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EDITOR'S NOTE

It is a great honour to me to extend my warm greetings and welcome you all to the journal, **Research Highlights,** a refereed journal of multi disciplinary research. The journal, which is a peer-reviewed, will devote to the promotion of multi-disciplinary research and explorations to the South Asian and global community. It is our objective to provide a platform for the publication of new scholarly articles in the rapidly growing field of various disciplines. We are trying to encourage new research scholars and post graduate students by publishing their papers so that they may learn and participate in literary publishing through a professional internship. Scholarly and unpublished research articles, essays and interviews are invited from scholars, faculty researchers, writers, professors from all over the world.

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

Editor

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"Research Highlights"

A Review of Environmental Consciousness with Major Concern Related to Climate Change and its Effect On Biodiversity in India

Dr. Lalit Prakash[*]
Divya Parashar[**]

Abstract

India is a "mega-diverse" country that has a significant problem to identify a balance between preserving its wealth of natural resources and promoting economic growth, as only 2.4% of its total area of land supports 8% of the world's biodiversity. The "threat multiplier" effect of climate change has worsened this particular problem by destroying habitats and changing ecosystems more quickly than species can adapt. Climate change is currently the most significant environmental problem the world is experiencing. It is a challenge as well as a threat. It is predicted that climatic changes are likely to hurt the key economic sectors and sustainable development. It is predicted that all sectors of developing countries will be more severely impacted by climate change. Biodiversity is one such sector that will be seriously impacted. Changes to the country's present climate system may affect India's different ecosystems, which may have an impact on key sectors including agriculture, forestry, water resources, health and the industrial sector. Climate change is one of the major threats to biodiversity because it increases the pressure on species, populations, and genetic resources. Biodiversity Conservation and promoting sustainable development are two possible ways that might be used to reduce the impacts of climate change. The present study focuses at the rising environmental consciousness in India and the significant threats to its biodiversity posed by climate change. This paper reviews the current status of knowledge on biodiversity and climate change, including the most recent understanding of the observed climatic changes and their effects on biodiversity at the national level in the context of India. Additionally, it further discusses summarily the actions taken on a national level to mainstream climate change concerns about biodiversity.

Key Words: Climate Change, Biodiversity, Sustainable Development, Global Warming, Greenhouse Gas.

1. Introduction:

Globally, particularly in India, the effects of climate change present multiple challenges. It refers to a change in climate that is attributed directly or indirectly to human activities that alter the composition of the global atmosphere.[1] Climate change is associated with several negative effects on the agricultural sector, water resources, forests and biodiversity, good health, coastal management, and temperature rise. The major effect of climate change on India is a decline in agricultural production.[2]

Climate change is a shift in the usual weather patterns that are prevalent on Earth. The weather may change quickly, as we all know, yet it can take hundreds of years or even millions of years for the climate to shift.[3] Climate change in India is having profound effects on India, which is ranked fourth among the list of countries most affected by climate change in the year 2015.[4] India emits about 3 Giga tonnes (Gt) CO2eq of greenhouse gases each year; about two and a half tons per world person, which is less than the average.[5] The country contributes 7% of the world's emissions despite having 17% of the world's population.[6]

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India, which was ranked as the fourth most affected country by climate change in 2015, also experiencing severe consequences from the phenomenon. India emits more greenhouse emissions than the world as a whole on average—approximately 3 Giga tonnes (Gt) CO2eq per year, or approximately two and a half tons per person. Despite of having 17% of the world's population, the country generates 7% of global emissions. The Ganges, Brahmaputra, Yamuna, and other important rivers' flow rates are in danger due to the retreat of Himalayan glaciers on the Tibetan Plateau as a consequence of increasing temperatures.

In India, heat waves are becoming more severe and more frequent as a result of climate change. Floods and Severe landslides are expected to occur more regularly in places like Assam. Out of 63 countries, which would be responsible for 92% of global GHG emissions in 2021, India's performance in combating climate change comes in at eighth rank. India's temperature increased by 0.7 °C (1.3 °F) between 1901 and 2018.

The Ganges, Brahmaputra, Yamuna, and other important rivers' flow rates are at risk due to Himalayan glaciers retreating as a result of temperature increases on the Tibetan Plateau. According to a 2007 World Wide Fund for Nature (WWF) assessment, the Indus River could dry up for the same reason.[7] In India, both the intensity and frequency of heat waves are both rising due to climate change. States like Assam are predicted to see more frequent severe landslides and floods.[8]

2. Factors responsible for Climate change in India:

2.1. Burning Fossil Fuels: Burning wood in fires for cooking or heating, burning coal to produce electricity, burning oil to power cars and planes (vehicle emissions), and other similar activities transform stored organic carbon from a liquid (like oil) or solid (like coal/wood) into a gas (like carbon dioxide) that is released into the atmosphere.[9]

2.2. Industrial Emissions: The manufacturing of cement, iron, and steel are the primary contributors to industrial pollutants, which account for 25% of all emissions. Fuel consumption in the industrial sector increased by 406% between 2000 and 2014. As of 2014, 42% of energy was also consumed by industry.

2.3. Deforestation: During the process of the process of photosynthesis vegetation takes carbon dioxide from the atmosphere and converts it to carbon, which is then stored by all plants (i.e., it is a carbon sink). This organic carbon is converted from a carbon sink to a carbon source when vegetation is burnt because it emits carbon dioxide into the atmosphere.

2.4. Electricity Generation: According to the Central Electricity Authority, India will target to raise its installed capacity by a total of 472 GW between 2022 and 2032.[10] This would come from two sources, solar (279 GW) and wind (94 GW), for almost to 80% of the overall. These targets are in line with the pledge of India to have 500 GW of non-fossil generation capacity by 2030, which was made during COP26. About 32 lakh crore would be needed for these projects.[11] Increase in installed capacity of electric power from non-fossil sources to 50% by 2030 is part of India's Nationally Determined Contribution.[12]

Fossil fuels are utilized in the energy-generating process to produce heat that powers steam turbines, which contributes to around 40% of the world's CO2 emissions. India generates 60.2% of its electricity from fossil fuels, of which 51% is coal, and 39.8% from renewable energy sources as of September 2021. When these fuels are burned, carbon dioxide (CO2) is produced, which is a primary "greenhouse gas" that traps heat and causes global warming.

2.5. Coal-fired power plants: In contrast with renewable energy sources, India has an extensive system of coal power plants that produce inexpensive electricity. There will be a phase-out of coal as India advances toward renewable energy sources. It could be challenging to gradually reduce the capacity of coal plants.[13] The decommissioning of coal plants might have some negative effects on the environment, including employment losses and emissions from demolition and disposal of waste (such as metal scrap and oil sludge).[14] To address these issues, these guidelines mandate that coal companies accomplish Environmental Impact Assessments before decommissioning and clean up the

site following decommissioning. Companies should also demolish the plant to the extent that it may be put to use elsewhere.[15]

India's coal-fired power plants, which provide around 70% of the nation's electricity, are under serious risk because of overcapacity, affordable renewable energy sources, and water scarcities. In addition to its own coal mining, India also imports coal to be used in its coal-fired power plants. There is currently a significant overcapacity in the coal mining industry. India's coal-fired power capacity is currently 50 Giga watts above normal demand levels and 20% over peak demand.

2.6. Urbanization and Industrialization: Rapid industrialization and urbanization have led to an over exploitation of natural resources, which has contributed to climate change.[16]

3. Impact of Climate Change:

3.1 Biodiversity: Indian biodiversity is threatened and is affected by a variety of direct and indirect effects. As much as a third of all indigenous species are in threat of extinction, according to the National Forest Commission, which found that the number of these effects and challenges is quite considerable. The key threats to India's biological resources are similar to those that threaten biological resources across the globe, including habitat loss, fragmentation, and degradation; unsustainable usage; over exploitation; pollution; invasive alien species; climate change; and desertification.[17]

In only 2.4 percent of the world's land area, India has more than 45,000 plant species, making it a country with a high biodiversity. In the entire country, more than 12% of the wild animal species are in danger of going extinct. According to the findings, larger species, especially those that live in freshwater habitats, are more at danger of turning extinct. These include, among others, the river dolphins found in India, the enormous Mekong catfish, the otters, and the beavers.[18]

3.2 Impact of the Climate Change on Natural Environment: Temperatures in India have risen by 0.7 °C (1.3 °F) between 1901 and 2018, thereby changing the climate in India.[19] The Ganga, Brahmaputra, Yamuna, and other important rivers, which are essential to the lives of hundreds of thousands of farmers, are at danger of flooding as a result of retreating Himalayan glaciers brought on by temperature increases on the Tibetan Plateau.[20]

3.3 Changes in the weather and temperature: The Intergovernmental Panel on Climate Change (IPCC) predicted a 1.5°C rise in temperature by 2040 compared to pre-industrial levels (1850–1900) in August 2021. This could lead to an increase in heat waves, a reduction in snow cover, a rise in ocean level, and an increase in the frequency and intensity of tropical cyclones.[21]India's temperature changes from 1901 to 2020 are shown. India's climate has changed as a result of a 0.7 °C (1.3 °F) increase in temperature between 1901 and 2018. In India, a severe heat wave was recorded in May 2022. The temperature reached to 51 °C. Such heat waves are 100 times more likely as a result of climate change.

3.4 Resources for Water: In India, 15% of the groundwater resources are being over exploited even in the absence of climate change. In account of rising water consumption from a growing population, more affluent lifestyles, the services sector, and industry, as well as from the industry, it is projected that falling water tables would continue to decline. Increased temperatures on the Tibetan Plateau are causing the Himalayan glaciers to retreat, which is threatening the Ganga, Brahmaputra, Yamuna, and other important rivers, which are essential to the lives of hundreds of millions of farmers. According to a World Wide Fund for Nature (WWF) report, the Indus River could dry up for the same reason.

3.5 Impact on Himalayan Glaciers: Climate change, which is a result of global warming, is causing the glacier melt. It is now clear that global warming is occurring due to human activities, primarily the excessive burning of fossil fuels like oil and coal. Himalayan glaciers are a source of fresh water for perennial rivers in India.[22]

3.6 Impact on Sea Level: The next effect of climate change is rise of sea levels. Though a sea level rise in some Indian coastal cities has been quite mild so far, less than a centimeter a decade, it did not specify its rise in recent years.[23]

Sea levels would rise in the Indian subcontinent far more quickly than they would at higher latitudes due to its proximity to the equator. Sea-level rise and storm surges would cause saltwater intrusion in coastal areas, which would impact agriculture, degrade groundwater quality, contaminate drinking water, and possibly lead to an increase in cholera outbreaks and diarrhea cases because the cholera bacterium can survive longer in saltwater. Due to their high population densities, Kolkata and Mumbai are particularly susceptible to the effects of river in floods, tropical storms, and sea level rise.

4. The Impact of Climate Change on India

4.1 Impact on Agriculture: India's agriculture industry is susceptible to climate change. Higher temperatures tend to reduce crop yields and flavor weed and pest proliferation. Due to changes in water supply and temperature rise, climate change may have an adverse effect on the yields of irrigated crops in all agro-ecological regions.[24] The climate change could cause irresistible damage to land and water ecosystems and lead to loss of production potential.[25]

In the last three decades, there has been an increase in the frequency of severe rainfall events as well as a rise in the mean temperature over all of India. Major crop production fluctuates as a result in different years. National Innovations in Climate Resilient Agriculture studied whether climate change will impact Indian agriculture (NICRA). In India, it is predicted that irrigated rice yields would increase by 7% in 2050 and 10% in 2080 scenarios, while rain fed rice yields will decrease slightly (2.5% in each scenario). Furthermore, wheat yields are predicted to drop by 18–23% and wheat yields by 6-25% in 2100. Chickpea productivity is predicted to grow by 23-54% in future climates.[26]

4.2 Economic Impacts: According to a research by the London-based Overseas Development Institute, climate change might cause India to lose anywhere between 3 and 10% of its GDP yearly by 2100 and increase its poverty rate by 3.5% by that year.[27]Indian economic growth has decreased by 31% as a result of global warming.[28]Since the past, recurring floods and droughts during the boreal summer have caused substantial socioeconomic losses in India.[29] According to IPCC7, India, like other developing countries, is projected to experience losses in all significant economic sectors, including energy, transportation, agriculture, and tourism.[30]

According to the World Bank report, 7 out of the 10 severe hotspot areas are in Maharashtra's Vidarbha region. The remaining ones are in Madhya Pradesh and Chhattisgarh. The GDP loss in these extreme hotspots might be as high as 9.8% compared to the national average of 2.8%.[31]

4.3 Impact On Human Health: A number of prominent severe weather conditions, including increasing temperatures, precipitation, more frequent and intense heat waves, floods, droughts, high winds, and landslides, are problems caused by climate change that have an impact on human health.[32]The impacts of climate change on fluctuations in temperature and precipitation, which can cause in extreme heat, extreme cold, and unexpected rain, include malnutrition, water and airborne infections, vector-borne infections, the incidence of diarrheal diseases, and heat-related morbidity and death.[33]Aside from dehydration as well heat cramps, heatstroke, heat exhaustion, fluid loss, heat injuries, and eye and skin illnesses, the effects of heat on human health also include dehydration.[34] These health effects are more likely to affect children, the elderly, and those who reside in urban. Climate change has been linked to about 150,000 deaths and 5 million diseases per year.[35]

The World Health Organization (WHO) expects that between 2030 and 2050, climate change would result in an extra 250 000 deaths year from hunger, malaria, diarrhea, and heat stress. Human health issues attributed to climate change either directly or indirectly include respiratory infections, chronic pulmonary obstructive disease, asthma, hyperthermia, and dehydration. In India, 6% of children and 2% of adults suffer from respiratory tract infections and asthma, which are developmental risk factors.

4.4 Heat Waves: In India, heat waves are occurring more frequently and are more intense. 36 individuals recently died when the temperature in 2019 surpassed 50.6 degrees Celsius. In 2019, 23 states are anticipated to be affected by the high temperatures, compared to nine in 2015 and 19 in

2018. The frequency of heat wave days has increased as both daytime and night time temperatures have increased. Eleven of the country's fifteen warmest years have happened since 2004, and 2018 was the sixth warmest year on record. New Delhi's capital had an all-time high temperature of 48 degrees Celsius.

5. INDIA'S APPROACH TO CLIMATE CHANGE:

5.1 India has set certain target of achieving net zero emissions and transition to a more sustainable energy source. For instance, India set a target for achieve net zero emissions by 2070 and increasing the proportion of renewable energy in India's energy mix to 50% by 2030 during COP26 in November 2021.[37]

5.2 In compliance with India's energy strategy and the Paris Agreement, the Indian Government and several state governments have taken specific actions. These are a few of those steps:

5.3 By 2030, India should double its goal for renewable energy to 450 giga watts (GW)

5.4 Mission Solar National

5.5 Indian wind energy

5.6 India's National Action Plan on Climate Change (NAPCC), which set out various goals for the country as a whole, was published in 2008. These goals include off, but are not restricted to, covering a third of the nation with trees and forests and increasing the supply of renewable energy to 6% of the entire energy mix by 2022, and continuing disaster management. All of the actions aim to improve the resiliency of the country as a whole, which is crucial because India's economy is largely dependent on its natural resource base and climate-sensitive sectors like forestry, agriculture, and water.

5.7 Forest Cover is One of the eight missions within the NAPCP is the National Mission for a Green India.[38]It seeks to protect, improve, and enhance India's forest cover. The Mission will get Rs 220 crore in 2023–2024, a 3% increase above the 2022–2023 revised estimates. In comparison to the budget expectations (Rs 362 crore), the Mission's allocation has been reduced by 41% during the 2022–23 revised stage (Rs 214 crore).[39]

5.8 Finance Minister Niranjan Pujari of the Indian state of Odisha presented the Climate Budget when presenting the state budget for the financial year 2020–2021. The climate budget strives to maintain track of the expenses incurred by the government for addressing climate change or to fund adaptation and mitigation measures. As per the document evaluating the effect of current projects on climate change would enable the government decide whether to redesign or safeguard them. The first Indian state to implement a climate budget is Odisha.

5.9 India must submit its first biennial transparency report to the UNFCCC by 2024 as a signatory to the Paris Agreement, along with inventory figures in a standard format. India declared in September 2021 that it will submit a new Nationally Determined Contribution before to COP26. India set the latest target of becoming net-zero by 2070 at COP26. For the first time ever, India's climate policy included a target date for reaching carbon neutrality.[40]

5.10 India is the third-largest emitter of greenhouse gases globally, and coal is the biggest contributor. India's 2016 CO2eq emissions were 2.8 Gt. 79% were CO2, 14% were methane, and 5% were nitrous oxide. India emits approximately 3 gigatonnes (Gt) of CO2eq annually, or about two tonnes per person, which is half the global average. The nation contributes 7% of world emissions. India will gain from reducing greenhouse gas emissions and air pollution in the world's most cost-effective way, with health benefits worth 4 to 5 times the cost.

5.11 The Paris Agreement's pledges called for a 33–55% decrease in this intensity by 2030. According to the UNEP, India's yearly emissions per person are expected to be between 3 and 4 tonnes by 2030, which is lower than the world average. According to estimates, China produced 27% of the global greenhouse gas emissions in 2019, followed by the US (11%), India (6.6%), and China.

6. Conclusion:

Climate change is the most significant environmental concern in the last 10 years. Climate change is currently posing the biggest threat to human welfare on a global scale. There is a critical

need to focus on reducing carbon and greenhouse gas emissions from energy, industrial, and transportation sources by reducing the quantity and quality of fuel used, implementing better and more advanced technologies, increasing public awareness of the value of biological diversity and climate change, and improving public understanding of the environment they live in. Developing policies and standards for biodiversity, climate change, and biodiversity can help local communities be less vulnerable to the impacts of climate change and more adaptable to those effects. Public participation is necessary to integrate ecosystem conservation with rural development since the needs of rural populations depend on particular ecosystems.

India has set ambitious targets in each of these sectors because it understands the crucial link between biodiversity and climate. We live in one of the most ecologically varied regions in the world, with a wide range of ecosystems and species that sustain the livelihoods of millions of people and provide essential ecosystem services. India must continue to provide the highest priority and financing on biodiversity protection and climate action while ensuring that these initiatives are fair, inclusive, and sustainable.

