet Connectivity	72	36%
Technical Errors	54	27%
Cybersecurity Concerns	46	23%
Lack of Digital Literacy	28	14%

**Statistical Analysis of Primary Data (N = 200)**

Based on the collected data, the following statistical interpretation is presented:

**1. Adoption Rate Analysis**

Out of 200 respondents, **172 enterprises (86%) adopted UPI**, while only 28 (14%) did not adopt it.

**Interpretation:** The very high adoption rate indicates strong digital penetration among small and micro enterprises in Varanasi district.

**2. Usage Intensity Analysis**

- 48% conduct more than 20 UPI transactions daily.
- 29% conduct 10–20 transactions daily.
- 23% conduct fewer than 10 transactions daily.

**Mean Usage Level (Approximation):**

Assigning weighted scores (Low = 1, Medium = 2, High = 3):

$$\begin{aligned}
 \text{Mean} &= \frac{(46 \times 1) + (58 \times 2) + (96 \times 3)}{200} \\
 &= \frac{46 + 116 + 288}{200} = \frac{450}{200} = 2.25
 \end{aligned}$$

Since the mean value (2.25) is closer to 3, it indicates **moderate to high daily usage of UPI transactions**.

**3. Impact on Financial Performance**

Indicator	% Reporting Increase
Sales Volume	67%
Profit Margin	59%
Cash Flow Efficiency	76%
Customer Base	73%

**Interpretation:**

- A majority (67%) reported an increase in sales, suggesting a positive relationship between UPI adoption and revenue growth.
- 76% reported improved cash flow efficiency, indicating faster and smoother transactions.
- 73% experienced expansion in customer base, reflecting increased customer convenience.

This supports the alternative hypothesis that **UPI adoption positively influences financial performance.**

**4. Challenge Analysis**

Challenge	% Respondents
Internet Connectivity Issues	36%
Technical Errors	27%
Cybersecurity Concerns	23%
Digital Literacy Issues	14%

**Interpretation:**

Internet connectivity is the most significant barrier (36%). However, since adoption remains high (86%), challenges are present but not strong enough to discourage digital usage.

**5. Overall Conclusion from Statistical Findings:**

The descriptive and percentage analysis clearly indicates a **positive association between UPI adoption and business growth indicators** such as sales, profitability, and customer expansion.

Thus, statistical evidence suggests that UPI adoption significantly contributes to improved financial performance of small and micro enterprises in Varanasi district, despite minor operational challenges.

**Findings of the Study:**

The study reveals that UPI adoption has become widely accepted among small and micro enterprises in Varanasi district. A large majority of business owners have integrated UPI into their daily transactions, showing a clear shift from cash-based operations to digital payment systems. This indicates growing digital awareness and acceptance among local entrepreneurs. One of the major findings is that enterprises using UPI reported noticeable improvement in their financial performance. Many respondents experienced an increase in sales volume and customer footfall, mainly because customers prefer quick and cashless payment options. Instant transfer of funds into bank accounts has improved cash flow management and reduced delays in receiving payments. Business owners also reported better record-keeping and transparency in transactions, which supports financial discipline and easier tracking of income.

The study further finds that UPI adoption has helped expand the customer base, especially among younger and digitally active consumers. It has also reduced risks related to cash handling, such as theft and mismanagement. However, certain challenges were identified. Some respondents faced issues related to poor internet connectivity, transaction failures, cybersecurity concerns, and limited digital knowledge. Despite these challenges, most enterprises continue to use UPI regularly due to its overall benefits.

Overall, the findings indicate that UPI adoption positively influences financial stability, operational efficiency, and growth opportunities for small and micro enterprises in Varanasi district.

**Conclusion:**

The study concludes that the adoption of UPI has played a significant role in improving the financial performance of small and micro enterprises in Varanasi district. The shift from cash-based transactions to digital payments has increased business efficiency, transparency, and convenience for both entrepreneurs and customers. Most enterprises reported growth in sales, better cash flow management, and expansion of their customer base after adopting UPI. UPI has supported faster transactions and reduced the risks associated with handling physical cash. It has also encouraged financial inclusion by connecting small businesses more closely with formal banking systems. Digital records of transactions have improved financial discipline and made it easier for businesses to track income and manage expenses.

Although certain challenges such as internet connectivity issues, technical errors, cybersecurity risks, and limited digital literacy were identified, these barriers have not significantly reduced the overall positive impact of UPI adoption. Most enterprises continue to prefer digital payment systems due to their long-term benefits.

In conclusion, UPI adoption has contributed positively to business growth and financial stability among small and micro enterprises in Varanasi district. With improved digital infrastructure and awareness programs, its impact can become even stronger in the future.

#### **Suggestions:**

Based on the findings of the study, several practical suggestions can be made to strengthen the positive impact of UPI adoption among small and micro enterprises in Varanasi district.

First, there is a need to improve **digital awareness and training programs** for small business owners. Many entrepreneurs still face difficulties due to limited knowledge of digital payment systems. Government agencies, banks, and local business associations should organize regular workshops and awareness campaigns to enhance digital skills and confidence.

Second, improving **internet connectivity and digital infrastructure** is essential, especially in semi-urban and rural areas. Stable network services will reduce transaction failures and increase trust in digital payments.

Third, strong measures should be taken to address **cybersecurity concerns**. Banks and financial institutions should provide guidance on safe digital practices, fraud prevention, and secure transaction methods to protect business owners from financial risks.

Fourth, policymakers can introduce **incentive schemes or rewards** for digital transactions to encourage wider adoption among small enterprises.

Finally, further collaboration between financial institutions and local enterprises can promote easier access to credit based on digital transaction history.

By implementing these suggestions, UPI adoption can become more effective and contribute to sustainable financial growth of small and micro enterprises in Varanasi district.