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Beyond Contemporaneity: Balbir Singh Katt and his Enduring Expression in Stone

Dr. Nitin Dutt[*]
Vandana Dutt[**]

Abstract

Stone is synonymous with Indian Art. Over time, the modern materials and methods of fabrication have overshadowed this medium. Amidst the changing landscape of art media, it is imperative to discuss the works of Balbir Katt, given his unflinching belief in stone. His unique focus on scale and volume versus the favored lyrical approach sets him apart. His exemplary works instigate a dialogue, bringing the medium of stone into the evolving environment of contemporary art and the public domain. In the absence of substantial primary resources, the research methodology adopted parallels that of investigative journalism. Besides me, who has an intimate experience of having studied under him, there are numerous individuals, such as his peers, colleagues, students, writers, and curators, who have been vital to this paper. My conclusions indicate that Balbir Katt has maintained an unfazed stance towards the medium of stone and its monumentality. His near-absolute reliance on stone underlines his commitment to this medium by focusing on its inherent qualities and, at the same time, highlighting its contemporary possibilities. His work clearly engages the spectator by helping decipher the overpowering connection between content, form, and material.

Sculpture making is synonymous with Indian Art. Through the ages, the expression of sculpture making has come a long way. The Indian sculptural tradition flourished under the political and religious patronage for most periods in its development and has assimilated many influences to become what we perceive it to be today. Its amalgamation with architecture as a construction component and as a means of adornment was only natural. The medium of stone stands witness to how the stone sculptors have been able to maintain their distinctive identity, which is at stake today. While carefully tracing the chronological developments of Indian art in the 19th and 20th centuries, one cannot ignore the role of educational infrastructure, which was based on the European academic model and practice. The prolonged exposure to such a system distanced some artists from our rich traditional practices in an unnatural manner. As a result, many artists embraced the Indian idiom completely, and others adopted an ideology that best suited their expression and purpose.

In the context of the modern Indian sculpture movement, many thinkers find the practice and works of Ram Kinker Baij as crucial, setting in motion a paradigm shift. Before Ram Kinker Baij, the practice of sculpture making could be aptly defined as post-traditional[i], entrenched in British colonial style, both in content and material. His artistic personality was shaped while growing up in a rural environment and further honed under the tutelage of Nand Lal Bose, and was complemented by the experience gained under the guidance of teachers trained in Western traditions. The versatility of a stalwart such as Ram Kinker Baij reflected his own search that gave direction to the Indian sculptural movement. More importantly, his works initiated a dialogue that brought to the center stage the importance of identity and individuality in art at that time[ii]. Although Ram Kinker Baij spearheaded the modern Indian sculpture movement, there have been a few other notable contributors, such as Pradosh Das Gupta, Sankho Chaudhari, Dharaj Bhagat, Amarnath Sehgal, and Chintamani Kar, who contributed substantially to the movement since the 1950s[iii]. It would only be appropriate to

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acknowledge the works of such artists, and many others, as the twentieth-century heritage of India in the field of visual arts and, more specifically, sculpture.

Given the rapid rate of modernization, the plethora of new materials, methods of fabrication, and constantly changing and contesting cultural ethos, we have arrived at a retrospective juncture today. We live in times where expression is independent of the medium. Today's art and artists are instrumental in fusing most of the available mediums in order to increase the efficiency of the expression. But amidst the changing landscape of art media, one clearly notices that the contemporary expression in stone is being marginalized. The involvement with this medium by students and sculptors alike has become meagerly academic, and the impact of symposiums and camps is only minor. The lack of resources, both human and material, logistics, costing, and the shrinking urban spaces may be some of the factors that have contributed to downplaying this medium. It is worth pondering if our present-day glamorous environment of art galleries has failed to promote and assimilate this quintessential Indian medium.

Due to the fast-paced and constantly shifting parameters in our global culture today, many hard-hitting questions have arisen. I feel it is vital to debate whether such a medium and the contemporary artists engaged with it are crucial in pushing forward the very spirit of the medium of stone and transforming it. In order to attempt this, it is important to identify our contemporary milieu and its prominent stone sculptors. Nagji Patel, Mahendra Pandya, Ramesh Pateria, Kanhai Kunhiraman, Akka Yadagiri Rao, M. Dharmani, V.R. Khajuria, and Balbir Singh Katt have contributed immensely. In my careful assessment, one name that stands out clearly is that of Balbir Singh Katt. Having studied under Ramkinker Baij at Shantiniketan, his narrative strongly indicates that his work is ingrained and founded in Indian stories. As Kinker Da's student, Balbir Katt chose to chase the mysticism of mythology, folklore, and nature. Balbir Katt built on his experience within the academic framework at Baroda, as a National Cultural Scholar under the supervision of another master, Sankho Chaudhuri.

Before Balbir Singh Katt began his tryst with stone or monumentality, there is clear evidence that he worked with materials ranging from wood to concrete and various other conventional and modern materials available then[iv]. Not known to many, his lifelong engagement with poetry originates from his earlier years and his interest in literature, nurtured by teachers such as Mohan Rakesh. As a natural progression, his literary creativity found a convincing extension into the fine arts. Before proceeding to Baroda, Balbir Katt was still working with conventional cast materials and additive methods of sculpture making, exploring cubist idiom. It was in New Delhi during the execution of *Yaksh-Yaski* that Ram Kinker Baij provided his young prodigy with stone for the first time, and he carved *He and She Baul*. As expressed in a personal conversation with Anjan Chakrverty, it was then that he learnt the basics of carving; contrary to Anshuma Das Gupta's claim that it was Sankho Chaudhuri who was instrumental in influencing Balbir Katt with the direct stone carving technique[v]. His short stay at Baroda was uneventful, as he did not find the environment conducive to his growth, in stark contrast to his Shantiniketan days, as noted by Anjan Chakrverty[vi]. Despite possible speculation, Balbir Katt went on to carve *Integral of a Torso* – a robust female form at Baroda, marking his departure from figurative abstraction.

This particular phase in his artistic development coincides with his move to Varanasi. Mesmerized by the rustic and frozen-in-time character of the ancient city, Balbir Katt realized anew a fondness for the city's unique architecture and its panoramic river views drenched in sun and music. It is this sense of space that makes its maiden appearance as an encapsulating device, binding his sculptural compositions[vii]. It is during this period that the dichotomy of geometric and organic forms emerges in his sculptures, yet they seem to be effortlessly amalgamated. By the time Balbir Katt got the prestigious British Council scholarship to study at the Royal College of Art, his creative vision had taken a path to which he was fully committed. One of the high points of his stay at the Royal College of Art was his interaction with notable art historian Philip Rawson. The Rawson inspired

comparative analysis of the bas-relief from Amravati and Egypt became the basis upon which Balbir Katt developed a new vocabulary of plastic protrusion, becoming part of his sculptural expression[viii].

Apart from the common perceived notion of being naturally receptive to influence after prolonged international experiences, Balbir Katt remained firmly rooted in the ethos of the subcontinent. At many international symposiums, he perceived the participation of sculptors from Asia and Africa as a trend forecasting a movement devoid of Eurocentrism[ix]. Upon his return to India, Balbir Katt honed his conceptual understanding and aesthetics of putting together the structurally inspired geometric shapes and forms against the natural and organic, a seminal motif that was to become permanent with almost all his works. His Sun Series was to become a sojourn that was visited again and again. A series of stone carvings in Jammu and Kashmir with the signature central orb highlight the ingenious play of light and shadow on the contours and surface of a stone otherwise not popular among carvers due to loosely packed layers. Admittedly, Balbir Katt clarified that he was indeed an admirer of Brancusi and Noguchi. Reflections of Bracusi and Noguchi percolated in Balbir Katt's work and find clear associations in the Sun Series, despite their distinct ideological backdrop.

His coming to Varanasi was for a good reason. For the years to come, Varanasi was to become Balbir Singh Katt's Karmbhoomi. His renewed interest in music became the fertile ground out of which the sound of his new oeuvre. *Nadeshwar* immediately announces its presence. Like the omnipresent *Anhad Naad*, Balbir Katt's unhindered and rhythmic linearity achieved through chiseling underscores his comprehensive understanding of connecting the content with material. His affinity for the interplay of textured and polished surfaces is a reminiscence of techniques learned under Professor Medow in England[x]. His deep faith in workshop practice and urge to understand of material possibilities led him to the Bheslana stone quarries, where he tapped into the various facets of this fine black stone. The Bheslana marble and the pink sandstone from Chunar remained Balbir Katt's most favored stones.

Otherwise, more conceptual and appearing to be almost exclusive and understood by few, Balbir Katt's works are actually rooted in daily life. Our ever accessible mythology, the nature fable, and the monoliths were the sources from which he drew his imagery. While discovering and further refining his own language of expression, Balbir Katt's works in open and his inclination towards monumentality were most notably influenced by the works of Ram Kinker Baij and Henry Moore[xi]. Balbir Katt has toiled in looking at the old in an attempt to retain the specificity of identity, while continuously and successfully transforming the art of stone sculptures. Professor Rattan Parimoo rightly observed that Balbir Katt possessed a unique perspective on scale and volume versus the much-favored and prevalent lyrical approach, making him an "archetypal stone carver"[xii].

Although Babir Katt's works encompass certain clear characteristic markers that set him distinctively apart from the rest. His work, which incorporates elements such as scale, volume, and mass, also acts as a confluence of the organic and the geometric, which accentuates his passion for monumentality through his sculptures. I witnessed up close how three large blocks of sandstone and an equally large black stone were chiseled to become *The Outstretched Bird Trapped between Sunrays*, a sculpture that adorned the main entry at Jahangir Art Gallery in his 1999 show. As a young apprentice, I was allowed to work on these stones at the very initial stages of carving, an event which I perceive and cherish as my induction ceremony into the fraternity of sculptors. The sheer monumental scale of his sculptures is mainly attributed to his acute understanding of structural systems, enabling large monoliths to poise at nodes and, as a result, appear to be weightless. One cannot ignore how huge boulders were carefully dressed to become a well defined geometric volume that further morphed eloquently into an organic shape.

Like his guru, his relationship and fondness for his students were crucial and have left a legacy that still echoes in the sculpture department at the Faculty of Visual Arts, Banaras Hindu University. His sensitivity towards the diminishing stone carvers and their cause and integration in the sculpture making process will remain unparalleled. Balbir Singh Katt inspired many of his students to become teachers and successful sculptors. Disturbed by my displacement and even more

by helplessness in its portrayal in my art, it was Balbir Katt who elucidated, and I quote him, "*art is not a sob story…you need to distill your everyday experiences*"[xiii]. The department, which is now better known as a renowned sculpture school, is a live workshop, where stone as a medium dominates and is being continually infused with newness on a day-to-day basis.

Balbir Singh Katt's journey is marked with achievements, which can be compared to a photo postcard collection of an itinerant bohemian. In our time, when we are amidst an array of seductive, popular, logistically viable materials, I perceive Balbir Singh Katt to be the torch- bearer who maintained an unflinching and uncompromising stance towards his medium of choice. His near absolute reliance on stone as a preferred medium of expression emphasizes his commitment towards imbuing this age old medium with a more contemporary spirit.

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13. Based on candid inputs and conversations with Sh. Balbir Singh Katt during the author's M.F.A. at the Faculty of Visual Arts at Banaras Hindu University.

Use of Digital Registries in Organ Donation Law: Privacy, Access and Administrative Efficiency

Gaurav Singh Sachan*

Abstract

Digital registries are now a key part of modern organ donation and transplantation systems because they turn legally important information like consent, refusal, waiting-list status, allocation history, donor-recipient matching data, and outcome reporting into records that can be searched, updated, and checked. The National Organ and Tissue Transplant Organisation (NOTTO) framework in India includes a national organ transplant registry, an organ donation registry, a tissue registry, and an organ donor pledge registry. It also allows for data submission via the web or on paper for these purposes. Any legal move toward more digitization, on the other hand, raises tough questions about privacy, different levels of access, traceability, government oversight, and stopping businesses from abusing their power. This paper contends that digital registries can enhance donation governance solely when the law delineates explicit distinctions between public transparency and personal confidentiality, restricts access based on role and function, and enforces obligations of accuracy, security, and prompt reporting. The paper analyzes the Indian legal framework under the Transplantation of Human Organs and Tissues Act, as exemplified by the NOTTO system, and juxtaposes it with international standards regarding traceability and transparency. It advocates for reforms aimed at establishing a privacy-conscious, interoperable, and administratively efficient registry architecture.

Introduction

Records have always been a part of organ donation law. Before digital systems, hospitals and transplant authorities used broken paper files, local waiting lists, institutional pledge cards, and manual communication between retrieval centers, transplant units, and regulators. That model made it harder to find donors, made it less reliable to manage waiting lists, made it harder to keep track of outcomes, and made it harder for the state to find abuse or non-reporting. Digital registries say they can fix these problems by creating a shared information system for consent, retrieval, matching, allocation, transplant performance, and follow-up after the transplant.

Digital registries are more than just useful; they have legal meaning. In transplantation, data serve not only as medical facts but also as instruments through which the law enforces consent, equity, accountability, and anti-trafficking measures. A registry can keep track of a person's promise to donate, show if a potential donor has opted in, show if a patient is on the right waitlist, record if a hospital reported a transplant, and let authorities follow an organ from retrieval to implantation. On the other hand, a poorly regulated registry can reveal very private health information, reinforce bureaucratic exclusion, or centralize state power without the right safeguards in place.

This debate is especially important for the Indian system. NOTTO gives a lot of information about the national registry structure. It says that data should be collected from retrieval and transplant centers, preferably through a web-based interface.[1] It also says that hospital-level transplant information should still be available for authorized State and Central Government officials to compile, analyze, and use. But the same institutional setup shows both promise and danger. A national portal can make things run more smoothly and keep an eye on things, but because it includes demographic, medical, and outcome data about donors and recipients, privacy law and access control

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[1] National Organ and Tissue Transplant Organisation (NOTTO), "FAQs," Ministry of Health and Family Welfare, Government of India, available at: https://notto.mohfw.gov.in/faqs.htm (visited Feb. 4, 2025).

are necessary. The problem is even more urgent because there is proof that not all registered hospitals consistently report to the national registry portal. This has a direct impact on the completeness and integrity of the digital ecosystem.

This paper talks about the subject in five parts. First, it talks about the legal roles that digital registries play in the management of organ donation. Second, it looks at the privacy issues that come up when collecting, storing, sharing, and possibly reusing donor and recipient data. Third, it looks at the access question: who should be able to see what, why, and with what legal protections. Fourth, it looks at how administrative efficiency can be improved, but it also looks at how efficiency can lead to exclusion when the law ignores differences in infrastructure and fairness in procedures. Lastly, it gives India a plan for reform that makes registry design fit with constitutional values, health governance needs, and international transplantation principles.

Legal Functions of Digital Registries

At least four legal functions are served by a digital registry in transplantation law. The first is evidentiary: it keeps track of consent, refusal, pledges, waiting-list entries, allocation decisions, and steps in the process that are important for the legality of the transplant. The second is coordinative: it lets different organizations work with the same up-to-date information. The third is regulatory: it lets the government and other relevant authorities keep an eye on hospitals, find problems, and make sure that reporting duties are followed. The fourth is distributive: it keeps track of current waiting lists and donor matches to help make sure that organs are given out fairly.

The NOTTO FAQs list four national databases that are linked to each other: the Organ Transplant Registry, the Organ Donation Registry, the Tissue Registry, and the Organ Donor Pledge Registry.[2] The Organ Transplant Registry has information about the demographics of patients waiting for a transplant, waiting lists for each organ and hospital, donor categories, hospital information, and follow-up information for both donors and recipients. The Organ Donation Registry has information about living and dead donors, their medical history, the cause of death for dead donors, lab tests, details about the retrieval, transplant coordinator information, organs or tissues that were retrieved, and information about the recipient. The Tissue Registry is just as detailed, and the Organ Donor Pledge Registry keeps track of the wishes of people who have promised to donate their organs after they die. It also lets people change their minds about their pledge.

This architecture reflects a deeper legal reality: transplantation is impossible to regulate adequately without traceability. WHO Guiding Principle 11 says that the organization and execution of donation and transplantation activities, as well as their clinical results, must be open and clear while still protecting the privacy and anonymity of donors and recipients. The relevant international documents also stress how important it is to code and track cells, tissues, and organs used in transplants. So, registry law needs to connect two things that people usually think of as opposites: being able to trace things within the system and not being able to trace things outside of it.

A well-designed registry also changes the legal status of a promise to give. The national organ donor register is a computerized database that keeps track of the wishes of people who have agreed to donate. People can register through Form 7 or withdraw by letting NOTTO know. The same NOTTO materials, however, make it clear that family consent is still the most important factor in practice. This is because healthcare professionals still talk to the family, and if they say no, the donation does not go through, even if the person had a donor card or registered online. This means that the digital pledge in India right now works more as formal proof of the deceased's wishes than as a self-executing legal authorization. That difference is important from a legal point of view because it makes registry entries less important and puts decision-making in the hands of surviving relatives and hospital procedures.

Digital registries are also important for stopping organ trafficking and forgery. NOTTO says that THOA makes it illegal to buy or sell organs and lists punishments for other crimes, such as

[2] *Supra* note 1.

removing organs without permission, doing business with organs, falsifying documents, and more. In theory, a central registry can cut down on fraudulent transplants by keeping track of audit trails, double-checking hospital submissions, and letting authorities find suspicious patterns, like repeated unrelated donations, inconsistent donor histories, or missing follow-up data. So, the registry works as both an administrative tool and a compliance tool.

Privacy and Data Protection

The main legal issue with digital donation registries is privacy, because the information they hold is some of the most private personal data. Demographic identifiers, cause of death, medical history, lab results, donor suitability information, follow-up details, and recipient outcomes are all examples of registry fields. Even if public-facing systems don't show names, internal databases can still be misused, accessed without permission, linked to other identities, stigmatized, or targeted for business purposes if role-based protections aren't strong enough.

General claims of confidentiality do not fix the privacy issue in transplantation. What matters is the law: what data can be collected, for what purpose, by whom, for how long, under what security standards, and with what rights to change or take back the data. WHO materials say that being open about transplant activities is okay as long as it doesn't reveal information that could identify specific donors or recipients. The issue is not whether to gather data, but rather how to organize legal information flows in a way that does not turn traceability and oversight into surveillance.[3]

In India, NOTTO's privacy policy is pretty general and tells users to double-check information and get professional advice before acting on what they find on the website. However, it does not have a detailed transplantation-specific charter of data rights that is as clear as the operational registry descriptions.[4] The registry descriptions, on the other hand, are very detailed and clearly show that a lot of information about donors and recipients will be collected. This difference is telling. It seems that the system is more clear about what the state and hospitals can collect than about what data subjects can ask for in terms of notice, access logs, correction rights, retention limits, or breach notification.

The legal framework for a transplant registry must delineate a minimum of four distinct categories of information. First, there is consent data, which can include a pledge, withdrawal, refusal, or family permission. Second, there is clinical eligibility and matching data, such as blood type, how urgent the medical need is, and any tests that are needed. Third, there are records of administrative oversight, like hospital reports, transplant counts, and allocation records. Fourth, there is outcome and research data that can be combined or anonymized for public health and academic purposes. Different privacy rules are needed for each group. Consent and clinical data require the utmost confidentiality; administrative data may be disclosed to regulators and authorized entities; research data should typically be de-identified or aggregated prior to external utilization.

The best reason to have digital registries is also the biggest risk. Systems are made to make information available quickly because organ transplants need quick coordination. But legal urgency shouldn't turn into complete openness. According to NOTTO, waiting lists and allocation work on computer systems at the local, regional, and national levels, and the system is always on. Speed is important for getting and matching organs, but a system that works around the clock still needs authentication standards, logs of each access event, and strict limits on how the system can be used. If not, efficiency becomes too broad institutional access.

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[3] World Health Organization, *WHO Guiding Principles on Human Cell, Tissue and Organ Transplantation* (2010), available at: https://iris.who.int/bitstream/handle/10665/341814/WHO-HTP-EHT-CPR-2010.01-eng.pdf (visited Feb. 4, 2025).

[4] National Organ and Tissue Transplant Organisation (NOTTO), "Privacy Policy," available at: https://notto.mohfw.gov.in/privacypolicy.htm (visited Feb. 5, 2026).

Family privacy presents a unique challenge. NOTTO says that cadaveric donation is kept private, but families can share some basic information about the donors, like their age and sex, if they want to. Transplant coordinators can also send anonymous letters back and forth. This means that the law informally values relational closure without directly naming people. A digital registry should stop hospital staff from casually looking at patient information and make sure that any information that is meant for family members goes through specific channels and rules for not identifying people.

Another privacy issue has to do with how registry data can be used for other purposes. When gathered in a central location, information about donors and recipients may be useful for policy analysis, academic research, insurance profiling, or partnerships with vendors. A legal system should say that secondary uses need either anonymization or a separate authorization process based on what is necessary, fair, and in the public interest. Without these kinds of protections, expanding the registry can go beyond the legal reasons for which donation data was first collected.[5]

Access, Governance and Procedural Fairness

Privacy debates often hide another important legal question: access. There are two parts to access. The first is institutional access, which means who in the system can see or use registry data. The second is citizen access, which means that donors, families, and patients can use the registry in a meaningful way to register their choices, check their status, correct records, or learn about how resources are allocated. To be legal, a digital registry has to get both parts right.

The Indian framework already hints at controlled visibility when it comes to institutional access. According to NOTTO, authorized people from the State Governments and the Central Government should be able to access hospital-level transplant data so they can compile, analyze, and use it again. The 2025 government update also says that only authorized users can access the National Organ and Tissue Transplant Registry Portal. It also says that 217 of the 804 registered transplant hospitals did not report data during 2025, and that States are expected to take action under THOTA. These two points show that access is not meant to be universal and that reporting compliance is a real problem with governance.[6]

But authorized access is not a full legal standard. A rights-based approach necessitates role differentiation. The transplant coordinator does not need the same information as a state regulator; a surgeon matching an organ does not need to see all historical records; and a policy analyst should usually use datasets that do not have any identifying information. Because of this, the legal framework should change from using the term "authorized persons" to the more specific term "least privilege" access, which means that each role only has the minimum visibility it needs to do its job.

Access for citizens is just as important. NOTTO lets people pledge online, withdraw by letting them know, and see their place on the waiting list in a clear way. However, waiting-list rank alone does not guarantee receipt of an organ because many factors affect matching. These features are important because they link digital governance to personal freedom and the right way to do things. A registry that keeps track of a person's wishes but makes it hard to check or change them could hurt trust. A waiting-list system that doesn't make it clear how urgency, compatibility, and geography work together can also make people think that the rules are unfair, even when the rules are medically sound.[7]

In a country with big differences in digital and institutional access, the question of access is especially important. If online registration becomes the main way for donors to pledge, people who don't know how to use computers, don't have a stable internet connection, or don't speak the language

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[5] K. Kaundal & A. S. Agrawal, "The Importance of Data Privacy in Organ Donation," *Advances in Social Science, Education and Humanities Research*, available at: https://www.atlantis-press.com/article/126011899.pdf (visited Feb. 6, 2025).

[6] Press Information Bureau, Government of India, "Update on Organ Transplantation," Nov. 19, 2024, available at: https://www.pib.gov.in/PressReleasePage.aspx?PRID=2237410&reg=3&lang=1 (visited Feb. 4, 2025).

[7] *Supra* note 4.

may not be represented. NOTTO itself thinks about both web-based and paper submission for collecting data, which shows that mixed methods are still important. Instead of using digitization as an excuse to get rid of physical forms, hospital-based registration, and assisted facilitation, the law should keep this plural access architecture. If it effectively keeps people with weaker digital access out, administrative modernization is not legal.

Procedural fairness also means that there should be ways to fix mistakes. Registry errors can have serious effects. For example, if a pledge entry is missed, it may go against the wishes of the deceased person; if hospital reporting is wrong, it may change the way waiting lists are analyzed; and if patient data is wrong, it may change the order in which patients are treated. However, the public materials that are currently available do not include a full error-correction process for people who are on the registry in a form that is specific to transplantation. A well-functioning legal system should allow people to request corrections that can be checked, set deadlines for responses, appeal decisions not to change records, and hold institutions accountable for not reporting errors or not reporting them on purpose.

Access also has a constitutional side. As the state increasingly depends on digital platforms to facilitate decisions regarding the body, mortality, and life-sustaining treatment, procedural fairness becomes integral to legality. In the context of transplantation, access transcends mere technical usability; it constitutes a prerequisite for substantial consent, equitable participation, and confidence in public allocation decisions.

Administrative Efficiency and its Limits

The argument for digital registries is strongest when it comes to how well they work for businesses. Organ donation and transplantation necessitate urgent time constraints, inter-hospital coordination, medico-legal evaluation in certain instances, compatibility analysis, organ transportation, and distribution at local, regional, and national tiers. A paper-based system doesn't work well for these kinds of needs. Digital registries cut down on information lag, make reporting formats the same, manage waiting lists from one place, and make records that can be updated all the time.

NOTTO says that a registry is necessary to find out who and where potential donors are, helps planners come up with ways to get more people to work together, and lets doctors and transplant coordinators check if a brain-dead person wanted to donate, which saves a lot of time when approaching the family. This is a big plus for the administration. In cadaveric donation, delays in identifying consent signals, locating records, or verifying donor information can diminish organ viability and complicate retrieval logistics. So, efficient data systems have direct effects on patient care.

National and networked registries also help institutions be responsible. The government's 2025 update showing that 217 of the 804 registered transplant hospitals did not report data on the national registry portal shows how digital systems can show compliance gaps that might not be obvious in decentralized paper records. When these kinds of gaps are clear, state governments can use THOTA-based regulatory powers against institutions that don't report. In this way, administrative efficiency isn't just about getting things done quickly; it's also about making it clear when someone isn't following the rules

Digital systems also make it easier to analyze data. Registry data can show trends in waiting lists, where donors come from, how often organs are used, differences between regions, and how things have changed over time. The WHO commentary supports public access to regularly updated, complete information about allocation, transplant activities, and outcomes. This is because being

open makes it easier to keep an eye on things and fix problems. This means that registry law can turn anecdotal policymaking into evidence-based governance for lawmakers and public health officials.[8]

But we should be careful with claims of efficiency. First, centralization can make mistakes worse. A mistake in a local paper file might only affect one institution, but a mistake in a shared national database can quickly spread throughout the system. Second, too much standardization may make doctors and coordinators feel like they have to meet portal requirements instead of using their own judgment. Third, efficiency metrics can become performative, meaning that hospitals may focus on making sure that reports are complete without actually improving patient counseling, donor support, or follow-up after a transplant. Fourth, a registry that focuses on efficiency may favor things that are easy to measure over things that are important in a normative sense.

There is also the danger of relying on bureaucracies. If digital access fails due to outages, credential bottlenecks, or data-entry delays, the system can become less efficient than mixed models that keep manual backups. So, the law should require plans for continuity, offline fallback protocols, regular audits of data quality, and standards for interoperability that let retrieval and transplant centers work even when central systems are temporarily down. In legal terms, resilience must be a part of efficiency.

The connection between efficiency and fairness is especially fragile when it comes to organ allocation. NOTTO says that computerized lists find the best match for a patient for a certain organ. Factors that are taken into account include how urgent the need is, how long the patient has been waiting, their blood type, the size of the organ, and other medical criteria. Computerization enhances consistency; however, it does not address the normative inquiry regarding the weighting of those criteria. Administrative efficiency cannot replace publicly reasoned principles of allocation. The law must make sure that digital systems follow clear rules instead of hiding them.

Reform Agenda for India

A strong Indian legal framework for digital donation registries should assume that registries are necessary but not enough to justify themselves. Their legitimacy relies on clear regulations regarding data minimization, access, accountability, and user rights. So, the first change should be a code or schedule for data governance that is specific to transplantation and fits within the current legal framework. That instrument should set the limits on what fields are allowed in each registry, sort data by how sensitive it is, set retention periods, require encryption and access logging, and require reporting breaches to the right authorities and affected people when there is a serious risk.

Second, the law should make it clear how strong a donor pledge is. NOTTO now sees the register as a record of wishes, but practice still needs family consent and lets family members say no to donation even if the deceased had promised to donate or had a donor card. A reform paper can go in one of two directions. It might keep the current family-centered model but need better counseling and written explanations when the family goes against what the deceased wanted. Alternatively, it could make first-person authorization stronger by giving the digital pledge presumptive legal force, with a few exceptions like proof of coercion, invalid registration, or a later withdrawal that takes precedence. In either case, the legal effect of registry entries needs to be more clear than it is now.

Third, access governance should switch to a model with layers. Aggregate statistics, policy reports, and de-identified outcome data should be the only things that the public can see. Access to clinical information should be limited to people who are currently receiving treatment, retrieving information, matching needs, or coordinating care. Regulatory access should include compliance and audit functions. When researchers want to use data, they should usually use de-identified datasets and

[8] The Transplantation Society, "WHO Guiding Principles on Human Cell, Tissue and Organ Transplantation," available at: https://tts.org/108-tts/about/tts-and-the-who/604-who-guiding-principles-on-human-cell-tissue-and-organ-transplantation (visited Feb. 4, 2025).

follow ethical and permission controls. This architecture would allow for transparency, as the WHO wants, without giving up privacy and anonymity.[9]

Fourth, India should make hospitals and transplant centers responsible for better data quality. The fact that a lot of registered hospitals didn't report in 2025 shows that the effectiveness of a registry depends on both compliance incentives and the design of the software. Reporting deadlines, required validation checks, fines for not reporting on time, and regular publication of compliance dashboards would all make the information more complete and reliable. At the same time, institutions need training, technical help, and standardized reporting procedures so that they can actually follow the rules.

Fifth, the registry system should keep access open to everyone. The law should allow for online registration in many Indian languages, but it should also allow for paper forms, entries made with the help of a hospital, and assisted registration at public health facilities. It should be just as easy to withdraw, correct, and check your status as it is to register. A digital system that makes it easy to opt in but hard to withdraw or change would go against basic ideas of fairness and freedom.

Sixth, the law should clearly say how registry data can be used for other purposes. De-identified or aggregated data access should be allowed for public health planning and legitimate research, but it should be very hard for businesses to reuse, profile, or share the data with people who aren't related to the research. Because transplant data has to do with bodily integrity, death, and private medical conditions, the bar for non-clinical use must be high.

Seventh, India needs to use a model of transparency that can be checked. NOTTO already says that hospitals should regularly update their websites with the total number of transplants and reasonable details about each one. Only authorized government users should be able to see this data. This should be supplemented by regular public releases of national and state-level statistics on waiting lists, allocation timelines, organ utilization, reporting compliance, and outcomes, all in anonymized form. This kind of publication would meet the WHO's need for public accountability without giving away any information about the donors or recipients.

Conclusion

Digital registries are now a key part of organ donation law because they make consent records, waiting lists, organ allocation, traceability, and regulatory oversight legal. The NOTTO-linked registry structure in India already has the basics of a national digital governance system for transplantation. Recent reports show both the benefits of that system and the problems with compliance that still exist. The main legal question is not whether to digitize, but how to manage digitization so that privacy, access, and efficiency work together instead of against each other.

There should be five main ideas behind a principled registry system. First, the system must be able to track things while keeping things private outside of it. Second, access must be granted based on role and legal purpose, not in general terms. Third, administrative efficiency should not only mean speed; it should also mean resilience, correction, and inclusion. Fourth, there should be strict limits on the secondary use of donor and recipient data, as well as strong institutional accountability. Fifth, transparency should emphasize overall results, distribution methods, and compliance reporting instead of revealing individual identities.

The jurisprudential potential of digital registries resides in their ability to convert transplantation from a disjointed domain of scattered institutional discretion into a more unified and verifiable legal framework. Their constitutional peril resides in the potential for bodies, decisions, and vulnerabilities to transform into excessively centralized data points devoid of substantive rights against the system. Indian transplantation law should respond by making the digital registry not just an administrative portal, but a legally bounded public institution governed by confidentiality, fairness, and reasoned accountability.

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[9] EDQM, "WHO Guiding Principles on Human Cell, Tissue and Organ Transplantation," available at: https://www.edqm.eu/documents/52006/286852/WHO+guiding+principles+on+human+cell,+tissue+and+organ+transplantation,+as+endorsed+b... (visited Feb. 4, 2025).

Maharaja Gulab Singh and the Integration of the Northern Frontiers of India

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Abstract

Maharaja Gulab Singh holds a glorious role in the political and territorial history of Northern India in the nineteenth century. His works are not confined to his relationship with the emergence and strengthening of the Sikh Empire under Maharaja Ranjit Singh to outline his participation in the development of the Indian frontiers in the North. The current paper discusses political, military, and strategic efforts based on which Gulab Singh established the groundwork of the power of the Dogra Kingdom in the lands of trans-Himalayas. It examines his involvement in the methodical annexation and control of such territories as Ladakh, Baltistan, and some of Gilgit which later came to play a monumental geopolitical role.

The paper will examine the administrative skills of Gulab Singh, his military campaigns and his diplomatic talks with the British and the Sikh rulers in establishing the borders that will later turn out to be the pricely state of Jammu and Kashmir. The paper contextualizes his frontier policy in the larger framework of imperial competition in the nineteenth century and the development of the so-called Great Game in Central Asia, and says that the activities of Gulab Singh were significant in bringing the color of strategy and politics of the day to the frontiers of India. In an attempt to highlight the timeless importance of Maharaja Gulab Singh in the historical events, which expanded India borders into areas that became pivotal in the following centuries, the paper will analyze his legacy as a ruler in consolidating territories and forming states.

Keywords: Northern areas, Gilgit, Chushul, Dogra, Indus, Trans Himalayan

Introduction

Jammu and Kashmir is a unique region in the Indian sub continental history and geopolitics that has both the civilizational antiquity and a high-modern strategic significance.[1] The region is seen as a beautiful place in the classical texts of Kashmir, and its spiritual relevance, with the gods wanting to inhabit the place, is emphasized in the Nilamat Purana, which speaks of the place as being even more beautiful than heaven. Grossly contrasting with these utopian portrayals, the area, in the modern era, has suffered long periods of political turmoil, separatist violence, and socio-economic devastation and is currently one of the most disputed regions in South Asia.[2]

Historically, Jammu and Kashmir have been ruled by a series of Hindu dynasties and Muslim sultanates, each of which left a distinct imprint on its political structures, religious life, and cultural practices.[3] The integration of Kashmir into the Mughal Empire in 1586, under the rule of Emperor Akbar, signaled the start of a new administrative and cultural order, where imperial integration was more pronounced and consolidation of regional elites into the Mughal structure took place. After the fall of the Mughal power in the eighteenth century, the region was conquered by the Afghans in 1756 during which time it was believed that there was a high taxation rate, and political coercion that brought in much dissatisfaction among the locals.[4]

With the rise of the Sikh kingdom of Maharaja Ranjit Singh in the early nineteenth century, another phase of political reconfiguration in the region was further led into. The Sikhs annexed Kashmir in 1819, thus ending the reign of the Afghans and extending the influence of the Lahore Darbar to the Himalayan borderlands. [5] In this context, Gulab Singh, a Dogra noble of Jammu region, became famous at

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[1] Rai, M. K. (2004). The Dogra rulers and the formation of Jammu and Kashmir. National. Publishing House.
[2] Bose, S. (2003). Kashmir: Roots of conflict, paths to peace. Harvard University Press.
[3] Ashutosh. (2013). Jammu Kashmir: An Analysis of Facts. Jammu Kashmir Study Centre.
[4] Bloeria, S. S. (2016). The Man Who Served J&K. Natraj Publishers.
[5] Charak, S. (2019). General Zorawar Singh. Publication Division.

the court of Maharaja Ranjit Singh both as a military leader and a political ally. In 1820, Gulab Singh was granted the territory of Jammu, and in 1822 he was officially made hereditary Raja, becoming the progenitor of the Dogra principality.