#### **Future Scope of the Study:**

The present study focuses on small and micro enterprises in Varanasi district; however, there is wide scope for further research in this area. Future studies can expand the geographical coverage to include other districts of Uttar Pradesh or different states of India to make comparative analysis more comprehensive. Such comparative studies would help in understanding regional differences in UPI adoption and its financial impact. Researchers can also conduct sector-wise analysis, such as examining retail, manufacturing, and service enterprises separately, to identify specific growth patterns and challenges in each sector. A longitudinal study covering a longer time period would provide deeper insights into the long-term financial effects of UPI adoption on business sustainability and profitability.

Further research may include advanced statistical tools and larger sample sizes to strengthen empirical findings. The role of government policies, digital literacy programs, and fintech innovations can also be explored in detail. Additionally, future studies can examine customer perspectives to understand how consumer behaviour influences digital payment adoption. By exploring these dimensions, future research can provide broader and more policy-oriented insights into digital transformation and enterprise development.

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# Digital Media Initiatives Empowering Tribal Population: Insights on Tribal Youth

Dr. Sony Parhi\*  
Dr. Phagunath Bhoi\*\*

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## Abstract:

*The protection of tribal communities' rights requires well-formulated government policies and effective communication strategies to ensure awareness, accessibility, and engagement. In the digital era, leveraging digital media platforms has become essential for disseminating information, promoting inclusivity, and fostering dialogue between government and tribal populations. The objective of this paper is to examine the role of digital communication in implementation of government policies and initiatives aimed at safeguarding the rights of people belonging to tribal communities. This paper explores various digital platforms—social media, government portals, mobile applications, and community-driven digital networks—assessing their effectiveness in reaching tribal population. The study also identifies challenges such as digital literacy gaps, connectivity issues, and cultural barriers while proposing solutions for effective communication strategies. By analyzing case studies and policy frameworks, this research highlights the potential of digital media to enhance governance transparency, community participation, and the protection of tribal rights.*

**Key words:** tribal population, digital media, digital literacy, government policies

## Introduction:

*India will prosper when our tribal communities prosper; Welfare of tribal communities is our foremost priority:*

- Prime Minister, Narendra Modi

In the drive for a welfare state as envisioned in our national policies, the protection and promotion of tribal rights in India have remained a key focus of the development agenda of India. With over 700 recognized Scheduled Tribes (STs) who comprise approximately 8.6% of the total population, ensuring their cultural identity, land rights, and socio-economic well-being is vital for achieving inclusive growth and equitable progress. Over the years since our country became a free nation, India has introduced several policies and legal frameworks aimed at empowering tribal communities. This was done to put an end to injustices and unfairness continuing from historical times, and to provide for justice-based access and fair opportunities. This aims to bring the tribal population at par with all other members of society.

According to the Ministry of Tribal Affairs, Scheduled Tribes (ST) constitutes approximately 8.6% of population of India numbering around 10.4 crores. There are over 730 Scheduled Tribes as notified under Article 342 of the Constitution of India. Prime Minister, Narendra Modi has envisioned '*SabkaSaath, Sabka Vikas, Sabka Vishwas and SabkaPrayaas*'.<sup>(1)</sup>

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\* Faculty Member in the Department of Journalism and Mass Communication at the Central University of Odisha. NAD Post Office, Sunabeda 763004, District: Koraput, State: Odisha  
She may be reached at sonyparhi@gmail.com and mobile number 9439253267.

\*\* Currently posted as the Public Relations Officer at the Central University of Odisha, Koraput, India.  
PRO Office, Central University of Odisha, NAD Post Office, Sunabeda 763004, District: Koraput, State: Odisha  
He may be reached at [pro@cuo.ac.in](mailto:pro@cuo.ac.in) and mobile number 7873234023.

Therefore, the government has focused on putting tribal people on the road to development while at the same time, laying emphasis on preservation of tribal heritage and culture so that they do not lose their identity.

According to a document by PIB, India has the second-largest tribal population in the world. The tribal people are noted for their unique traditions and cultural heritage. There are constitutional provisions for their welfare and also a separate ministry: The Ministry of Tribal Affairs that was set up in 1999 to provide a focused approach to the integrated socio-economic development of the Scheduled Tribes (STs). The programmes and schemes are intended to support and supplement other Central Ministries, State Governments and voluntary organizations and to fill gaps in institutions and programmes, and provide the STs with financial assistance.<sup>(2)</sup>

In the information technology and digital era, media and technology have emerged as powerful tools for advocacy, awareness, and governance. Digital media initiatives, including e-governance platforms, social media campaigns, and digital literacy programs, institutions of social justice have played a crucial role in making the tribal voices heard and thereby aiding their participation in decision-making processes. When aligned with government policies, these initiatives can build knowledge avenues, promote transparency, close information gaps, and create new opportunities for tribal empowerment.

This paper explores the juncture at which government policies and digital media initiatives align to safeguard and spearhead tribal rights in India. It examines key strategies that promote inclusive development, with focus on policy effectiveness, technological interventions, and community-driven approaches that ensure sustainable progress for tribal populations and preservation of their cultural heritage.

### **Government Initiatives for the Protection of Tribal Rights:**

#### **1. Constitutional Safeguards**

- Fifth and Sixth Schedule: Special provisions for governance in tribal-dominated areas.
- Scheduled Tribes (ST) Reservation: Ensures representation in education, employment, and legislatures.
- Article 46: Mandates the state to promote educational and economic interests of Scheduled Tribes.
- Article 244: Governs administration of Scheduled and Tribal Areas.

#### **2. Legislative Measures**

- The Forest Rights Act (FRA), 2006: Recognizes traditional rights of forest dwellers.
- Panchayats (Extension to Scheduled Areas) Act (PESA), 1996: Empowers self-governance in Scheduled Areas.
- The Prevention of Atrocities Act, 1989: Safeguards against discrimination and violence.
- The Land Acquisition, Rehabilitation and Resettlement Act, 2013: Ensures fair compensation and rehabilitation for displaced tribals.

#### **3. Policy and Welfare Initiatives**

- Vanbandhu Kalyan Yojana: Focuses on holistic tribal development.
- Eklavya Model Residential Schools (EMRS): Provides quality education to tribal children.
- Tribal Sub-Plan (TSP): Ensures budgetary allocations for tribal development.
- Development of Particularly Vulnerable Tribal Groups (PVTGs): Targets extremely disadvantaged tribal communities.

#### **4. Digital and Media Initiatives**

- Digital India Program: Expands digital literacy and connectivity.
- Tribal Digital Literacy Programs: Equips tribals with digital skills.
- E-commerce Platforms (TRIFED's Tribes India): Markets tribal handicrafts online.
- Geo-tagging of Tribal Lands: Prevents encroachments and secures land ownership.

### 5. Institutional Support

- Ministry of Tribal Affairs: Implements tribal welfare policies.
- National Commission for Scheduled Tribes (NCST): Monitors and addresses tribal rights issues.
- Tribal Research Institutes (TRIs): Conducts research on tribal development.

### Reviewing literature:

Kapoor, N.J. et al. (2021) discuss the interactive existing portals that were revamped and the e-governance performance dashboard of the MoTA. The authors discuss real-time monitoring tools for efficient fund allocation, transparency and policy decisions for the development of tribals. They explain that the Ministry of Tribal Affairs (MoTA) has empowered the tribal population by integrating initiatives, projects and funding across government, NGO, academia and industry into a single platform and moving to data-driven policy planning, monitoring, reporting and policy decisions.

The Performance Dashboard aims to go towards a data-driven governance model to achieve digital inclusivity, financial inclusivity, and productivity improvement so that the social impact is improved substantially. The process of conceptualization, development and implementation of the system showed the main thrust should be on the quality of data, the correctness and completeness with regard to the multiple and disparate sources of data, portals and schemes. Lastly, the author opines that programs for enhancing capacity at various levels should be streamlined to update internal and external stakeholders about processes and guidelines, along with technological know-how. Fraud is reduced. Projects and outcomes are connected. The Performance Dashboard covers significant facts and figures related to tribal population. The digitization of available information that have been collected from multiple internal sources and external sources make this possible. MoTA has been actively engaged in the promotion of digital inclusion of ST population by initiatives like the exclusive Tribal Research Portal, Repository of Tribal Artefacts, Tribal Health and Nutrition Portal and Forest Rights Act. The Performance Dashboard ensures transparency when these are integrated in it. We are able to get information on their role in the holistic development of tribal population. MoTA was the first ministry to aid financial inclusion as it developed the Direct Benefit Transfer (DBT) as per the mandate of the DBT Mission. This system helped to shift from paper-based to data-based systems. Stakeholders were able to get faster dissemination of information, online access with multiple stakeholders and speedy redressal of grievances.<sup>(3)</sup>

Malik, S. (2022) argues that Scheduled Tribes in India are still subject to digital divide. Legal frameworks and government schemes aimed to digitally include the STs are discussed. Malik emphasizes policy reforms for better access, literacy and infrastructure in tribal areas. The author says that reasons for digital divide include insufficient digital infrastructure and demand-side reasons like less income and education levels among the Scheduled Tribes. There could be various reasons for the same. The digital inclusivity of a country is related to law and policy prevalent in the country and this is especially relevant for the disadvantaged communities. He further says that the Organization for Economic Co-operation and Development (OECD) notes that the presence of an independent telecommunications regulator can affect the ability of Internet services to be delivered to consumers on fair and efficient basis. Again, the author mentions OECD (2023) in that regulatory reforms can impact the supply-side challenges of the digital divide. On overcoming the digital divide, the author opines that everyone has access to digital technology and its benefits.

In order to bridge the digital divide and reap the benefits of digital technology, we require national level planning on a large scale. Our government is committed to address the digital divide through policy instruments of various kinds. The government's efforts have centered on two types of interventions. One is initiating and running government-funded schemes like IT for Masses, and secondly devising policies like the National Telecom Policy and National Education Policy to set objectives and create a blueprint to achieve the objectives.

Interventions like the BharatNet has gained success to some extent in providing internet access for STs, while ST specific interventions remain absent. There are challenges like education and employment have had little success due to opaque policies, lack of statutory backing, and lack of focus on STs. Here the government can address these challenges with the help of India's domestic capacities and lessons learnt from countries with indigenous populations like the US, Australia and Canada. Many countries are adopting innovative approaches, ranging from including private stakeholders to involving the community directly to support policy formulation. Our country can look into both its domestic experiences and those of other countries to polish its approach towards inclusion of ST population to the digital world.<sup>(4)</sup>

Satapathy, Subrata S. (2023) points out that when tribals are digitally included; they are assimilated in the mainstream of society. Since tribals are at a geographical disadvantage, digital media connects them to the outside world. Such technology can make a difference by providing the tribals with information and helping them to stay updated. It also helps in the decision-making. The author examines the digital divide affecting India's indigenous population, namely the STs. The author offers ideas to integrate them into the digital economy. The author provides insights and explains the context as he says that tribal groups in India, accounting around 8.2% or more of the population, are subject to marginalization, and that digital technologies offer a chance to empower them on socio-economic lines and provide for their inclusivity.