In the following decades, a calculated policy of territorial growth was followed by Gulab Singh and his deputies, the most notable one being General Zorawar Singh, towards the neighbouring hill states and the trans Himalayan areas. Ladakh and Baltistan were conquered in the 1830s and early 1840s and put under the control of Dogras, extending the sphere of influence over the plains of Jammu up to the high plateau which was close to Tibet and Central Asia. These conquests profoundly transformed the strategic profile of the new Dogra state, placing the latter in the center of wider imperial rivalries which would come to be understood subsequently as the Great Game between the British and Russian empires.[6]

The turning point was made decisive after the First Anglo Sikh War (18451846) in which the British East India Company after defeating the Sikh forces reorganised the territorial arrangements in the north. The British gave Kashmir and its dependencies to Gulab Singh under the terms of the Treaty of Amritsar (1846) in exchange of which he paid 7.5 million rupees, thus becoming the Maharaja of the newly established princely state of Jammu and Kashmir. Through this settlement, Gulab Singh now had control over Jammu, the Kashmir Valley, Ladakh and adjacent frontier areas and this made Jammu and Kashmir one of the largest princely states in Britain India before the partition of 1947.[7]

The Dogra dynasty that Gulab Singh founded ruled Jammu and Kashmir until 1947, presiding over a polity marked by considerable ethnic, linguistic, and religious diversity.[8] The Dogra ethnic ethnically based ruling family, which was based in the Jammu region, wanted to consolidate power by combining military domination, bureaucratic centralisation and the selective incorporation of local elites.[9] By the time of Maharaja Ranjit Singh's death in 1839, Gulab Singh had already asserted effective supremacy over the surrounding hill states, and his subsequent acquisition of Kashmir and Ladakh completed the process of state formation in the northern frontier region.[10]

Within this larger historical context, Maharaja Gulab Singh becomes not only a strongman of the region, but one of the architects of the demarcation and expansion of the northern borders of India in the nineteenth century. This political maneuvering between the Sikh Darbar and the British, his dependence on good military leaders such as Zorawar Singh and his annexation strategies in the Himalayas, were all part of forming a frontier state which would take a middle stage in future South Asian politics.[11] The current paper places the career of Gulab Singh in these broader contexts of imperial expansion, frontier consolidation and interstate diplomacy, and specifically how his actions pushed the limits of the Dogra kingdom and defined the lines of what would later become the northern frontiers of India. The figure below represents Dogra kingdom. (see fig.1)

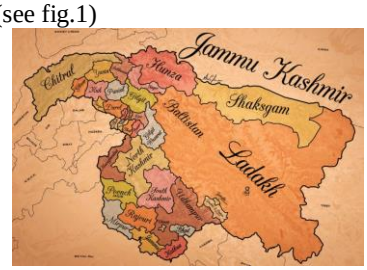

Fig.1 Boundaries of the Dogra kingdom
Source: *The Himalayan Travel Group*

[6] European Foundation for South Asia Studies. (2021). Jammu and Kashmir in legal perspective. https://www.efsas.org/publications/study-papers/jammu-and-kashmir-in-legal-perspective/
[7] Joshi, H. (2009). Jammu and Kashmir, Aakrosh. *Asian Journal on Terrorism and Internal Conflicts, 12*.
[8] Kashmiriat. (2024). A historical context of the Amritsar Treaty, 1846. https://kashmiriat.com/a-historical-context-of-the-amritsar-treaty-1846/
[9] Rai, M. K. (2004). The Dogra rulers and the formation of Jammu and Kashmir. National Publishing House.
[10] Singh,J.(2004). Economy of Jammu and Kashmir. Radha Krishnan Anand & Co. Social Science Research Network.
[11] Sunita. (2006). Politics and State Autonomy and Regional Identity of J&K. Kalpaz Publications.

Figure 1 reflects the territorial expanse of the Princely State of Jammu and Kashmir as consolidated under Dogra rule, especially during the reign of Maharaja Gulab Singh (mid-nineteenth century). The three geographical regions that became part of the Dogra state, namely Jammu, Kashmir, and the Trans-Himalayan Frontier i.e., Ladakh, Baltistan, and Gilgit became part of one central political unit. Jammu, the Dogra heartland, was the administrative centre of Maharaja Gulab Singh's power; the relatively newly-acquired Kashmir Valley (through treaty with the dogras - the Treaty of Amritsar (1846)) became the economic and political centre of the state; while the lands of Ladakh, Baltistan, and Gilgit were annexed as a result of earlier military campaigns of General Zorawar Singh and extended Dogra rule into the mountainous regions bordering Tibet, Central Asia and Afghanistan. Overall, the map indicates that the Dogra rule transformed several disjointed hill principalities and foreigen lands into one of the largest and most strategically prominent princely states in British India, appropriately establishing the northern boundary of India in the nineteenth century.

Life History of Maharaja Gulab Singh

On October 21, 1792, Gulab Singh was born into the Dogra royal lineage at Anderwah, near Samba in the Jammu region. His father, Mian Kishore Singh, held the jagir of Anderwah, while his grandfather, Mian Zorawar Singh, is credited with training the young Gulab Singh in various martial skills, including horsemanship and swordsmanship. Although the formal education of Gulab Singh remains uncertain, evidence from original Dogri documents preserved in the Punjab Government Records Office at Patiala suggests that he was literate and able to read and write in Dogri.[12] Baba Puran Dass of Surinsar village was his spiritual mentor and is credited with having been significant in influencing his early attitude and motivating him to go out in pursuit of his destiny outside his own estate.[13]

Gulab Singh by the age of mid-teen had joined the military service by the turn of the nineteenth century in relation to the new strength of the Lahore Darbar led by Maharaja Ranjit Singh.[14] It is stated that at about 18081809, at an early age, say sixteen, he had already made himself known in the defence of Jammu on occasions of Sikh invasions and retired soon after joining the cavalry of Ranjit Singh, where his gallantry and sword play soon came into notice. In a few years after his induction, Gulab Singh had advanced to a high post in the Lahore Darbar and by 1813, his father, Mian Kishore Singh, and his brothers, Dhyan Singh and Suchet Singh, had, too, been recruited into service by the Sikh ruler, and were collectively growing in influence and closeness to the Centre of power.[15]

By diligent and useful service the three Dogra brothers gradually rose in rank and were granted jagirs and principalities as a reward of their military and administrative services. It is his bravery and ability on the battlefield which impressed Maharaja Ranjit Singh to the extent that he began to give him command in major campaigns in an effort to spread Sikh influence all the way to the frontier areas and westward to the Punjab. Gulab Singh participated in a number of frontier expeditions, among them those to Multan, Kashmir and Dera Ghazi Khan, in the years 1818-1820, and on every occasion proved himself to be tactful and personally brave.[16]

The Sikh capture of Kashmir in 1819 saw the suzerainty of the Lahore Darbar extended as far north as Jammu, new responsibilities and opportunities arose before the eyes of loyal commanders like Gulab Singh. In 1820, Ranjit Singh gave Gulab Singh the jagir of Jammu, with the particular mandate to bring to heel the strong and rebellious hill chief Mian Dido, and in the process to prove and confirm his ability to act as a regional power holder.n.d.). Gulab Singh was given the title of Raka, allowed to raise an independent army and collect revenue alongside this jagir, which formally recognized his status as an inferior but semi-autonomous ruler in the Sikh polity. Later on, the jagir belonging to his father became permanent to the family, bringing Dogra under Jammu.[17]

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[12] Social Science Research Network. (n.d.). https://papers.ssrn.com/

[13] Suri, P. (2011). The Dogra Rulers of Jammu and Kashmir. Shubi Publications.

[14] The Law Brigade. (n.d.). Home. https://thelawbrigade.com/

[15] Sharma, R. (2022). Rise of Gulab Singh from a soldier to the Maharaja of Jammu and Kashmir. International Journal of Finance and Management Research.

[16] Schofield,V.(2000).Kashmir in conflict: India, Pakistan and the unending war. I.B.Tauris. ScienceGate. (n.d.).

[17] Sagar, D. (2014). Jammu and Kashmir 1947, Accession and Events Thereafter. Jammu Kashmir Study Centre.

Following the death of Mian Kishore Singh, Maharaja Ranjit Singh confirmed the succession of Gulab Singh to the rajagi of Jammu and performed his formal coronation on 17 June 1822, a ceremony often remembered for the unique application of saffron tilak by the Sikh ruler himself.[18] This coronation was the ultimate rise of Gulab Singh as a renowned military leader of the Lahore Darbar to the official status of Dogra ruler of Jammu, which paved the way to establishment of institutional bases of the subsequent growth of authority of his dominance over the broader frontier areas of the north.[19]

Table 1: Chronology of Major Events in the Life of Maharaja Gulab Singh

Year	Event	Region / Context	Historical Significance
1792	Birth of Gulab Singh	Anderwah, Jammu	Birth into Dogra royal lineage
1808–09	Entered military service	Lahore Darbar	Beginning of rise under Maharaja Ranjit Singh
1819	Participation in Sikh conquest of Kashmir	Kashmir Valley	Expansion of Sikh influence northward
1820	Granted jagir of Jammu	Jammu	Formal recognition as regional ruler
1822	Coronation as Raja of Jammu	Jammu	Establishment of Dogra authority
1834	Dogra expedition to Ladakh	Ladakh	Opening of trans-Himalayan expansion
1840	Annexation of Baltistan	Baltistan	Strategic control of Indus headwaters
1842	Extension of influence to Gilgit	Gilgit	Securing northern frontier
1846	Treaty of Amritsar	British India	Creation of princely state of J&K
1857	Death of Gulab Singh	Jammu	End of foundational Dogra rule

Major Accomplishments of Maharaja Gulab Singh in Redrawing Northern Frontiers

One of the most outstanding men of his era, whose work transcended well beyond the boundaries of Jammu and Kashmir, was Gulab Singh, who is a great figure in the greater Indian history. He was a great statesman, military commander, administrator, talented negotiator, diplomat, and visionary whose successes have been undervalued in the history of the region. It took Gulab Singh thirteen years in the Lahore Durbar before he came back to Jammu as the accepted ruler. In this ability, he was instrumental in the expansion of his territories under his rule and he was successful in conquering some of the major areas such as Reasi (1817), Kishtwar (1821), Rajouri (1821) and was involved in the Sikh conquest of Kashmir (1819), so that his influence was cemented to further campaigns in the trans-Himalayan region.[20]

His time with the Lahore court gave him a fine feel of Anglo-Sikh relations and he keenly realised the rising British interests in the northern countries, such as Kashmir, Ladakh and the Himalayan trade routes nearby. Gulab Singh foresaw that Jammu had strategic importance to British interests in the North, and therefore undertook to strengthen his own position and took action to frustrate any foreign intentions about this vital province. When Jammu was safely in his possession, and when Sikh rulers governed Kashmir, Raja Gulab Singh began a succession of systematic incursions upon the third major part, Ladakh, which was not only the seat of the profitable trade of Pashmina wool, but also of great importance in world trade and diplomacy.[21]

On the realization that it was necessary to regulate the Silk Road and its trade before either the British or the Russian empires would be able to directly interfere in the region, Gulab Singh sent his most

[18] Mishra, N. (2015). Need of Article 370 in Present Political Set up in India: A Critical Study. The International Journal of Multidisciplinary Research and Development, 8.

[20] Kashmir Life. (2015). The man who purchased Kashmir. https://kashmirlife.net/the-man-who-purchased-kashmir-issue-15-vol-07-81400/

[21] Ministry of Home Affairs, Government of India. (n.d.). https://www.mha.gov.in/

energetic general, Zorawar Singh, to lead the Dogra invasion of Ladakh in 1834. These campaigns eventually entrenched Dogra rule in Punjab up to Sinkiang and Tibet spanning an area of about 135,000 square kilometres. The control of this huge and strategically located territory also rendered the region of the British imperial interests, as well.[22]

Gulab Singh's reign also rested on the loyalty and valour of his lieutenants such as Zorawar Singh, whose exploits in conquering principalities like Bhimber, Rajouri, Bhaderwah, and Kishtwar extended Dogra rule from Rawalpindi in the west to Ladakh in the east, fundamentally redrawing the region's political map. Thus, Gulab Singh's statesmanship, foresight, and military strategy shaped the northern frontiers of India and left an enduring legacy in the subcontinent's history.[23]

The territories that were transferred to Maharaja Gulab Singh were sll of the outer hills between the Ravi and the Indus. The Valley of Kashmir. (Provinces of Cashmere and Hazarah. See Article 4 of the Supplement Treaty of 11 March 1946.

1. Ladakh
2. Gilgit
3. Baltistan
4. Indus Valley down to Chilas.

Creation of the princely state of Jammu and Kashmir:

- The princely state of Jammu and Kashmir was established following the defeat of the Sikh Empire in the First Anglo-Sikh War.
- During the war, Gulab Singh maintained neutrality, which ultimately contributed to the British victory.
- He even assumed the role of prime minister of the Sikh Empire for the last 38 days of the conflict.
- The Treaty of Amritsar, signed in 1846, was the sale by the British to Gulab Singh for 7,500,000 Nanakshahee Rupees of all the lands in Kashmir that had been ceded to the British by the Sikhs through the Treaty of Lahore.
- Under the Treaty of Lahore, the defeated Lahore court transferred Gulab Singh's kingdom and the adjoining hilly regions of Hazara, Gilgit, Kashmir, and Chamba to the British instead of the war indemnity.
- In 1947, Hari Singh, the great-grandson of Gulab Singh, confronted an incursion of Pashtuns from Pakistan and decided to accede to the Indian Union.
- This led to the formation of the Indian state of Jammu and Kashmir.[24]

Table 2: Territorial Expansion under Maharaja Gulab Singh

Territory	Year of Annexation	Mode of Acquisition	Strategic Importance
Reasi	1817	Military campaign	Consolidation of Jammu hills
Kishtwar	1821	Military conquest	Gateway to Ladakh
Rajouri	1821	Military action	Control of Pir Panjal routes
Ladakh	1834–36	Military expedition	Trade, Tibet frontier
Baltistan	1840	Military conquest	Control of Indus basin
Gilgit	1842	Military–political control	Frontier defence, Great Game
Kashmir	1846	Treaty of Amritsar	Political legitimacy, resources

Hurdles Faced by Maharaja Gulab Singh in expanding Northern Frontiers in special Reference to: (Gilgit- Baltistan)

Expanding the northern frontiers was not an easy task for Maharaja Gulab Singh, who encountered military, political, and diplomatic challenges while attempting to integrate far-flung regions into a coherent territorial unit. In extending the northern frontier and consolidating boundaries, he was required to act with firmness, ambition, courage, and administrative skill, demonstrating qualities that set

[22] Observer Research Foundation. (n.d.). https://www.orfonline.org/

[23] My India My Glory. (n.d.). https://www.myindiamyglory.com/

[24] Joldan, S. (2023). Ladakh, Gilgit-Baltistan, Its People & Trade Relations. Shubi Publications.

him apart from many contemporary princely rulers. While he was able to extend control up to Jammu with relatively fewer obstacles, the acquisition of Kashmir demanded confrontation and complex negotiation.[25]

Kashmir did not come into Gulab Singh's possession without resistance from existing Sikh officials in the Valley. Imam-Ud-Din, the Sikh governor of Kashmir, supported by Bambas from the Jhelum Valley, defeated Gulab Singh's forces on the outskirts of Srinagar near the area often identified as Dalgate and in this engagement, Wazir Lakhpat was killed (Kashmir Life, 2015). Later British mediation was decisive; it was through the intervention of Sir Henry Lawrence that Imam ud Din finally handed over Kashmir without any further agitation and this paved the way to the formal takeover of power by Gulab Singh in November 1846. As this episode shows, the handover of Kashmir, as approved by treaty, still had to be made a reality on the ground by the use of force, diplomacy and imperial support.[26]

The accommodation of frontiers in other areas of the state northward was also found to be very difficult. The Indus River was actually a boundary between Jammu and Kashmir between 1852 and 1860 but later changes occurred with respect to the frontier along Ravi. The Ravi cut across the land of the Chamba state and the Raja of Chamba was very much opposed to the proposals to divide his state between the control of Jammu. In a new settlement Chamba gave up its title to Bhaderwah in return of territory west of the Ravi, and other places, including Chandgraon and Lakhanpur, were exchanged to make the frontier simple and rational. These negotiations highlight the degree to which the frontier formation was marked by unceasing bargaining and re-institution of the local sovereignties.[27]

The situation along the Indus further illustrates the complexity of Gulab Singh's frontier policy. By the time of this transfer of the territories as laid down by the treaty of Amritsar, the Hazara chiefs were openly in revolt against the Sikh rule and were not ready to be subordinate to Gulab Singh. With the threat of governing a turbulent and rugged border country with scarce resources, Gulab Singh came to the Lahore Darbar to offer Hazara as a trade off to lands near Jammu. Due to this disposition, Hazara fell back to Sikh control, and Gulab Singh was granted Munawwar and Garhi, thus bringing closer to him smaller and manageable states. These modifications indicate that the expansion of Gulab Singh was not a cumulative process of the acquisition of land, but a selective and tactical process designed to obtain defensible and administratively viable frontiers in the north.[28]

Table 3: Territories Transferred under the Treaty of Amritsar (1846)

Region	Treaty Reference	Nature of Transfer	Resulting Status
Jammu Hills	Treaty of Lahore	Transfer by British	Core Dogra territory
Kashmir Valley	Treaty of Amritsar	Sale by British	Princely capital
Ladakh	Treaty of Amritsar	Confirmed possession	Northern frontier
Baltistan	Treaty of Amritsar	Confirmed possession	Strategic highlands
Gilgit	Supplementary Treaty	Conditional control	Frontier buffer zone

Gilgit-Baltistan

Gilgit Baltistan is strategically significant as it is surrounded by Afghanistan, China, India, and Pakistan and is sandwiched between the Himalayan and Karakoram Mountain ranges. Situated at the northernmost tip of Kashmir and encompassing sections of Ladakh, the territory is claimed by India and occupied by Pakistan. It is becoming increasingly important in the security calculations of the countries in the region.[29]

It was in 1947 when Pakistan illegally occupied certain parts of Jammu and Kashmir; India refers to this area as 'Pakistan-occupied Kashmir' (PoK). The region comprises two ethnically and linguistically different regions: what Pakistan calls 'Azad Jammu and Kashmir' or AJK, which includes

[25] Jammu and Kashmir Tourism Development Corporation. (n.d.). https://www.jktdc.co.in/

[26] Jammu and Kashmir Political Institute. (n.d.). Article 370. https://www.jkpi.org/?s=article+370

[27] Gilgit-Baltistan. (2001). In Wikipedia. https://en.wikipedia.org/wiki/Gilgit-Baltistan

[28] HRDC Gujarat University. (n.d.). Towards excellence: Strategic importance of Gilgit-Baltistan. Retrieved from https://hrdc.gujaratuniversity.ac.in/Publication/article?id=12473

[29] Hindustan Times. (n.d.). https://www.hindustantimes.com/

parts of Kashmir and Jammu; and Gilgit Baltistan, which makes up 86 percent of the total area of PoK.[30]

The region that is today known as 'Gilgit Baltistan' was not always one distinct political grouping. Historically, Gilgit—also known as Dardistan and Baltistan, the land of the Balti people, and 'Little Tibet' in medieval literature evolved as two separate political entities. The region has been coveted by a succession of kingdoms. It was conquered by different rulers and dynasties, including the Mauryan Empire, the Huns, the Ujjain Empire, Muslim and Hindu kings, and over the centuries, the region had close relations with the larger Jammu, Ladakh and Central Indian region.