As challenges, the author identifies gaps in digital adoption, citing infrastructure limitations, low levels of literacy, low levels of awareness, and barriers on linguistic lines. The author again applauds MoTA as a driving force for change, as it uses data-driven governance to spearhead the development initiatives aimed at the development of tribal population through the dedicated performance dashboard. Finally, the author suggests guidelines like improving digital literacy, forging public-private partnerships (PPP) for infrastructure development, and boosting two-way communication so that digital solutions emerge that are customized to the needs of tribal population.<sup>(5)</sup>

**Objectives:**

- To examine the role of digital communication in implementation of government policies governance transparency, community participation, and the protection of tribal rights
- Highlight policies and programs for tribal welfare
- Explore digital platforms and assess their effectiveness in reaching tribal population
- Analyze case studies and policy frameworks

**Methodology:**

The paper draws heavily from sources of secondary data. Internet, government data, public documents, data have been studied to understand and draw inferences. Since the sources are reliable, field data has not been collected, (except the opinion of one director in a case study) and previously published sources have been used. Two case studies that have promoted digital literacy for tribal population have been discussed.

**Perspectives:**

This paper draws inspiration from the Theory of Technological Determinism, a sociological and mass communication approach. Thorstein Volben, American economist and sociologist coined the terms Technological Determinism. He explains that the nature of any given society is determined by technology. Technology also has the power to influence culture in a society. This notion is rooted in the ideas of Karl Marx.<sup>(6)</sup>

New media has been added to existing media and because of the new technologies in new media; there is a deterministic factor as well. As the famous media guru, Marshall MacLuhan said, the medium is the message. The medium influences the audiences, so also technological advances impact the mind of the people in our society. Critically it can be said that though man creates technology, no one can be forced to use technology. Technology to be effective requires participation of the people to use and involve themselves.

Technological determinism is a theory that suggests the technology developed, shaped and used by a society has a bearing on its culture, history and future. The changes that occur due to advancement in technology are often beyond the control of society.

The concept has evolved to mainly stress on digital and computerized technologies. Critics of the theory argue that societal needs and desires often drive technological development, thus they are of the opinion that society and technology have an interactive relationship.<sup>(7)</sup>

#### **Digital Media: Definition and Types**

All forms of content distributed through digital technologies falls within the ambit of digital media. It refers to text, images, audio, and video accessed via electronic devices.

#### **Trends in Tribal Population in India on Use of Mobile for Social Media**

Over 600 million Smartphone users actively engage in social media. The trends include:

##### *1. Growing Mobile and Internet Penetration*

- Digital India and BharatNet initiatives are expanding connectivity in tribal regions.
- Affordable Smartphone (₹5,000-₹10,000) are driving adoption.
- 40% of India's tribal population now has mobile Internet access.

##### *2. Popular Social Media Platforms among Tribals*

- WhatsApp & Facebook: Used for communication and marketing.
- YouTube: Accessed for educational and skill-building content.
- Instagram & Reels: Gaining traction among tribal youth.
- Telegram & Twitter: Used for activism and policy awareness.

##### *3. Impact of Mobile-Based Social Media in Tribal Communities*

- Education & Awareness: Mobile learning and digital inclusion.
- Entrepreneurship & E-Commerce: Online platforms support tribal artisans.
- Social & Political Engagement: Digital activism strengthens advocacy efforts.
- Healthcare & Governance: Digital health initiatives improve welfare outreach.

#### **Case Studies:**

##### **First case study: Tribal Digital Literacy Program**

This is a study based of a centre to impart digital literacy to tribal youth. If the youth of tribal population are empowered, they will be able to access government schemes and also pass on the information to others of their community. The Central University of Odisha in the district of Koraput that is a tribal-dominated district launched a Tribal Digital Literacy Program jointly with the Forum for Integrated Development and Research (FIDR) to impart and strengthen digital skills and literacy among young tribal population and make them techno-savvy. The unit started operating at the Centre for Tribal Welfare and Community Development (CTWCD) of the varsity. Youth belonging to tribal community of the district have an opportunity to get trained on digital skills. The launching of the centre offers hope to tribal youth to gain digital skills and will lead to access, knowledge and employability. This is also on the lines of *AtmaNirbhar Bharat*. The socio-economic parameters are likely to improve. The initiative will help the beneficiaries to know and access the schemes and projects related to tribal welfare, integrated tribal development and get assistance from government.

The Tribal Digital Literacy Centre is targeted to provide access and competency with regard to basic computer knowledge and skills to tribal population coming in the age group of sixteen to twenty-five years. No cost has to be paid and it extends up to three years. There are various certificate courses of different durations to be continued with few batches of enrolled students. The enrolled students could be matriculates or non-matriculates or separate batches of class twelve pass students or non-pass-outs of class twelve.

The boys and girls from SC/ST/OBC or Marginalized Section of the Society are allowed to take admission into 03 Months Computer Basic Certificate Course or 6 months computer basic certificate course during a session.

The Director of the Centre, Dr. Kapila Khemundu expressed his happiness over the successful implementation of the scheme. He informed that around 80 students belonging to tribal community have become digitally literate through the scheme.

**Second case study: GOAL (Going Online as Leaders)**

Going Online as Leaders (GOAL) Program was launched by Facebook in partnership with the Ministry of Tribal Affairs (MoTA) on 15th May, 2020 to digitally skill and empower 5000 youth from tribal communities over the next five years. The project was done to identify and mobilize 2500 well-known people from the industry including policy makers, influencers, teachers, artists, entrepreneurs and social workers. They were chosen to provide mentorship to tribal youth from all parts of India. The nine-month program includes seven months of mentorship in digital literacy, life skills, leadership & entrepreneurship and sector-specific skills and also a two-month internship for practical knowledge and ground work and experience after that.

The GOAL program is a completely digitally enabled program. It gained prominence in Covid era. There was leveraging of digital tools and platforms for e-learning, interaction and monitoring. The objective of Digital India was achieved by this platform. The program is to empower is a step to take the youth from tribal area to become spread digital awareness at the village level and become entrepreneurs for their communities.