Role of Maharaja Gulab Singh

Over the years, the Sikh ruler, Maharaja Ranjit Singh and his Dogra feudatory General Gulab Singh, steadily brought into their fold the areas of Ladakh (in 1836), Baltistan (in 1840), and Gilgit (in 1842) While at the time the British were rulers of the Indian subcontinent, they refrained from upsetting the powerful Dogras and in 1846 signed the Treaty of Amritsar tomake Gulab Singh the independent ruler of Jammu and Kashmir. The treaty formalised the princely statehood of J&K, which was handed over to Gulab Singh for a mere 75 lakh rupees. Under the terms of the agreement, "all the hilly mountainous country, with its dependencies, situated to the eastward of the Indus and westward of the river Ravi" was "forever, independent possession" to Gulab Singh and his heirs. It is important to state that the only reason the regions of Jammu, Kashmir, Ladakh, Gilgit, and Baltistan were clubbed was because of Gulab Singh and Dogra imperialism. Such expansion of the Dogra dynasty was supported by the British, allowing them to "claim" Jammu and Kashmir.[31]Triggered by the mutiny of 1857 and the growing Tsarist Russian presence in Central Asia, the British began to fear what a growing Russian presence in their backyard could mean for their influence in India. Its 'Great Game' power rivalry with Russia in the subcontinent led to it tightening its control over the frontier regions, including what is now the tribal areas in Pakistan, along the Afghan border and the Gilgit region. In 1877, the British established the Gilgit Agency. The Gilgit Agency comprised one, the princely states of Hunza, Nagar, Chilas (present-day Diamer), Koh Ghizr, which were autonomous regions ruled by independent kings; two, the Gilgit wazarat or district, which was the city of Gilgit and its surrounding towns, which were headed by the Dogra wazir and part of the state of J&K under Gulab Singh; and three, unadministered areas of Darel, Tangir, Jalkot. In this manner, the British ruled the Gilgit Agency through a political agent that ran parallel to Gulab Singh's Kashmir administration.[32] Due to growing British apprehension following the 1917 Russian Revolution, Maharaja Gulab Singh was compelled to give the British a 60-year lease on the Gilgit Agency in March 1935. The British essentially administered Gilgit and the neighbouring areas until they departed India and split the subcontinent into two. Baltistan was excluded from this, as it continued to be ruled by the Maharaja.

The journey of Gulab Singh as a chief of a Jagir to Raja of Jammu hills and ultimately Maharaja of Jammu and Kashmir was not an easy one. He lost his two brothers, two sons and several others on the way. He would hardly have imagined that his state would become a major trouble spot in the world a hundred years later.[33]

Role of Maharaja Gulab Singh in the Integration of the Northern Boundaries

It goes to the credit of Gulab Singh, the only ruler in India's long history who could be said to have extended the geographic boundaries of India.

His conquest and annexation of Ladak is an achievement that writes his name forever in the history of India. No previous Indian ruler, not even Samudra Gupta or Akbar, had even dreamed of invading Tibet, and through Zorawar, the Maharajah's forces routed the Tibetans.

Gulab Singh established a state as diverse as the rest of India – many languages, diverse cultures, many shades of geography, a history of regions going back to pre-Harappan, Harappa, Gandhar, Mahabharat, Budha, Alexander, Porus, Ashoka times, to name only a few.

Gulab Singh assembled a bouquet of different hues and fragrances for the inhabitants of the state,

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[30] Encyclopaedia Britannica. (2013). Baltistan. https://www.britannica.com/place/Baltistan

[31] Bhatta, M. (2019). Maharaja Gulab Singh: An accomplished administrator and military leader.

[32] Bamzi, P. N. K. (1994). Cultural and Political History of Kashmir. M.D. Publications.

[33] Bose, S. (2003). Kashmir: Roots of conflict, paths to peace. Harvard University Press.

which is unique in more ways than one.[34] The people of the state must be left alone to keep this bouquet intact. History can't be reversed, but nothing prevents them from being inheritors of the bouquet assembled by Gulab Singh. The state of Jammu and Kashmir is his living monument**.** Also, Maharaja Gulab Singh became the ruler of the vast territory of Jammu and Kashmir with the districts of Ladakh and Gilgit, and he was recognised as an independent ruler both by the English and the Sikhs.[35] It comprised three large divisions, namely:

1. Jammu-comprising the area in the South of the Pir Panjal range and Kishtwar.
2. Kashmir- containing the valley and the mountainous slopes encircling it.
3. Ladakh, Gilgit and Baltistan, which comprised all the highlands and mountains on the northern frontier.

Maharaja Gulab Singh played a crucial role in shaping the northern boundaries of India through his strategic military campaigns and political maneuvers during his reign. Not only did his attempts achieve territories but also established the basis of the future state of Jammu and Kashmir and affected the regional politics largely.[36] The legacy of Gulab Singh still influences the geopolitical discourse of the region, showing the complexity of the relations between the claims to the territories and the historical discourse.[37]

Table 4: Administrative Divisions of Jammu and Kashmir under Gulab Singh

Division	Sub-Regions	Geographical Character	Administrative Control
Jammu	Jammu, Kishtwar, Bhaderwah	Plains and hills	Dogra administration
Kashmir	Kashmir Valley	Mountain valley	Centralised rule
Ladakh	Leh, Baltistan, Gilgit	High plateau	Military-administrative

To comprehend the influence of Gulab Singh, we should consider the background of the formation of the boundaries which has been shaped by a multifaceted interaction of political, economical, and social factors during different periods of time.

1. **Military Campaigns**: Gulab Singh conducted a number of military campaigns to establish authority over other parts. His campaigns were not only limited to expanding territories but also to bring about a stable system of governance in the conquered territories.[38] The political landscape of these military campaigns was imperative because they helped to integrate the various territories into a sensible administrative system that would take shape to define the state of Jammu and Kashmir.[39] These campaigns do not only show his military capabilities but also his vision of a united state, which was the key to the future state of Jammu and Kashmir as a princely state. Such military operations played a vital role in creating a stable system of governance finally resulting into the formation of the princely state of Jammu and Kashmir. The military policies of Gulab Singh were supported by the diplomatic talks with the British, which helped to change the territories and strengthen his rule in the country.[40]
2. **Political Maneuvers**: Gulab Singh was also a tactful politician in addition to being military strength. He also used his way in the political intrigue of his time, he made allies, and negotiated treaties that would serve his

[34] Encyclopaedia Britannica. (2013). Baltistan. https://www.britannica.com/place/Baltistan

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[40] Dr. K. S. (2022). An Inquiry into Transfer of territories of Jammu and Kashmir to Maharaja Gulab Singh by British. International Journal For Multidisciplinary Research, 4(5). https://doi.org/10.36948/ijfmr.2022.v04i05.979

interests and the interest of his state. His skill of balancing military strength and diplomatic skills was the key to forming the princely state of Jammu and Kashmir which eventually defined its rule and territory. His political finesse enabled him to maintain political and military relations with both the local rulers as well as the British and he managed to create a precedent of how the rule would be conducted in the future in the area of Jammu and Kashmir. His legacy is further enhanced by the fact that he introduced administrative reforms that formed the basis of good governance in the new state of Jammu and Kashmir.[41] These reforms were essential in addressing the diverse needs of the population, fostering a sense of unity, and ensuring the stability of the state in its formative years.

3. **Territorial Securing**: He succeeded in making the boundaries of the north of India not only demarcated but also made impregnable against the foreign invasions. This played a critical role with boundary issues and invasion being a norm during that period of time and his military campaigns and political machinations led to establishing a legacy that would shape the political landscape in the region decades later. The geopolitical landscape was a key piloting aspect of the formation of the princely state of Jammu and Kashmir with Gulab Singh making strategic moves especially through his accords with the British which not only formalized his hold over Kashmir valley but also relocated his administrative restructuring as well as consolidation of territories. The events of the time that Gulab Singh engaged in played a significant role in determining the future of Jammu and Kashmir, shaping its governance and social-political life.
4. **Foundation for Jammu and Kashmir**: The incorporation of different regions by Gulab Singh was the foundation of the Jammu and Kashmir state as it is today. The impact of his legacy can be seen in the geopolitical forces within the region that are still determined by the historical accounts that he assisted in the making. The actions taken by Gulab Singh cannot be overemphasized regarding the the history of the state since they laid a structure of governance that echoed all the political events later in the state of Jammu and Kashmir. His administration system and reforms were instrumental in the stability and growth of the princely state of Jammu and Kashmir because he was able to create a unified administrative system. The effects of the integration processes by Gulab Singh are even being experienced in the modern world because the regional boundaries he created still affect the political discussions in the region today.[42]
5. **Impact on Regional Politics**: The demarcations that were done during the reign of Gulab Singh have created permanent impacts on the politics of the regions. His strategic foresight with regard to claims on territories has affected the current debates and disputes on the region. The complicated history of Gulab Singh is present in the current political debate about Jammu and Kashmir and the issues that the historical context of the territorial claims implies in the modern context. The territorial integration of Gulab Singh is reflected in the fact that up to now Jammu and Kashmir are defined by the enduring regional tensions and boundary issues. His reforms as an administrator and as a strategist in the military not only influenced the manner in which the state was run, it also formed the foundation in political relations in the region to come. The historical background of the reign of Gulab Singh shows that military and political policies succeeded in creating the princely state of Jammu and Kashmir, which had far-reaching implications on its future governance and territory. The long-lasting effects of the works of Gulab Singh can be seen through the protracted history of political intricacies and territorial conflicts that permeate the socio-political environment of Jammu and Kashmir even now.The interplay between the strategies of Gulab Singh and the historical context of the colonial rule can be stated as the long-term effects of his governance on the modern political issues at Jammu and Kashmir.[43]

Discussion

The historical course of the reign of Maharaja Gulab Singh and his key contribution to the development of the northern India frontiers provide dense material to be discussed critically. Gulab Singh was not just a regional power broker, his geographic and political vision defined the geographical and

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[41] Sa, S., & Bg, G. (2016). The Advent of Dogras Rule in Kashmir and Initial Approach to Agriculture. Arts and Social Sciences Journal, 7(2), 1–5. https://doi.org/10.4172/2151-6200.1000180

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[43] Rawat, M., & Bhat, D. D. N. (2024). *The Architect Of Indian Unity: Strategies Of Sardar Patel In The Integration Of Princely States*. https://doi.org/10.53555/kuey.v30i1.10700

political boundaries of the princely state of Jammu and Kashmir. With calculated military campaigns, prudent alliances, and diplomatic skills he gained Dogra control over the Jammu, Ladakh, Baltistan, and Gilgit regions which were later to be flashpoints in world politics because of their position, resources and transregional linkages.

The annexation and integration of the frontier regions which were usually in tumultuous conditions was achieved despite the rooted political opposition against it by the local rulers, unfavorable geography, and external influences by the British and their imperial competitors in Central Asia. The growth required flexibility of military operations and sensitive knowledge of local cultures. In Ladakh and Baltistan, as an example, the campaigns of Gulab Singh were driven by both strategic and economic interests as Pashmir trade was profitable, as well as by territorial goals. The later settlement of borders, especially by treaties concerning Tibet, is an indication of a practical policy, striking a balance between customary relationships and new state-craft.

The Dogra rule played a significant role in the changing of the balance of the history of the region: the establishment of a single political unit embracing various ethnic and cultural areas within the territory of the plains of Jammu to the high plateaux of Ladakh changed the geopolitical map of the subcontinent and placed Jammu and Kashmir in the center of the politics of the Anglo-Russian Great Game. The 1846 Treaty of Amritsar that established the sovereignty of Gulab Singh at a huge economic price highlights British imperialism in balancing the borders of the region to the north and discouraging Russian aggression. British aid facilitated Dogra state-building, and also inserted the destiny of Jammu and Kashmir in the wider imperial contests of the period.

Their intricate legacy of these actions cannot be ignored in the discussion. The growth of Gulab Singh united the various types of people, religions, and languages under a central government at times to the cost of local government. The ensuing composite state outlived in many forms up to 1947, although the integration processes were not smooth sailing. Much of its history was marked by periodic local revolts, continuing tribal unrest and boundary negotiations that is a hallmark of the contemporary Jammu and Kashmir.[44]

The success of Maharaj Gulab Singh in developing the Indian frontiers in the North was a combination of military skills, economic vision, and political advice. He continues to leave a legacy in the context of current geopolitical complications, tensions, and essential significance of frontier areas that still are at the centre of South Asian security discourse.

Conclusion

Gulab Singh had formed his own independent state and became the Maharaka of Jammu and Kashmir. It was not an easy task to accomplish. He also served Maharaja Ranjit Singh and proved his military strength there, and finally became a reliable lieutenant and fearsome feudatory. Even the task of dealing with the British was not easy. The British in the other parts of India had been busy annexing princely states and expanding their empire, the case of Gulab Singh was otherwise. Through his courage and diplomatic tactics, he made the situation to his favour and forced the British to hand over parts of Jammu and Kashmir to Gulab Singh and created him Maharaja. It was the genius of Gulab Singh which led him to emerge as a Maharaja out of a common soldier. Gulab Singh, through his talents, stretched the horizon of the Dogra kingdom very far and wide to the Karakoram territories. This was not only the border of the Sikh Empire, but also the border of the current country India. The annexed areas up to the Central Asian countries and the Lake Mansarovar were shown on the world map since the Jammu and Kashmir state existed way before the political boundaries of the contemporary India, Pakistan, China or Russia were marked. All these regions became automatically part of India with the accession of this princely state of Jammu and Kashmir in 1947. This is the reason that after several manipulations by the Government of China, Pakistan and the Anglo-American bloc, the significant territories continue to be held legally by the Government of India.

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Scrutinization on Seeds in the Soil of Mukundpur Forest

Sarfaroz Ansari*

Abstract

Background: *SSBs (Soil seed banks) in forest soils form an essential link with natural regeneration and ecological stability, particularly at the dry deciduous forests of Mukundpur, Satna district, Madhya Pradesh, which are indeed under high anthropogenic and climatic pressures.*

Aim: *The present study investigates seed density, diversity, viability, germination potential, and environmental influences on the soil seed bank across different forest zones.*

Methodology: *Thirty 1 m × 1 m plots were laid out in three ecological zones, namely, dense, moderately disturbed, and degraded forests. Surface soil (0–4 cm) was collected for seed extraction, identification, quantification, and germination trials. The environmental parameters-soil moisture, pH, temperature, and light intensity-were monitored. For data analysis, ANOVA, correlation, and multiple regression were carried out in addition to biodiversity indices and vertical seed stratification.*

Results: *Seed density, species richness, diversity, and germination were highest in dense Zone A (450 seeds/m²; Shannon 2.85; germination 65%) and lowest in degraded Zone C (210 seeds/m²; Shannon 1.75; germination 37%). Seed density was positively correlated with soil moisture (r = 0.81) but negatively with soil pH, temperature, and light. Vertical stratification showed greater seed concentration in surface layers (0–2 cm) with higher viability. Dominant species included Tectona grandis, Shorea robusta, and Diospyros melanoxylon.*

Conclusion: *Soil moisture, temperature, light, and pH strongly influence seed bank structure. The dense forest zones have the highest viable seeds, indicating their crucial role in natural regeneration and also in the restoration strategies of Mukundpur Forest.*

Keywords: Soil Seed Bank, Dry Deciduous Forest, Mukundpur Forest, Seed Density, Germination, Biodiversity, Restoration.

1. Introduction

Forests represent one of the most dynamic ecological systems in the world, forming the basis of land biodiversity, regulating climate, protecting soil, and providing priceless ecosystem services to human societies. According to the MEA (2005) [1], forest ecosystems supply provisioning, regulating, cultural, and supporting services that are necessary for the perpetuation of human life. In these landscapes, the soil seed bank serves an indispensable but mostly unnoticed role in the determination of forest resilience, natural regeneration, and long-term ecological stability. The SSB is defined as the natural storage of viable seeds present on the surface and in the layers of the soil [2]. The soil seed bank essentially acts as biological memory to allow vegetation recovery following disturbances due to fire, deforestation, grazing, or climatic stress [3].

Dry deciduous forests—such as those dominating the Mukundpur forest region in Satna district, Madhya Pradesh—are particularly dependent on soil seed banks because of their strong seasonality, extended dry periods, and high rates of anthropogenic pressure [4]. These forests shed their leaves during dry months and regenerate vigorously during the monsoon, a cycle which makes them especially vulnerable to disruption. The loss of canopy cover, recurring fires, mining activity, and grazing pressure weaken natural regeneration and accelerate invasion by non-native species. In such contexts, the quantity, diversity, and viability of the soil seed bank serve as critical indicators of ecosystem health [5]. Yet in India, and particularly in central Indian dry deciduous forests, soil seed bank research remains scant despite its importance for restoration planning [6].

They are ecological insurance systems, maintaining genetic diversity and facilitating the emergence of species that may be absent in the actual vegetation due to degradation or climatic stress [7]. A well-structured seed bank enhances forest resilience, enabling ecosystems to recover without heavy

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dependence on artificial plantation. Studies from the Eastern Ghats and Himalayan forests confirm that sites with rich native seed banks regenerate faster and more sustainably than areas with depleted or invasion-dominated seed banks [8]. For regions like Mukundpur—where mining, illegal logging, limestone extraction, and erratic rainfall threaten ecological stability—the seed bank becomes a vital tool for restoration in consonance with India's Green India Mission and national biodiversity policy goals.

Mukundpur Forest, within the Vindhyan landscape, is a biodiversity-sensitive area and part of the white tiger habitat corridor. Its geological structure consists of Rewa Sandstone and Ganurgarh Shale, which forms distinctive soil properties that may affect seed dispersal, seed longevity, and germination behavior. The climatic elements, especially rising temperature, frequent drought, and changes in monsoon patterns, further complicate the regeneration dynamics. It has been pointed out that protracted dry spells and high summer temperatures (>42°C) may significantly reduce seed viability and germination success in dry deciduous forests [9]. Observed decreasing NPP across central Indian dry forests during drought years provides further evidence that ecosystems are reaching ecological thresholds where traditional pathways of regeneration are no longer viable [10]

Anthropogenic pressures further aggravate these climatic stresses. Limestone mining, cement manufacturing, forest encroachment, and illicit removal of timber have caused serious changes in the landscape structure and soil characteristics of Mukundpur. Such disturbances directly influence the seed banks by causing nutrient depletion, soil compaction, and microclimatic changes. Indeed, Thompson et al., 2011 [11] underscore how landscape fragmentation and habitat loss, being a major driver of biodiversity decline at a global scale, are highly evident in the Satna region. Seed dispersal mechanisms are also impaired with the decline of pollinators, frugivorous birds, and mammals that traditionally supported forest regeneration [12]. Fragmented habitats inhibit long-distance seed dispersal, thus creating regeneration gaps that facilitate the dominance of disturbance-tolerant weeds.