A pilot study was done in 2019 to mentor 100 tribal girls through the support of 25 women leaders. It ran across five Indian states, namely Madhya Pradesh, Jharkhand, West Bengal, Odisha and Maharashtra. The response was satisfactory and there were many success stories. GOAL in 2020 partnered with more than 46 MPs, 250+ NGOs & COEs, top-tier educational institutes and members of the state and central bureaucracy. It used webinars, video endorsements and social media for a strong all India reach.

It is imperative in the program to ensure for a governing committee is established to monitor and spearhead the program. The program by its wide network of partners aims to ensure optimal reach and contribute to empowerment and progress of the tribal community.<sup>(8)</sup>

**Analysis and Discussion:**

An intersection of digital media and governmental policies are keystones for tribal development and tribal empowerment.

Today Smartphone and social media initiatives promote access, education, knowledge, and involvement in feedback sharing.

Transparency and accountability are important for governance and digital initiatives pave the roads for tribal inroads into the above.

At the same time the challenges and barriers for tribals like improving digital literacy, removing linguistic barriers and countering misinformation are to be handled.

Digital initiative also calls for sustainable development for tribal population. Community participation and innovation from the group to garner government support initiatives is the need of the hour.

**Recommendations:**

There is a need to consider infrastructure gaps and investment. Cultural and linguistic barriers are to be removed. This will promote access in tribal broadband and promote tribal participation and democratization. Connectivity correlates with better outcomes. Feedback from stakeholders regarding improvement is necessary. Gender gap should also be considered. All grievances must be addressed with immediate effect. Training of tribal youth to improve digital literacy in the community will boost confidence in the government schemes.

**Conclusion:**

The increasing adoption of mobile-based social media among India's tribal population is fostering empowerment in education, business, and governance. However, challenges such as digital literacy, language barriers, and misinformation must be addressed for sustainable and inclusive digital growth. With targeted government policies and community-driven digital initiatives, mobile

technology can significantly contribute to the social and economic progress of people belonging to the tribal communities.

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# E-learning and Development of Nomophobia among Adolescents

Natasha Sharma\*  
Dr. Ravi Ranjan\*\*

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## Abstract

*In the past few years, the advancement of technology has created a situation in all over the world where it has become an integral part of everyone's life. Information and Communication Technology has affected every aspect of our life and education is no exception to it. The trend of e-learning is increasing.*

*E- learning is a learning environment which uses information and communication technology as a platform for teaching and learning activities. It is also known as online learning or electronic learning.*

*Nomophobia or no mobile phone phobia is a term described as a phobia for a particular or special thing. Nomophobia is a problem of virtual or digital society. It refers to discomfort, anxiety, nervousness or anguish caused by being out of contact with a mobile phone. It is considered as a form of behavioural addiction.*

*As we know, technology has an important place in the current education system and e-learning has become very popular in the whole world including India. But everything have their pros and cons.*

*The increasing use of new technological devices like computers, smartphones and virtual communication has brought changes in the daily behaviour and habits of the individual as well as students.*

*The paper discusses about how e- learning develop Nomophobia in adolescent. Since e-learning is being used as an important aspect in imparting education from which students are benefit but some negative consequences are also emerging. Earlier it was used in higher education but now it is being used in school education also. Many studies have shown that due to prolonged screen time, many types of physical, mental, behavioural and social problems are arising. E-learning can also increase this screen time and develop phone addiction which affects the different aspects of development of school students and this may lead to the development of nomophobia.*

**Keyword:** E-learning, Nomophobia, Adolescent

## 1. Introduction

In the era of 21<sup>st</sup> century it is evident that there has been a paradigm shift or changes in education system i.e. transformation from manual to digital mode. In the past few years, the advancement of technology has created a situation in all over the world where it has become an integral part of everyone's life. Development and invention in the field of science and technology have also played an important role in it. Information and Communication Technology has affected every aspect of our life and education is no exception to it. Education system which was earlier based on face-to-face interaction in the classroom now teaching- learning process is incomplete without technology. Technology advancement has created many devices like computers, smartphones, tablets, smart TVs, projectors etc. to make life simpler and to get information quickly.

The concept and use of e-learning has increased significantly in the last few years in the area of education and becomes very popular in whole world as well as India. In India e- learning or online

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\* Research Scholar, Dept. of Psychology, Patliputra University, Patna  
Email: natasha4dso@gmail.com Contact no. 9955182765

\*\* Assistant Professor, Dept. of Psychology, Oriental College, Patna  
Email: drfarhatjabin@yahoo.com Contact no. 8709336628

learning was not widely used until a few years ago. It was used only by students and teachers of distance education, some online institution, higher education and persons who admitted in foreign universities. But due to COVID-19 Pandemic in 2020, e-learning used from primary to higher level in education. The trend of e-learning or online education has increased in India in the last few years. Especially the Covid-19 pandemic has presented it as an alternative. The Government of India has also included it as a blended learning in NEP, 2020 and it become an important part of the main stream education system and formal education. Apart from this, many online courses and online coaching institutes (Byju's, Academia etc.) are running their institutes at the online level in which people are getting their children to take classes. But the process of learning has become even more complex due to online mode or e-learning. New tools and programs about which teachers and students do not have much knowledge are making it even more complex. Many teachers are not technically competent and many students do not have the facilities of devices and connectivity required for online education or e-learning. This problem is more in a developing country like India.

## **2. E-Learning: Concept**

**E-learning** refers to a mode of learning in which students are taught through the internet using devices like computers, mobile phone, tablets, projector etc. It is a flexible instructional delivery system that encompasses any kind of learning that take place via internet. It is also a process of teaching and learning in which information and communication technology is used as a platform where teaching and learning activities are completed.

### **2.1 E-learning: Positive Aspects**

**According to Zaid (2009)**, "E-learning is a term for all types of technology enhanced learning, where technology is used to support the learning process."

The term e-learning comprises a lot more than online learning, virtual learning, distributed learning, network or web- based learning. It would incorporate all educational activities that are carried out by individual or groups working online or offline, and synchronously or asynchronously via networked or standalone computers and other electronics devices (**Chitra A.P. et al.**).

E-learning Carries out the teaching- learning process or activities through smart classes, video conferencing etc. In this, teaching process is done using the internet through various devices such as computers, smartphones, tablets, smart TV, projector etc. Information can be easily obtained or teaching- learning process is possible while sitting at one place.

It Has been included in the education world with the names e-learning, online education, digital education, virtual learning, blended mode of learning etc. It is being used in both formal and informal education, in all over the world. It has brought students closer to computers and smart phones. The entire world's knowledge and information has come at the click of a human finger. Information related to any field can be obtained within minutes. This has made the field of education more extensive and easily accessible. But everything have their pros and cons and E-learning has too.

### **2.2 E-Learning: Negative Effect**

In this type of learning, there is a lack of face-to-face and physical interaction. Earlier, it was used more in the field of distance education and higher education, but at present it is also being used in regular mode and school education too. Many time students are not able to fully participate in the class and not being able to communicate due to connectivity problems such as network problems, technical issues. Due to loss of connectivity or network failure, nervousness, frustration, fear and anxiety increase among the students. During online classes, due to the absence of face to face classroom situation, many times students are looking at something else on the screen or are involved in some other activities despite being connected. There is also lack of interaction in a physical way. It is also not possible to make the assumptions that teachers used to make on the basis of faces and gesture- postures of students in front of them. It is not possible to have an in-depth discussion on a topic or subject, which is essential for clarity of the subject. Other hand, due to spending too much

time on the screen, it impacts young children and adolescents and developed many physical problems and the possibility of mental and cognitive disorders are also increasing.

In the article written by **Colleen Halupa (2016)** discussed the effect of technology and online learning on students' mental, emotional and social health. According to this article, excessive use of technology can negatively impact the physical, mental, emotional and social health of youth. Therefore, caution must be exercised in the use of technology among children and adolescents.

**Jumaroh and Eka Budiarto (2022)** point out that online learning may be associated with psychosocial health and addiction to smartphone. Their study reported that most of the respondent were psychosocially unhealthy and high risk of being addicted to a smartphone.<sup>8</sup> Recently in a study conducted by **Yangqiang Tao et al. (2023)** in the field of online learning and Internet addiction proved that the negative effect of online learning on secondary students' mental health and have important application for developing more effective interventions and policies to mitigate Internet addiction level among adolescents undergoing online learning.

Digital learning brings numerous benefits in education system but also raises significant questions about its effects on our daily life. Research indicates that it can have complex consequences on mental, emotion, physical health and social life. It can lead smartphone addiction and nomophobia too.

### 3. Nomophobia: Concept

**Nomophobia**, the abbreviation of 'No mobile phobia'. It is the "fear of staying without smartphone" (**Dailymail.co.uk,2008; Erdem, Turen and Ercil,2017**). It has been identified as another pathology of the digital age. The diagnostic and statistical manual of mental disorders (DSM) is the standard manual for the assessment of psychiatric disorders. Nomophobia defined in DSM-IV as a specific phobia and has been proposed to be included under specific phobia in the DSM-V.

It is a condition in which a person fears that he may be away from his phone, or may not be able to see any important message, or may lose connectivity. Due to this fear and anxiety, he keeps checking his phone again and again This thinking creates stress and anxiety in the person.

#### 3.1 Nomophobia: A digital Era Problem

A study conducted by **Yildirim et al. (2016)** in the field of prevalence of nomophobia finds that gender and the duration of a smartphone ownership had an effect on young adults' nomophobic behaviours, whereas age and the duration of mobile phone ownership had no effect. It also revealed that 42.6 percent of young adults has nomophobic and their greatest fear were related to communication and information access.<sup>14</sup> Another study conducted by **Rana and Sharma (2022)** findings showed that long term usage leads to addictive behaviour that is in evolving as a public health issue in a huge section of medical students.

According to studies, nomophobia can be considered a threat to the online learning aspect. E-learning or online learning requires students to access smartphones more often has an impact on students' dependence on the existence of smartphones.

Study in the field of digital literacy and nomophobia conducted by **Sulistiyani et al. (2021)** revealed that the online learning has the opportunity to increase digital literacy but on the other hand there is also a threat of increasing nomophobia.

Research conducted by **(Soleymani et al. 2019)** in the area of nomophobia and health hazards in the context of smartphone showed that there was a positive correlation between nomophobia and the frequency of using a smartphone.

The increasing use of new technological devices like computers, smartphones and virtual communication has brought changes in the daily behaviour and habits of the individual as well as students. Social media and digital gaming have become a means of entertainment and time-pass among people. Now E-learning is being used as an important mode of imparting education in the current education system and from which students are benefiting. But its negative effect is also on the body and mind. In some form or the other, whatever time a student is spending on the screen, e-learning is helping in increasing that screen time. But due to excessive use of smartphones and

spending too much time on screen, people are getting addicted to it and are falling prey to behavioral disorders as well as many mental and physical problems. Children, teenagers, adults, elderly, all are being affected by this virtual era in some form or the other and are developed phone addiction, depression, anxiety, physical problems related to eyes, head, waist, body posture etc. Have become common. Due to excessive screen time in children, disorders like language development and virtual autism are being seen.

#### 4. Adolescence: Concept

It refers to the childhood phase of a person's life which is transitional stage between childhood and adulthood. **G.S. Hall** has called it the state of 'stress and storm'. In this stage, physical, social, cognitive, intellectual etc. Changes take place in the adolescent which are more or less universal in nature. **Erik Erikson** has shown this stage as a stage of identity and role confusion. In this stage, adolescent children are struggle mentally and socially for their identity. They also become victims of confusion due to physical changes and social expectations.