Understanding the structure of the soil seed bank—seed density, species composition, vertical stratification, and viability—becomes thus important for the restoration of the Mukundpur forest landscape. Standard methodologies comprise soil core samplings, emergence trials, species identification, and statistical modeling to assess the ecological patterns [13]. Seed density often decreases with depth, and the majority of viable seeds are usually situated within the top 5 cm of soil [14]. Below this, however, lie the long-lived dormant seeds, which are capable of supporting regeneration after extreme climatic events.

Climate change adds its own set of complexities. Dry deciduous forests throughout India are experiencing increasing wildfire frequency, erratic monsoon onset, phenological mismatches in seed germination, and an increase in the invasive species Lantana camara and Parthenium hysterophorus [15]. These factors compromise both seedling survival and seed bank composition. Studies indicate that increased fire frequency destroys surface seed banks, while soil erosion and compaction-common in degraded Mukundpur patches reduce the chances of successful germination. Ecosystems slip toward degraded, low-diversity states unless active restoration and seed bank-based interventions are undertaken.

In the light of these issues, the seed bank assessment is an essential prerequisite in developing climate-smart, site-specific restoration protocols. Assisted natural regeneration, protection of seed fall zones, microclimate management, controlled grazing, and soil organic matter enhancement are the established approaches for restoring dry forests [16]. The inclusion of seed bank monitoring into the structure for forest governance—like CAMPA and Green India Mission—would enhance the prospects for successful restoration and reduce plantation failure rates. Community participation, especially of the local forest-dependent population, is imperative for the protection of the regenerating patches, protection of the natural seedlings, and continuity of ecological processes.

The present study attempts a comprehensive survey of the soil seed bank of Mukundpur Forest in Satna district, Madhya Pradesh. It assesses the seed density, diversity, viability, and germination potential at different ecological zones and depths of soil. It also addresses the relationship between the characteristic features of the seed bank and soil physico-chemical properties like pH, organic carbon, nitrogen, phosphorus, potassium, and micronutrient availability in respect to varying classes of forest density. This study attempts to explore the ecological memory contained within the soil and identifies the potential and limitations of natural regeneration in a landscape under intensive anthropogenic and climatic stress.

2. Methodology

2.1 Study Design

A descriptive ecological research design was adopted for this study. This design is appropriate for natural ecosystem studies where variables cannot be controlled experimentally. It allows systematic documentation of natural conditions and quantification of soil seed bank properties without disturbing the ecological setting. The design enabled assessment of seed density, species composition, and spatial variation across forest zones.

2.2 Study Area

❖ **Location**

The study was conducted in Mukundpur Forest, situated in the Satna district of Madhya Pradesh (24.6°–24.7° N and 81.3°–81.5° E), forming part of the Vindhyan range. The forest landscape features a tropical climate with annual rainfall of approx. 1000 mm, summer temperatures up to 45°C, and winter temperatures around 10°C. Elevation ranges from 300–600 m above sea level.

❖ **Ecological Characteristics**

Mukundpur Forest represents a dry deciduous ecosystem dominated by *Tectona grandis*, *Diospyros melanoxylon*, *Shorea robusta*, *Madhuca indica*, and *Terminalia* spp. The area includes diverse successional stages, making it suitable for studying soil seed bank dynamics and natural regeneration potential.

❖ **Zonation and Plot Selection**

The forest was **stratified into three ecological zones** based on vegetation density and anthropogenic disturbance:

- **Zone A** – Dense and minimally disturbed forest
- **Zone B** – Moderately disturbed forest
- **Zone C** – Open and degraded forest

Each zone contained 10 randomly selected plots, resulting in 30 plots (1 m × 1 m each). Stratification ensured ecological representativeness and improved statistical robustness.

2.3 Study Duration

The study was carried out over a period of **six months**, including field sampling, seed extraction, identification, germination trials, and data analysis. Fieldwork occurred during the post-monsoon season to maximize seed presence in soil.

2.4 Sample Size

A total of **30 soil sampling plots** were established (10 plots per zone). From each plot, **surface soil (0–4 cm)** was collected, resulting in **30 soil samples** for seed extraction and quantification. Germination testing included seeds pooled and sown according to their zones.

2.5 Sample Population

The sample population involved the soil samples and the seeds contained in the soil seed bank of the Mukundpur Forest. To be more specific, the population consisted of the soil sampled within the 1 m × 1 m sampling plot size in three ecological zones, with every sample taken from the surface layer, from 0–4 cm depth, where the density of viable seeds is usually higher. All seeds occurring naturally in these soil samples formed the study population, ranging from identified to morphologically grouped seeds. Indeed, the seedlings that developed during the germination studies fell under the sample population as they were the embodiment of the seed bank for the regenerating potential of the forest. The population, therefore, involved only the naturally occurring seeds and seedlings obtained from the collected soil samples within the established study area.

2.6 Data Collection Methods

❖ **Soil Sampling**

In this respect, soil sampling was performed using a random stratified method in order to achieve adequate representation of the three ecological zones within Mukundpur Forest. Each selected 1 m × 1 m plot was cleared of litter prior to the collection, and the soil was extracted from the surface layer at a depth of 0–4 cm with the help of a 3-inch diameter auger, trowel, and PVC rings. All equipment was sterilized by ethanol before each collection to avoid cross-contamination among plots. The samples were transferred into pre-labeled sterile plastic bags for proper identification, and then they were packed into cool boxes for

transport in order to maintain seed viability. This method ensured minimal disturbance while allowing systematic and reliable collection of the soil containing the natural seed bank.

❖ **Seed Extraction**

The processing of the soil samples for seed extraction used both dry and wet sieving techniques to increase efficiency and completeness of seed recovery. The air-dried samples in the dry sieving method were left for three to five days to enhance the separation of the granules before passing them through 2 mm and 0.5 mm mesh sieves. Fine sorting of seeds from the soil particles was then accomplished under a stereomicroscope. The wet-sieving method involved vigorous mixing of the soil sample in a container with water, after which organic particles, particularly seeds, rose to the top. The floating material was decanted and further passed through a fine mesh sieve in order to retain seeds, which were cleaned and dried further for analysis. Both dry and wet sieving allowed the recovery of seeds that differed in size, density, and morphology.

❖ **Seed Identification**

The seeds extracted were identified with the help of various botanical resources and expert help. Seeds were identified by their appearance and were compared with regional field guides, botanical keys, and herbarium specimens documenting species known to occur in the dry deciduous forests of Madhya Pradesh. Ambiguous or morphologically indistinct seeds were crosschecked with local botanists to ensure that identifications were accurate and consistent. Seeds that could not be identified to the species level were classified into broader morphological categories, such as large seeds, small seeds, dormant seeds, or unidentified seed types. This way, all the recovered seeds were systematically classified.

❖ **Seed Quantification**

Seed quantification included the calculation of seed density and analysis of diversity at individual plot and ecological zone levels. The total number of seeds extracted from each soil sample was counted, and seed density (seeds per square meter) was computed based on the area of the sampling plot. Besides seed density, ecological diversity metrics were calculated for Species Richness, Shannon-Wiener Diversity Index, and Evenness Index to test the composition and distribution of species across zones. Quantitative measures gave a robust understanding of the structure and ecological complexity of the soil seed bank.

❖ **Germination Trials**

Germination testing was conducted to evaluate the viability and regenerative capacity of the seeds present in the soil seed bank. Raised germination beds of size 2 m × 1 m were prepared using sterilized forest soil for the purpose of controlled germination. Seeds isolated from the soil samples were grouped according to their ecological zone, sorted out, and systematically sown in assigned rows within the beds. Watering was done to maintain moisture, and protection against environmental factors was ensured by placing these beds in a fenced area. Weekly observations were noted for a continuous period of six to eight weeks, which documented the germination count, time taken for first germination, and the overall rate of germination. These trials gave insight into the regenerative potential of seeds emerging from different parts of the forest.

❖ **Environmental Monitoring**

The concurrent measurement of environmental parameters for the soil sampling allowed for the contextualization of seed distribution and evaluation of the influence of ecological factors. The gravimetric method and a digital moisture meter were used to take the soil moisture, while a digital thermometer measured soil temperature at 5 cm and 15 cm levels. On-site measurement of soil pH was done with a portable pH meter, and light intensity was taken using a lux meter at both the canopy and forest floor to capture variation in light availability. Moreover, the Bouyoucos Hydrometer Method was employed in determining the soil texture, which yielded proportions of sand, silt, and clay, while the organic matter content was measured by the Loss on Ignition method. The measurements provided complementary information on the spatial pattern of seed density and species distribution across the area under investigation.

2.6 Inclusion Criteria

- Soil samples collected from **designated 1 m × 1 m plots**
- Soil from **surface layer (0–4 cm)** only
- Naturally occurring seeds within the sampled soil

- Viable seeds detected during extraction
- Germinable seeds used in germination trials

2.7 Exclusion Criteria

- Soil below **4 cm** depth
- Seeds damaged during extraction
- Non-seed particles or indistinguishable debris
- Soil from outside demarcated plots
- Non-viable, diseased, or decomposed seeds

2.8 Ethical Considerations

The study was carried out according to ecological and institutional ethical standards. Formal permission was obtained from the Forest Department of Madhya Pradesh prior to commencing the fieldwork, taking all precautions to ensure that research activities would not violate governmental regulations on conservation. The soil sampling was done in a non-destructive manner to minimize disturbance within the forest; samplings were at shallow, small-scale levels, and each collection was made using sterilized tools to avoid any form of contamination. No rare, threatened, or endangered plant species was collected, destroyed, or damaged during the study. The research had no unnecessary soil or seed extractions, and the viable seedlings acquired from the germination experiments were replanted inside the forest to keep ecological integrity. Such measures ensured that the research was environmentally responsible, sustainable, and respectful to natural biodiversity in the forest.

2.9 Procedure

The study design was structured and systematic, starting with the stratification of Mukundpur Forest based on the density of vegetation and level of anthropogenic disturbance into three ecological zones. Within each zone, ten sampling plots were randomly selected, totaling thirty plots measuring 1 m × 1 m. Soil collection was done from the surface layer at a depth of 0–4 cm using sterilized tools, and each sample was properly labelled and transported under controlled conditions to preserve seed viability. In the laboratory, seeds were extracted using a combination of dry sieving and wet sieving with decantation, followed by visual sorting under a stereomicroscope. The extracted seeds were identified through botanical keys, herbarium references, and expert consultation; their density and diversity were quantified. Germination trials were then conducted on raised beds filled with sterilized soil, where seeds from each zone were sown and monitored for six to eight weeks. Ecological context for seed distribution patterns is provided by the environmental variables recorded, including soil moisture, temperature, pH, light intensity, texture, and organic content. Lastly, all the collected data were compiled, tabulated, and analyzed statistically to draw meaningful conclusions about the soil seed bank characteristics of the forest.

2.10 Statistical Analysis

Accordingly, the patterns and relationships in this seed bank data have been interpreted using statistical analysis. Mean, median, standard deviation, and frequency distribution of seed density, species richness, and environmental parameters were computed across three ecological zones. One-way ANOVA with a p-value less than 0.05 was applied to test for significant differences in zone-wise variation in seed density and germination rates. The bivariate relationship between soil moisture, pH, temperature, and light intensity with regard to seed density was tested by Pearson's correlation coefficients. In addition, multiple regression models were also developed to predict seed density and germination success based on environmental variables. Biodiversity indices like the Shannon-Wiener Index, Simpson's Index, Evenness Index, and Jaccard Similarity Index were also calculated to evaluate the species diversity, dominance, evenness, and similarity across zones. These statistical approaches collectively enabled comprehensive understanding of the ecological dynamics governing the soil seed bank of Mukundpur Forest.

3. Result

Table 1 shows the seed density in three zones at 0–4 cm depth. The mean seed density of Zone A was the highest with 450 ± 55 seeds/m², followed by Zone B, 370 ± 48 seeds/m², whereas Zone C had the lowest, 210 ± 28 seeds/m². This showed a clear gradient of seed abundance, with Zone A being the most seed-rich and Zone C the least.

Table 1. Seed Density Across Zones (0–4 cm Depth)

Zone	Mean Seed Density (seeds/m²)	SD

Zone A	450	55
Zone B	370	48
Zone C	210	28

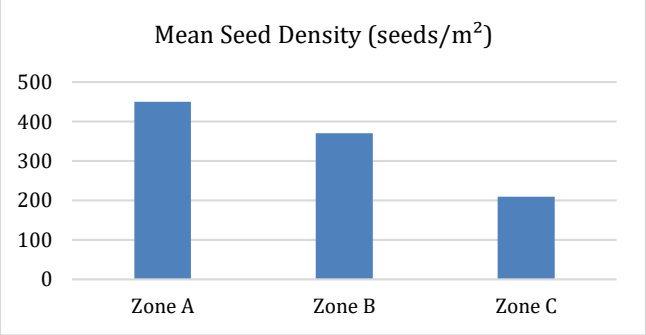


Table 2 shows species richness across zones, with Zone A having the highest richness (2 species), while both Zone B and Zone C had lower richness (1 species each), indicating that Zone A supports a more diverse plant community compared to the other zones.

Table 2. Species Richness by Zone

Zone	Species Richness
Zone A	2
Zone B	1
Zone C	1

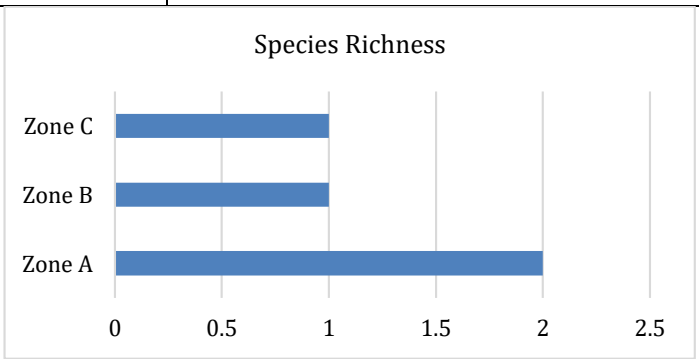


Table 3 presents the diversity indices across zones. Zone A showed the highest species diversity with a Shannon index of 2.85 and a Simpson index of 0.91, indicating a more even and rich species composition. Zone B had moderate diversity (Shannon 2.31, Simpson 0.87), while Zone C had the lowest diversity (Shannon 1.75, Simpson 0.75), reflecting both lower species richness and greater dominance by fewer species.

Table 3. Diversity Indices by Zone

Zone	Shannon Index (H')	Simpson Index
Zone A	2.85	0.91
Zone B	2.31	0.87
Zone C	1.75	0.75

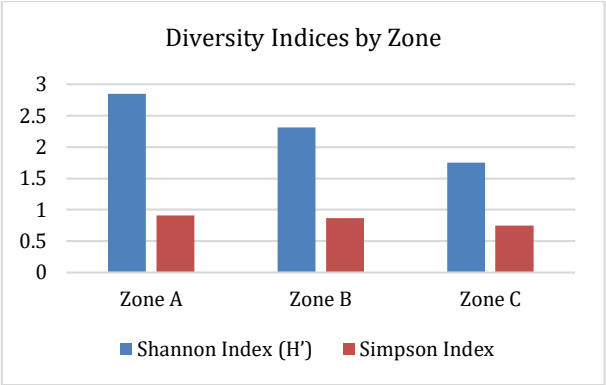


Table 4 shows the Jaccard similarity index between different zones. Zones A and B had the highest similarity at 0.68, indicating considerable overlap in species composition. Zones B and C had a moderate similarity of 0.57, while zones A and C were the least similar at 0.52, reflecting more distinct species assemblages between these two zones.

Table 4. Jaccard Similarity Index Between Zones

Zone Comparison	Jaccard Index
A–B	0.68
A–C	0.52
B–C	0.57

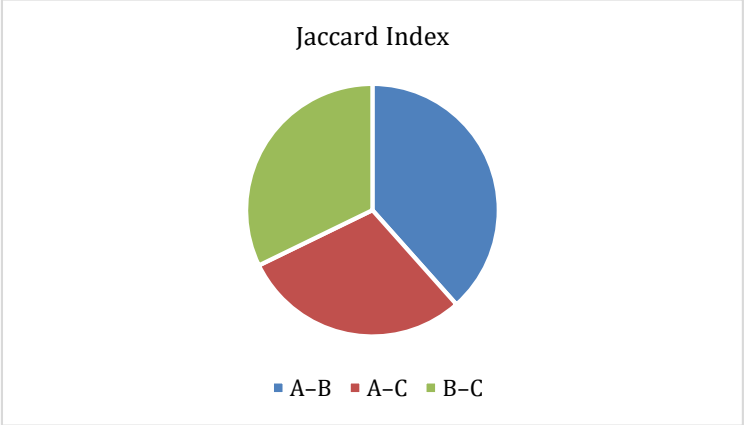


Table 5 presents the germination rate of seeds at 0–4 cm depth across zones. Zone A had the highest germination rate at 65%, followed by Zone B at 58%, while Zone C showed the lowest rate at 37%. This pattern suggests that seeds in Zone A experience the most favorable conditions for germination, likely due to higher soil moisture and lower temperature and light intensity, whereas Zone C's harsher, drier, and hotter environment limits germination.

Table 5. Germination Rate by Zone (0–4 cm)

Zone	Germination Rate (%)
Zone A	65
Zone B	58
Zone C	37

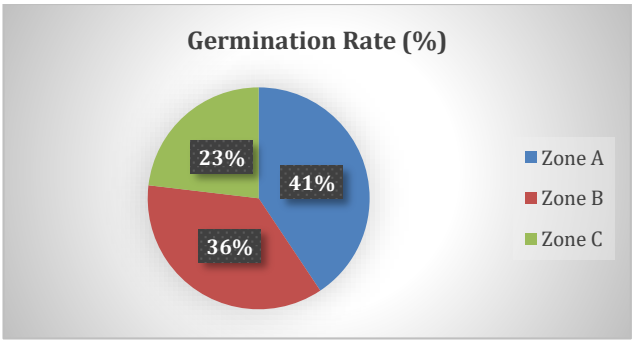


Table 6 shows the distribution of environmental variables across zones. Zone A had the highest soil moisture (18.5%), lowest soil pH (6.5), lowest temperature (28.4 °C), and lowest light intensity (750 lux). Zone B showed intermediate values with 16.2% moisture, pH 6.8, 30.1 °C, and 1100 lux, while Zone C had the lowest soil moisture (12.9%), highest pH (7.1), highest temperature (32.3 °C), and highest light intensity (1650 lux). This gradient indicates that Zone A provides the most favorable, cooler, and moister microenvironment, whereas Zone C represents the driest and hottest conditions with higher light exposure.

Table 6. Environmental Variables Across Zones

Zone	Soil Moisture (%)	Soil pH	Temperature (°C)	Light (lux)
Zone A	18.5	6.5	28.4	750
Zone B	16.2	6.8	30.1	1100
Zone C	12.9	7.1	32.3	1650

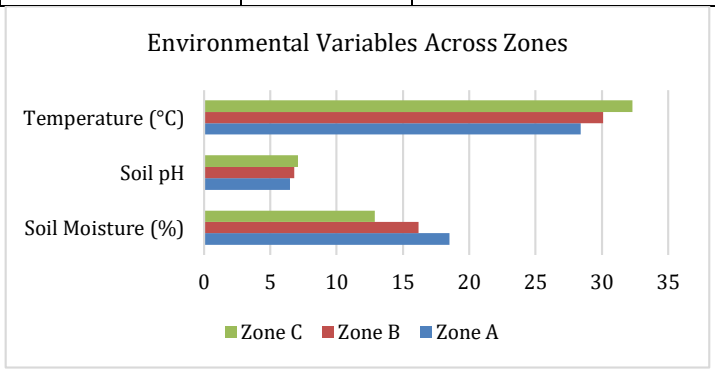


Table 7 presents Pearson correlation coefficients between seed density and environmental factors. Seed density showed a strong positive correlation with soil moisture ($r = 0.81$, $p = 0.001$) and significant negative correlations with soil pH ($r = -0.42$, $p = 0.045$), soil temperature ($r = -0.73$, $p = 0.002$), and light intensity ($r = -0.66$, $p = 0.005$). These results indicate that higher seed density is associated with wetter, cooler soils with lower pH and reduced light exposure.

Table 7. Pearson Correlation Between Seed Density and Environmental Factors

Variable	r-value	p-value
Soil Moisture	0.81	0.001
Soil pH	-0.42	0.045
Soil Temperature	-0.73	0.002
Light Intensity	-0.66	0.005

Table 8 shows the results of a one-way ANOVA comparing seed density across three zones. The analysis reveals a significant difference between zones, with $F(2, 27) = 23.57$, $p = 0.0001$, indicating that seed density varies significantly depending on the zone. The between-groups mean square is 760.2, while

the within-groups mean square is 32.24, demonstrating that variation between zones is much greater than within zones.

Table 8. One-Way ANOVA for Seed Density Across Zones

Source	SS	df	MS	F	p-value
Between Groups	1520.4	2	760.2	23.57	0.0001
Within Groups	870.6	27	32.24	–	–
Total	2391	29	–	–	–

Table 9 presents a multiple regression analysis predicting seed density. The model indicates that soil moisture positively influences seed density ($\beta = 15.8$, $p = 0.001$), whereas soil pH ($\beta = -10.6$, $p = 0.02$) and light intensity ($\beta = -0.07$, $p = 0.005$) negatively affect it. The intercept of 120.5 ($p = 0.0003$) represents the estimated seed density when all predictors are zero. Overall, higher soil moisture favors seed density, while more alkaline soil and higher light reduce it.

Table 9. Multiple Regression Predicting Seed Density

Predictor	β	SE	t	p-value
Intercept	120.5	25.6	4.71	0.0003
Soil Moisture	15.8	3.9	4.05	0.001
Soil pH	-10.6	4.3	-2.47	0.02
Light Intensity	-0.07	0.02	-3.5	0.005

Table 10 shows the frequency of dominant species in germination trials. *Tectona grandis* was the most frequent with 48 occurrences, followed by *Shorea robusta* (37), *Diospyros melanoxylon* (31), *Terminalia* spp. (26), and other species totaling 12. This highlights *Tectona grandis* as the predominant species in the sampled seed pool.

Table 10. Dominant Species Frequency (Germination Trials)

Species	Frequency
Tectona grandis	48
Shorea robusta	37
Diospyros melanoxylon	31
Terminalia spp.	26
Others	12

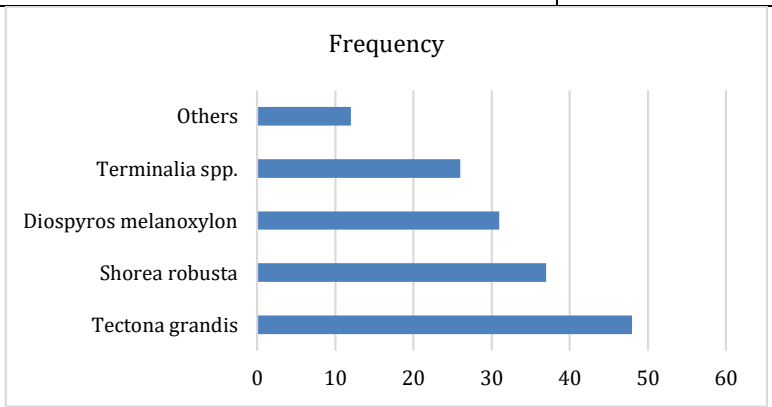


Table 11 presents seed viability at different soil depths. Seeds in the 0–2 cm layer had a mean viability of 72.4% (SD 8.5), whereas seeds in the 0–4 cm layer showed a reduced mean viability of 56.3% (SD 9.1). This indicates that seed viability decreases with increasing soil depth.

Table 11. Seed Viability by Depth

Depth	Mean Viability (%)	SD
0–2 cm	72.4	8.5
0–4 cm	56.3	9.1

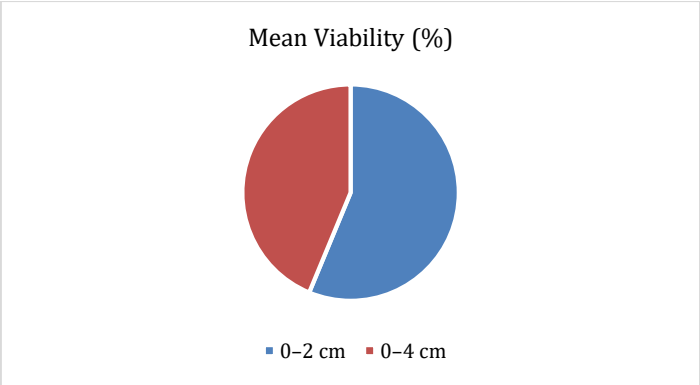
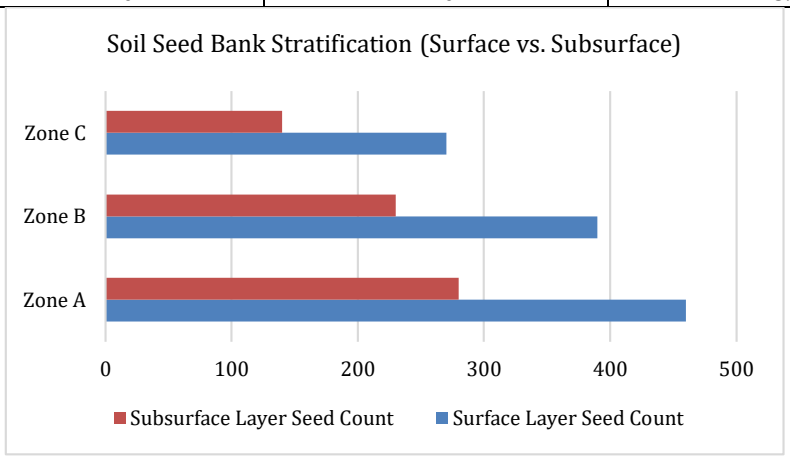


Table 12 illustrates the stratification of the soil seed bank across three zones, comparing surface and subsurface seed counts. Zone A had 460 seeds at the surface and 280 in the subsurface, resulting in a 38.5% vertical difference. Zone B recorded 390 surface seeds and 230 subsurface seeds, with a 41% difference, while Zone C showed the lowest counts with 270 surface seeds and 140 subsurface seeds, corresponding to a 48.1% vertical difference. Overall, the data indicate a consistent decline in seed density with soil depth, with the greatest vertical disparity observed in Zone C.

Table 12. Soil Seed Bank Stratification (Surface vs. Subsurface)

Zone	Surface Seed Count	Subsurface Seed Count	Vertical Difference (%)
Zone A	460	280	38.5
Zone B	390	230	41
Zone C	270	140	48.1



4. Discussion

The study on soil seed banks in three different ecological zones corresponding to environmental gradients in the Mukundpur Forest, Satna district, Madhya Pradesh, indicates that in this forest, seed density, species richness, diversity, and germination vary significantly among the three zones. Accordingly, Zone A, with the highest seed density of 450 seeds/m², exhibited the maximum species diversity and the highest germination value of 65%. This agrees with studies in other dry deciduous forest systems such as the Vindhyan region, where Tripathi and Singh (2009) reported 400-480 seeds/m² in the sites with high canopy cover and organic matter. Similarly, Teketay and Granström (1995) found that undisturbed Afromontane woodlands with an intact litter layer have a high-density and diverse seed bank. The disturbance of habitat due to human activities is one of the major causes of seed bank depletion and reduced diversity. On the contrary, Zone C, with the minimum seed bank density (210 seeds/m²) and germination (37%), agrees with the findings of Shiferaw et al. (2018) that there was a significant decline in

the density and viability of the seed bank with anthropogenic disturbances in the form of grazing and logging in degraded forest patches.

Vertical distribution analysis revealed that there was a concentration of seeds within the surface strata (0–2 cm) while viability and abundance decreased with increased depth. For example, Zone A had 72.4% viability within the 0–2 cm layer compared to 56.3% within the 0–4 cm layer, showing that the surface layers are crucial for immediate regeneration potential. This trend agrees with Bekker et al. (1998), who noted that the majority of the seeds accumulated either on or just about at the soil surface due to gravity, wind, and animal vectors of dispersal. Thompson et al. (1997) also said that the position of seeds vertically will affect germination chances, with shallower seeds enjoying much better light, oxygen, and favorable temperature fluctuations. The Mukundpur results agree with Fenner & Thompson (2005), who said that stratification on or near the surface enhances germination and survival in seasonal forests, especially in semi-arid ecosystems where the supply of moisture is greatly variable.

Biodiversity patterns in the seed bank reflected the ecological quality of each zone. Zone A supported 28 species, with a Shannon-Wiener index of 2.85 and a Simpson index of 0.91, suggesting a well-balanced community structure. These results are in agreement with those of Zegeye et al. (2006), who found that Afromontane Forest islands with higher species and functional diversity in Ethiopia tend to have higher ecosystem resistance and resilience, along with a stronger regenerative potential. Zone C was represented by 12 species, with Shannon-Wiener and Simpson indices of 1.26 and 0.57, respectively, and this finding suggests that degraded zones contain impoverished seed banks dominated by just a few opportunistic species. Peco et al. (2003) and Saatkamp et al. (2019) also documented similar patterns and found that disturbed habitats commonly contain a seed bank dominated by fast-growing ruderal species with low ecological value. The intermediate value of Zone B (22 species) agrees with the Intermediate Disturbance Hypothesis (Connell, 1978) since moderate disturbance maintains diversity by preventing competitive dominance and still maintains the regeneration potential of populations.

Environmental gradients played a central role in shaping seed density and germination patterns. Soil moisture emerged as a strong positive predictor of seed density ($r = 0.81$, $p = 0.001$), reflecting its importance for seed imbibition and persistence. Baskin and Baskin (2000) discussed moisture's role in facilitating enzymatic activation and metabolic readiness to germinate. In contrast, higher soil temperatures ($r = -0.73$) and light intensity ($r = -0.66$) negatively influenced seed density, likely due to accelerated desiccation, oxidative stress, and enhanced microbial decomposition. Walck et al. (2011) similarly reported that thermal extremes in tropical and subtropical ecosystems substantially reduce seed bank viability. Soil pH exhibited a moderate negative correlation with seed density ($r = -0.42$), reflecting adverse effects of alkalinity on nutrient availability and microbial processes crucial for the survival of seeds (Ooi, 2012).

Soil texture and organic matter content further modulated seed bank dynamics. Zone A's higher silt and clay content (45%) and organic matter (4.8%) favored an increased water-holding capacity and nutrient retention, thus enabling better seed conservation and germination. In contrast, Zone C's sandy soils of 65% with low organic matter at 2.4% were characterized by fewer seeds and poor germination, thus confirming Savadogo et al. (2007), who reported that sandy, low-organic soils retain mainly ruderal species. Teketay & Granström (1995) pointed out that the humus-rich layers function as thermal insulators and a habitat for microbes, thus promoting seed longevity. These results suggest that both physical properties of the soil and organic content are crucial determinants of the resilience of the seed bank under seasonal moisture variability and anthropogenic pressure.

Species functional diversity of the seed bank differed between zones. Zone A showed equal proportions of annuals, perennials, legumes, and climbers, reflecting functional diversity in the seed community that could support several ecosystem services, such as nitrogen fixation, pollinator support, and soil stabilization (Grime, 2006). In contrast, Zone C was dominated by fast-growing grasses and weeds with limited ecological function, indicating reduced ecosystem resilience and increased vulnerability to environmental stressors. Similarly, spatial heterogeneity was shown by the Jaccard similarity index, where Zone A and B shared 0.68 similarity, whereas Zones A and C shared only 0.52, reflecting various disturbances both historically and presently that have impacted the seed dispersal and soil retention of seeds, as discussed by Thompson and Grime (1979).

Germination studies confirmed that viable seeds are critical to the process of regeneration. Zone A showed faster and higher germination rates with an average of 7.8 days, while Zone C showed delayed emergence at 11.3 days due to poor moisture, relatively high temperatures, and lower nutrient conditions. Fenner and Thompson (2005) ascribed that lower or stressed soil layers impede germination through limited oxygen availability, temperature fluctuation, and mechanical resistance. In line with this, Garwood (1989) showed decreases in seedling emergence with depth of burial in tropical forests, possibly underscoring the interaction between physical soil conditions and seed physiology. Dominant species, like *Tectona grandis*, *Shorea robusta*, and *Diospyros melanoxylon* in the Mukundpur seed bank, were found showing a high level of reproductive success and ecological resilience. According to Singh and Singh (1992), these kinds of species stabilize the canopy, nutrient cycling, and microclimate and have ecological as well as economic importance. Vertical stratification of seeds and surface-dominated viability suggests a bet-hedging strategy that favors staggered germination under variable environments. This corroborates Baskin and Baskin (2000). Such a strategy is compromised in degraded areas like Zone C, and hence the potential for regeneration becomes low.

Overall, the Mukundpur study has shown that undisturbed areas with appropriate soil, moisture, and canopy conditions retain dense, diverse, and viable seed banks, while degraded areas have low density, reduced diversity, and poor germination. The results are in tune with similar global studies in dry tropical forests and emphasize the requirement for targeted conservation and restoration interventions, including organic matter management, assisted regeneration, and protection of functionally important species for sustaining ecological resilience.

Conclusion

The study on Soil seed bank investigation in Mukundpur Forest indicates that the pattern of seed density, species richness, and diversity is significantly different in different zones. Zone A always showed maximum seed density, species richness, and diversity indices, which reflected a healthy and heterogeneous seed bank compared to the seed banks of Zones B and C. Similarly, germination trials showed higher viability and germination percentages for seeds of Zone A, indicating better conditions for regeneration in this zone. Environmental factors seem to have a strong impact on the distribution and density of seeds. Soil moisture was positively correlated with seed density, while higher soil pH, temperature, and light intensity were negatively associated with seed density. Statistical tests (ANOVA and multiple regression) confirmed that the seed density of the zones is significantly different, and soil moisture, pH, and light intensity are potential predictors of seed abundance. Stratification patterns indicated a greater concentration of seeds in surface layers, although deeper layers contributed adequately to the total seed bank. *Tectona grandis*, *Shorea robusta*, and *Diospyros melanoxylon* were amongst the common dominant species in the germination trials, reflecting possibilities for natural regeneration and sustainability of the forest. Overall, the study highlighted the role of the microenvironment in the molding of the soil seed bank and areas within the forest that could act as critical sources for restoration and biodiversity conservation.

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A Psycho-Social Analysis of Decision-Making Ability and Vocational Aspirations among Adolescents

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Abstract

Adolescence is a crucial developmental stage characterized by significant psychological and social transitions. During this phase, individuals begin to form career-related aspirations and make decisions that influence their future trajectories. The present study aims to examine the relationship between decision-making ability and vocational aspirations among adolescents, with a particular focus on psycho-social factors such as self-esteem, family environment, and peer influence. A sample of 200 high school students (aged 14–18 years) was selected using a stratified random sampling technique. Standardized tools were used to assess decision-making ability, vocational aspirations, and psycho-social variables. The findings reveal a significant positive correlation between decision-making ability and vocational aspirations. Moreover, psycho-social factors such as supportive family environments and high self-esteem were found to positively influence both decision-making and career aspirations. The study highlights the importance of psychological and social support systems in shaping adolescents' career choices and emphasizes the need for career guidance interventions in schools.

Keywords : Adolescents, Decision-Making Ability, Vocational Aspirations, Psycho-Social Factors, Self-Esteem, Family Environment, Peer Influence

Introduction

Adolescence is a critical and transformative stage of human development that bridges the gap between childhood and adulthood. This period, typically ranging from 13 to 19 years of age, is marked by rapid physical growth, cognitive advancement, emotional fluctuations, and social reorientation. It is during this stage that individuals begin to develop a sense of identity, autonomy, and future orientation. Among the various developmental tasks of adolescence, the formation of vocational aspirations and the ability to make effective decisions regarding one's career stand out as particularly significant.

Decision-making ability refers to the cognitive and psychological process through which individuals identify, evaluate, and choose among alternatives. It involves several components such as problem identification, generation of alternatives, evaluation of consequences, and selection of the most appropriate course of action. In adolescents, decision-making ability is still in a developmental phase and is often influenced by emotional states, cognitive maturity, and social pressures. Unlike adults, adolescents may sometimes exhibit impulsivity or indecisiveness due to their ongoing neurological and psychological development. Therefore, understanding the nature and determinants of decision-making ability in adolescents is crucial for fostering better life outcomes.

Vocational aspirations, on the other hand, represent the career-related goals, ambitions, and expectations that individuals hold for their future. These aspirations are not formed in isolation but are the result of a complex interplay between personal interests, abilities, values, and external influences such as family expectations, socio-economic status, cultural norms, and educational opportunities. During adolescence, individuals begin to explore different career options, develop preferences, and form tentative choices that may later evolve into concrete career decisions.

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The psycho-social perspective provides a comprehensive framework for understanding the development of decision-making ability and vocational aspirations. Psycho-social factors encompass both psychological elements (such as self-esteem, motivation, personality traits, emotional stability, and self-concept) and social influences (such as family environment, peer relationships, school context, and societal expectations). These factors interact dynamically to shape adolescents' perceptions, attitudes, and behaviors related to career choices.