Education of adolescence is also considered the basis of higher education. At this age, children take secondary and higher secondary education and enter the field of higher education and also decide what they want to do or become in the future. Which profession, job or occupation to adopt. At the same time, at this age, there is a greater risk of teenagers getting trapped in bad company and adopting bad habits. The foundation of a healthy life is laid in adolescence. If there is no healthy development of all aspects at this stage, it will affect the entire personality. From this point of view, this stage of human life is very important.

##### 4.1 Adolescent: E- learning Effect

According to study conducted by **Buctot, D.B. et al. (2020)**, Adolescents spend a lot of their time on smartphones. They find it difficult to go about their daily life without using their smartphones. Losing a mobile phone or wi-fi connection can be distressing to anyone.1

4.2 The intense smartphone use in individuals' daily lives due to the mass popularization of these devices made necessary to analyze the limits of its use. Since it's use can trigger dependency, it became a serious problem. Even worse is when smartphone extreme usage is not recognised as an issue because it is considered so prevalent especially among young adults in all areas of their lives (**Sales et al. 2018**).

Studies also shown that, the student' lives are very dependent on smartphones or other gadgets, one of the aspects that can trigger this condition to occur is the online learning situation, where all the activities were conducted on the digital media platform. At least students who are not nomophobia also show that nomophobia has proven to be one of the negative impacts that students have to face as participants in online learning.

Since man is a social animal, his supreme development is possible only through social interaction in society. But due to the current and busy lifestyle, man is not able to find time for himself or the family. According to research, mental problems of low to high level are increasing all over the world. Stress, anxiety, social isolation, loneliness etc. Have become common problems. Children and adolescents are spending their time playing video games and on social media instead of going out and playing. They are also becoming dependent on technology for every work related to reading and writing which increases their dependence on technology. It is becoming an obstacle in the way of their healthy physical, mental development etc.

#### Conclusion

Since e-learning is being used as an important aspect in imparting education from which students are benefit but some negative consequences are also emerging. Earlier it was used in higher education but now it is being used in school education also. Many studies have shown that due to prolonged screen time, many types of physical, mental, behavioural and social problems are arising. E-learning can also increase this screen time and develop phone addiction which affects the different aspects of development of students and this may lead to the development of nomophobia. Thus, we can say that e-learning promotes more use of screen time among teenage students and can contribute

to the emergence of many problems. Out of which, nomophobia can also be a special psychological problem of the current virtual era.

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# The Effects of Gender Differences and Social Media Utilization on Academic Performance of Higher Secondary Students

Pramila Singh\*

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## **Abstract:-**

*This study examines the effects of gender differences and social media utilization on the academic performance of higher secondary students. In recent years, social media has become an integral part of adolescents' daily lives, influencing their learning habits, social interactions, and overall well-being. The research aims to explore how patterns of social media usage vary between male and female students and how these differences impact their academic performance. A descriptive survey method was employed, involving a representative sample of higher secondary students. Data were collected using standardized questionnaires measuring social media usage, academic performance indicators. Statical analyses were conducted to identify correlations. The study concludes that balanced and mindful use of social media is essential for maintaining academic success and overall well-being. It also highlights the need for educators, parents, and policymakers to develop strategies that promote healthy digital habits among students while considering gender-specific needs and behaviors.*

**Keywords-** adolescents, academic performance, social media.

## **Introduction: -**

**Adolescents-** Higher Secondary Students are in the age of 14 to 19 which is known as adolescent age. Adolescence is a crucial developmental stage that marks the transition from childhood to adulthood. This period is characterized by rapid physical growth, emotional changes, cognitive development, and the formation of identity. Adolescents begin to develop independent thinking, establish social relationships beyond family, and become more influenced by peers and external environments.

During this period, individuals experience significant psychological and social transformations. They become more self-aware and sensitive to societal expectations, which can affect their self-esteem and decision-making. The increasing exposure to technology, especially social media, has further reshaped adolescents' behavior, communication patterns, and lifestyle choices.

In the modern digital age, social media platforms play a vital role in adolescents' daily lives, while these platforms offer opportunities for leaving, social interaction, and self-expression, they can also pose challenges such as distractions from academic activities, reduced physical activities, and potential impacts on mental health. The way adolescent engage with social media often varies based on gender interests, and social influences. Understanding adolescence is essential for analyzing how factors like gender differences and social media utilization influence academic performance. Since this stage lays the foundation for future development, it is important to guide adolescents toward healthy habits, balanced technology use, and positive social engagement. According to Neeru Saini et al. (2020) social media is steadily penetrating in the lives of adolescents in India. Other authors found that age, gender and education of parent's affects academic performance (Khan, Iqbal, Tasneem, 2015 Eshetu, 2014).

## **Academic Performance: -**

Academic performance refers to the extent to which a student achieves educational goals, and typically measured through grades, test scores, and overall scholastic achievement. It is

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\* Research Scholar, Department of Psychology, J. P. University, Chapra (Bihar)  
Mobile No. 9934520497, Email- pramilasingh9934520496@gmail.com

considered to be the Centre around which the whole education system revolves (Anthony Abaido, 2018). Martha (2009) emphasized that academic performance of students is defined by ‘a student’ performance in an examination, tests and in a course. According to Yusuf, Onifade and Bellow (2016) “academic performance is the measurable and observable behavior of student within a specific period, which consists of scores obtained by student in assessment. “Zahid Amin et al. (2016) determined that in recent time social media encourage the career and future of students. Sanyogita Dhanwal et al. (2022) concluded that the social media use is positively correlated with age, sex and streams of study and negatively associated with the academic performance of the students. Joshi and Sharma (2017) show that the internet non users study habits are better than internet users with reference to different dimensions, gender and stream. This phase of student is the most important phase of life and education. Performance in this age decides the future of students. This significance of academic performance in this higher secondary level also signifies the present research work.

**Hypothesis: -**

There will be a significant difference in the gender and academic performance.

**Method of Study: -**

1. **Sample: -** The data will be collected from total of 400 students (200 males and 200 females), studying in class 11<sup>th</sup> and 12<sup>th</sup> in different schools /colleges of Siwan (Bihar).
2. **Measuring Instrument: -** The SSA Tool used to measures students’ perception of sociability and academic performance under social network sites environment.

**Results**

The results section of the data analysis sheet offers a rigorous empirical investigation into the effects of gender differences and social media utilization on academic performance among 400 higher secondary students (200 males, 200 females, aged 16-18 years), aligned with the study's the hypothesis. Analyses incorporate descriptive statistics, independent samples t-tests, Generalized Linear Model (GLM) regression, and Pearson correlations, supported by tables and graphs that visually encapsulate key distributions and relationships. These findings, rooted in SSA, validate hypothesis at  $\alpha = 0.05/0.01$  levels, revealing social media as a net positive influence moderated by gender.

**Table 1. Gender of Subjects**

Gender of Subjects		
Gender	Frequency	Percent
Male	200	50.0
Female	200	50.0
<b>Total</b>	<b>400</b>	<b>100.00</b>

Further, Table–2 compares academic performance scores across gender. Female students obtained a higher mean score (M = 44.80, SD = 10.70) than male students (M = 41.98, SD = 10.03).

**Table 2. Gender and Academic Performance of Students**

Gender	N	Mean	SD	Std. Err	95% CI Mean	Min-Max	DF	t value	p
Female	200	44.80	10.70	0.7569	43.30-46.29	28-63	398	2.72	<b>0.0069*</b>
Male	200	41.98	10.03	0.7095	40.58-43.38	26-59			
<b>Diff (1-2)</b>		2.82	10.37	1.0375	0.748-4.86				

*\*Significant at 0.05 level*

The analysis presented in Table 2 examines the relationship between gender and academic performance among the respondents, with an equal representation of male and female participants (N = 400; 200 males and 200 females). The results indicate a clear difference in mean academic scores between the two groups, with female respondents obtaining a higher mean score (M = 44.80, SD = 10.70) compared to their male counterparts (M = 41.98, SD = 10.03). The observed mean difference of 2.82 points suggests a trend in which female students demonstrate relatively better academic performance.

An examination of the dispersion measures reveals that the variability in academic scores is fairly similar across both groups. The standard deviation for females (10.70) and males (10.03) indicates that the spread of scores around the mean is comparable, suggesting that the difference in mean performance is not due to unequal variability. Furthermore, the standard error values (0.7569 for females and 0.7095 for males) are also closely aligned, reflecting a similar level of precision in estimating the population means from the sample data. The range of scores, with females scoring between 28 and 63 and males between 26 and 59, further highlights that although both groups exhibit a wide distribution of academic performance, the upper limit achieved by female respondents is slightly higher.

The 95 percent confidence intervals provide additional insight into the reliability and significance of the observed differences. For female respondents, the confidence interval ranges from 43.30 to 46.29, whereas for male respondents, it ranges from 40.58 to 43.38. The limited overlap between these intervals suggests that the difference in mean scores is unlikely to be due to random sampling variation. Moreover, the confidence interval for the mean difference (0.78 to 4.86) does not include zero, which further substantiates the presence of a statistically meaningful difference between the two groups.

To test the statistical significance of this observed difference, an independent samples t-test was conducted. The calculated t-value of 2.72 with 398 degrees of freedom yields a p-value of 0.0069, which is well below the conventional threshold of 0.05. This result leads to the rejection of the null hypothesis, which posits that there is no significant difference in academic performance between male and female respondents. Thus, it can be concluded that gender has a statistically significant effect on academic performance within the sampled population.

### **Discussion**

From a theoretical standpoint, these findings can be interpreted within the broader framework of gender and educational achievement. The higher performance of female respondents is consistent with a growing body of research indicating that girls often outperform boys in structured academic settings. This trend has been attributed to a range of socio-cultural and psychological factors. Socialization processes play a crucial role in shaping gendered behavior patterns, where females are often encouraged to be more disciplined, organized, and compliant with institutional norms. Such traits are positively associated with academic success, particularly in formal educational environments that reward consistency, attention to detail, and adherence to rules.

In addition, psychological explanations emphasize differences in self-regulation, motivation, and study habits. Female students are often found to exhibit higher levels of intrinsic motivation and academic engagement, which contribute to sustained effort and better performance outcomes. On the other hand, male students may demonstrate greater variability in performance due to factors such as lower academic persistence, higher engagement in non-academic activities, or differing attitudes toward formal education.

It is also important to consider the role of structural and environmental influences. Educational institutions, teaching methodologies, and evaluation systems may inadvertently favor learning styles and behavioral traits that are more commonly associated with female students. For instance, continuous assessment patterns, emphasis on written expression, and classroom discipline may align more closely with the strengths typically developed among female learners through socialization processes.

However, while the statistical significance of the findings is evident, the magnitude of the difference should be interpreted with caution. The mean difference of 2.82, when considered in relation to the standard deviations, suggests a small to moderate effect size. This indicates that although gender differences exist, they do not account for a large proportion of the variance in academic performance. Other factors such as socio-economic status, access to educational resources, quality of schooling, and individual cognitive abilities are also likely to play substantial roles.

In conclusion, the analysis demonstrates that female respondents significantly outperform male respondents in terms of academic performance, and this difference is both statistically reliable and theoretically meaningful. The findings underscore the importance of considering gender as a critical variable in educational research and policy formulation. At the same time, they highlight the need for a more nuanced understanding of the multiple factors influencing academic achievement, ensuring that interventions aimed at improving educational outcomes are inclusive and sensitive to gender-specific needs and challenges.

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