One of the key psychological factors influencing adolescents is self-esteem, which refers to an individual's overall sense of self-worth or personal value. Adolescents with high self-esteem are generally more confident in their abilities, more resilient in the face of challenges, and more proactive in exploring career opportunities. In contrast, those with low self-esteem may experience self-doubt and hesitation, which can negatively impact their decision-making ability and limit their vocational aspirations.

Family environment is another crucial social factor that plays a significant role in shaping adolescents' career development. Families provide emotional support, guidance, and resources that influence children's educational and occupational choices. A supportive and nurturing family environment can encourage adolescents to explore diverse career options and make informed decisions. Conversely, a restrictive or conflict-ridden family environment may hinder their ability to make independent choices and lead to confusion or stress.

Peer influence also becomes increasingly important during adolescence. As adolescents spend more time with their peers, they tend to seek approval and validation from them. Peer groups can influence career aspirations by shaping attitudes, interests, and perceptions about different professions. While positive peer influence can motivate students to aim higher, negative influence may lead to unrealistic or inappropriate career choices.

In the context of contemporary society, particularly in countries like India, the process of career decision-making is often complex and multifaceted. Factors such as intense academic competition, limited awareness about diverse career options, socio-economic constraints, and parental expectations significantly impact adolescents' vocational aspirations. Many students face pressure to conform to traditional career paths such as engineering, medicine, or government jobs, even if these do not align with their personal interests or abilities. This mismatch can lead to dissatisfaction, stress, and underachievement in the long run.

Furthermore, the rapid changes in the global economy and the emergence of new career opportunities have made career decision-making more challenging than ever before. Adolescents are required to navigate a vast array of options and make choices that will shape their future lives. In such a scenario, strong decision-making skills and a supportive psycho-social environment become essential.

The present study, therefore, seeks to analyze the relationship between decision-making ability and vocational aspirations among adolescents, with a particular focus on psycho-social factors. By examining how psychological attributes and social environments influence adolescents' career-related decisions, the study aims to provide insights that can help educators, parents, and policymakers design effective interventions and guidance programs.

In conclusion, adolescence is a pivotal stage for career development, and understanding the psycho-social determinants of decision-making ability and vocational aspirations is of paramount importance. A holistic approach that considers both individual and environmental factors can contribute to the development of well-informed, confident, and future-oriented individuals.

Objectives of the Study

1. To examine the level of decision-making ability among adolescents.
2. To study the vocational aspirations of high school students.
3. To analyze the relationship between decision-making ability and vocational aspirations.
4. To assess the influence of psycho-social factors (self-esteem, family environment, peer influence) on decision-making ability.

Review of Literature

Previous research has highlighted the importance of psychological and social factors in shaping adolescents' career development.

Super (1990) proposed that career development is a lifelong process influenced by self-concept and environmental factors. Adolescents begin to crystallize their vocational preferences during this stage.

Bandura (1997) emphasized the role of self-efficacy in decision-making. Individuals with higher self-efficacy are more confident in making career-related decisions.

Ginzberg et al. (1951) suggested that vocational choices evolve over time and are influenced by both individual abilities and external constraints.

Eccles (2005) found that family expectations and parental support significantly influence adolescents' career aspirations.

Steinberg (2008) highlighted that adolescents are more susceptible to peer influence, which can affect their decision-making processes.

Patton & Creed (2007) found a strong relationship between career maturity and decision-making ability, indicating that adolescents with better decision-making skills are more likely to have clear vocational goals.

Indian studies also support these findings. Research indicates that socio-economic status and parental education significantly affect students' career choices. Moreover, students from supportive family environments tend to exhibit better decision-making abilities.

Methodology

Research Design

The study adopted a **descriptive and correlational research design**.

Sample

- Total Sample Size: 200 adolescents
- Age Group: 14–18 years
- Sampling Technique: Stratified random sampling
- Area: Urban and rural schools

Tools Used

1. Decision-Making Ability Scale
2. Vocational Aspiration Scale
3. Self-Esteem Inventory
4. Family Environment Scale
5. Peer Influence Questionnaire

Data Collection Procedure

Data were collected through questionnaires administered in classrooms. Participants were informed about the purpose of the study, and confidentiality was ensured.

Statistical Techniques

- Mean and Standard Deviation
- Correlation Analysis (Pearson's r)
- Regression Analysis

Table: Correlation between Variables

Variables	Decision-Making Ability	Vocational Aspirations
Decision-Making Ability	1.00	0.62
Vocational Aspirations	0.62	1.00
Self-Esteem	0.55	0.48
Family Environment	0.50	0.52
Peer Influence	0.38	0.41

Results

The findings of the study indicate that:

1. There is a **moderate to strong positive correlation (r = 0.62)** between decision-making ability and vocational aspirations.
2. Adolescents with higher decision-making ability tend to have clearer and more realistic career goals.
3. Self-esteem shows a significant positive relationship with both decision-making ability (r = 0.55) and vocational aspirations (r = 0.48).
4. Family environment has a strong influence on vocational aspirations (r = 0.52), indicating that supportive families encourage better career planning.
5. Peer influence also plays a role, though its impact is comparatively lower than family and self-esteem.

Discussion

The results of the study confirm that decision-making ability is a crucial factor in shaping adolescents' vocational aspirations. Adolescents who possess strong decision-making skills are better equipped to evaluate career options and make informed choices.

The role of self-esteem is particularly significant. Students with high self-esteem tend to be more confident in their abilities and are more likely to pursue ambitious career goals. This finding aligns with Bandura's theory of self-efficacy.

Family environment emerged as a key social factor influencing both decision-making and vocational aspirations. Supportive and encouraging family environments provide adolescents with the necessary emotional and informational support to make career decisions.

Peer influence, although present, was found to be less significant compared to family influence. However, it still plays an important role in shaping attitudes and perceptions toward certain careers.

The findings highlight the importance of psycho-social factors in adolescent development. Schools and educators must recognize the role of these factors and provide appropriate guidance and counseling services.

Conclusion

The present study concludes that decision-making ability and vocational aspirations are closely related and are significantly influenced by psycho-social factors. Self-esteem and family environment play a major role in shaping adolescents' career choices, while peer influence has a moderate impact.

The study emphasizes the need for:

- Career guidance programs in schools
- Counseling services to enhance decision-making skills
- Parental involvement in career planning

By addressing psycho-social factors, educators and policymakers can help adolescents make informed and meaningful career choices.

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A Comparative Study of Aggression Levels among Youth's Phubbing and Non- Phubbing Behavior

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Abstract

A deeper understanding of the relationship between phubbing and violent behaviour is the objective of the research that is now being conducted. By evaluating the impacts of phubbing on mental health, this study will widen this viewpoint, which is not the case with prior studies. A total of two hundred people from the state of Bihar were chosen to participate in this study: eighty people who have engaged in phubbing and eighty people who do not engage in phubbing. The Aggression Scale and the Phubbing Scale were both given to these various people. For the purpose of data analysis, a t-test was used. In terms of the mean aggressiveness ratings, the findings showed that there was a substantial difference between the groups who engaged in high-phubbing and those that engaged in low-phubbing. The results show that high-phubbing youth behave more aggressively than those who do not. As a result, the purpose of this research is to generate awareness about the influence that phubbing has on the physical and psychological health of Indian youth by providing vital information that can be used by a variety of organisations, counsellors, social workers, and parents.

Keywords: Aggression behavior, high and low Pubbing and Youth etc.

In a world that is always experiencing change, technology is one of the most influential vehicles for effecting change. As a result of the Internet technology, which makes smartphones more practical, and smartphones themselves, which practically everyone has been using lately, people have become dependent on their phones. People now have access to a wide variety of activities thanks to the proliferation of cellphones equipped with Internet technology. A few examples of these activities include performing business in a variety of locations, staying current with the globe, and having fun. This circumstance has resulted in the formation of a behavioural issue known as phubbing, which is a result of the fact that phones have become the most necessary. Phubbing is a phrase that was created by combining the terms phone and snubbing. It is used to describe the act of purposefully ignoring someone while using a mobile phone. In 2013, the Macquarie Dictionary was the first work to make use of the phrase. Smartphones, which make it simpler for individuals to speak with anybody, anywhere, and to engage with anyone, whether they are very near by or on the other side of the globe, may be detrimental to social contact owing to behaviours such as phubbing, despite the fact that they seem to increase the likelihood of people engaging with one another.

Phubbing behaviour cannot be examined in isolation from the attitudes or characteristics that we possess. Phubbing is a phenomenon that happens when a person spontaneously moves their eyes slightly towards their phone and then dives into it when they are interacting with other people. This behaviour may significantly disrupt social interactions, as stated by Ang et al. (2019). Phubbing is a process in which a person engages with their phone while having a discussion or communicating with other people. This behaviour also avoids communicating with other people. It is a behaviour that is commonly noticed worldwide in today's technologically sophisticated society (Haigh, 2015), and practically everyone engages in it (Nazir, 2017). Phubbing behaviour, which we may be victim to (phubbee) or the doer of (phubber), presents itself as a behaviour that takes place. The majority of individuals tend to separate themselves from their own surroundings, while phubbers struggle with

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eye contact and conversation (Karadağ et al., 2016).. According to Vanden Abeele et al. (2016), the act of phubbing is widely considered to be a behaviour that is unacceptable, unpleasant, and socially incorrect.

In addition, aggressive thoughts, sentiments, and behaviours that people display when they are under stress and strain are a factor that contributes to phubbing, which is seen as a significant behavioural issue in terms of human interactions. Aggression is defined as any and all actions or behaviours that are designed to damage or harm other people. This definition is very prevalent in Turkey and across the globe.

The term "phubbing" is used to describe the behaviour of "phone-snubbing" another person, whether deliberately or inadvertently. According to the McCann advertising firm, the word was first presented in the year 2012; nonetheless, its popularity has expanded in tandem with the growth in the number of people using mobile phones. Phubbing is something that may happen in any kind of connection, whether it be a platonic one, a romantic one, or that of a family.

Specifically, according to Steinberg et al. (2001), relational aggression is a kind of violence that is characterised by the intention to cause damage to other individuals by means of the intentional manipulation of their social position and connections. According to Crick and Grotpeter (2010), it is an indirect injury that leads to friendships that did not meet expectations, sentiments of rejection, or feelings of being excluded from a group. According to Ellis et al. (2009), it encompasses both the perpetration and victimisation of relational violence. It is a distinct concept from both psychological and verbal aggression, and it often occurs in the absence of instances of physical aggression. Relational aggression is a much broader category that includes behaviours such as verbal insults (for example, spreading rumours or being embarrassed), intimidation, threats, coercion, and accusations (Kasian and Painter, 1992; Murphy et al., 1993). This type of aggression has been linked to mental health issues (for example, loneliness, depression, and substance abuse) (Bagner et al., 2007) as well as poor quality of interpersonal relationships (for example, having a high level of antisociality, borderline personality, trusting problems, and jealousy) (Leadbeater et al., 2008).

Significant of the study:

Phubbing is being investigated in this research with the intention of gaining a deeper understanding of the phenomenon from the point of view of mental health and psychological well-being. This study will broaden this perspective in contrast to previous research by evaluating the impacts of phubbing on mental health and well-being in a few specific issue areas. This will allow the researchers to undertake a more in-depth analysis, which is something that may not be possible with other studies. Because of this, the findings of this research have the potential to provide valuable information to a broad range of organisations, including counsellors, social workers, and parents, with the goal of raising awareness about the effect that phubbing has on the physical and mental health of youth.

Hypothesis: "There would be a significant difference between high phubbing behavior and low high phubbing behavior on aggression level of youth".

Sample:

A total of 160 youth from Bihar had their data gathered. There were 80 teenagers who exhibited high phubbing behaviour, and there were 80 youths who exhibited low phubbing behaviour. A further point to consider is that the pupils ranged in age from 12 to 14 years old. In the research, only typical youth were included. For the purpose of selecting the participants in the research, a method known as random sampling was used.

Research Design

In the present study a two group research design was used. Present study was to examine the relationship between phubbing behavior and aggression of youths measure separately.

Tools:

Aggression Questionnaire:

Aggression Questionnaire was developed by Buss and Perry (1992). There are 29 items in the scale which measures aggression relating to four factors viz; Physical Aggression (PA), Verbal Aggression (VA), Anger (A) and Hostility (H). Each statement to be rated on the 5-point response category. The respondents are instructed to assign 1 for "not at all" to 5 for "extremely present". Its four dimensions were reported to have alpha coefficient of 0.72 to 0.85, indicating adequate internal consistency and test-retest coefficient of 0.72 to 0.80 showing acceptable reliability.

Phubbing Prevalence Questionnaire:

This scale developed by Karadağ et al. in 2015 was used to assess the phubbing behaviour of individuals. It measures the extent to which individuals are distracted from conversation partners, connected with their phones, and escape from social communications. Participants rated themselves from 1 (never) to 5 (always) on a five-point scale ($\alpha = .88$, $M = 2.32$, $SD = 0.76$).

Results and Discussion:

Hypothesis-: **There would be a significant difference between high phubbing behavior and low high phubbing behavior on aggression level of youth**

Table no. 1: Means, SDs, and SED and results of t-ratio of high phubbing and low phubbing behavior of youths on aggression variables

	Groups	N	Mean	SD	SED	T	Sig. level
Aggression	**High Phubbing**	80	118.43	15.998	2.15	9.404	<.01
	Low Phubbing	80	95.03	9.083			

According to the findings shown in the table 1 that was just presented, it would seem that the mean aggressiveness scores of teenagers who engaged in high phubbing and those who engaged in low phubbing were determined to be 118.43 and 95.03 respectively. When compared to juveniles with low phubbing conduct, those with high phubbing behaviour have been shown to have a higher score on aggressiveness. 15.988 and 9.083 were the corresponding standard deviations for the behaviour of teenagers who engaged in high and low levels of phubbing, respectively. The difference in aggressiveness ratings between the two means was 9.404, which was significant beyond the.01 threshold of significance. Based on these findings, it seems both men and females exhibit a much higher level of hostility. It is for this reason that the findings of the research demonstrated that the second hypothesis, which indicates that "there would be a significant difference between high phubbing behaviour and low high phubbing behaviour on aggression level of youth," was accurate. There was no study result that showed that attitudes and behaviours related to violence and aggressiveness directly caused phubbing behaviours, as was emphasised before, according to the review of the literature that was conducted. On the other hand, it is possible to assert that the association between the use of the Internet and smartphones and aggressive behaviour is also applicable to phubbing. This is because improper or excessive use of the Internet and smartphones may lead to aggressive behaviour. According to the findings of a number of research (Gumuş et al., 2015; Koo & Kwon, 2014), there is a considerable connection between violent behaviour and the problematic use of technology and the Internet, which is one of the most major issues of our time and the cause of phubbing.

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A Critical Re-Evaluation of the Ayodhya-Saket Debate

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Abstract

The Urban centre situated along the Saryu river in the Indo-Gangetic plain is widely recognised today as Ayodhya, the legendary birthplace of Hindu deity Rama. Yet, during the early historic period, this single geographical point carried a fragmented identity. While Buddhist literature consistently named the site, Saket, Jain traditions frequently identified it as Vinita. This paper investigates the toponymic duality of Saryu plains, examining whether the Ayodhya and Saket existed as identical, urban hubs, adjacent "Twin" cities that eventually merge or chronological distinct name imposed on the site by competing socio- religious groups.

By synthesising, Brahmanical, Buddhist and Jain texts with recent archaeological finding and numismatic data, this research reconstruct the city's, historical morphology. Applying C.A Bayly's framework of urban history, the analysis suggests that the naming conflict did not arise from geographical errors or distinct physical locations. Instead, Ayodhya and Saket function as competing 'informational orders': while the name Ayodhya projected a Brahmanical ritual, ideal, Saket represented the live residential, and commercial reality of the time. Ultimately, this duality reveals a contested narrative. Uric tool used during Gupta Hindu Raasa to eclipse the sites thriving Buddhist and Jain Heritage and established a dominant sectarian identity.

Introduction: The Contested site of the Sarayu landscape

The urban history of Indian subcontinent often reveals multilayered landscapes, where successive dynasties and religious traditions layered their own maps over older settlements. Few sites demonstrate this phenomena as intensely as city on the right Bank of the Saryu river in modern Uttar Pradesh. In Brahmanical epic and Puranic traditions, the city appears as Ayodhya—the eternal, impregnable capital of the Ikshvaku dynasty and birthplace of Rama. In contrast, early Buddhist and Jain canonical literature is largely ignored the name Ayodhya in their contemporary accounts. Instead, they describe a bustling Metropolis named Saket or Vinita which served as vital commercial hub on the northern trade route. *Uttrapath.*

This Sharp divergence in the literary records has sparked along-standing historiographical debate. Scholars continue to question whether Ayodhya and Saket were actually the same city, twin settlements separated by minor geographical feature, or chronological sequential phases of a single urban space. To untangle this toponymic duality, the researchers must move beyond treating early texts as purely objective geography and instead analyse them as ideological construct.

This paper conduct a critical investigation into the Ayodhya- Saket problem by exploring its etymological roots, its cartographic representation by Chinese pilgrims, the material evidence from archeological excavations, and the political shifts of Gupta period. By utilizing C. A Bayly's concept of "Informational orders," this essay re-evaluates the dual identity of the Saryu plains. It argues that the shift in naming was not merely a matter of physical geography, but a dynamic contest over urban meaning and sectarian memory.

The Etymological Problem: Ritual Power vs. Residential Reality

Linguistic roots of the first significant clue into this dual identity. The name Ayodhya translate from Sanskrit as "The unconquerable" or "That which cannot be fought against,"projecting a vision of material supremacy and divine protection. In the *Ramayana* and the *Ayodhya Mahatmya*, the city function as idealised, impregnable fortress shaped like cosmic mandal and resting upon

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Chakra of Vishnu. This etymology reveals a "Ritual city"
—a space defined by cosmological order and royal authority rather than organic urban growth.

In contrast, the name Saket suggest a far more grounded urban reality. Derived from *Sa-ketu* meaning "with banners" which could be taken as buildings with banners. The term describe a lived material environment. It is stripped away the mythical grandeur of Ikshvaku dynasty, presenting instead, residential and commercial. This split reflects different priorities of authors: Brahmanical epics required an "Unconquerable" capital for a divine monarch, while Buddhist and Jain texts- penned for monastic orders reliant on merchant patronage- focused on a functional city "with homes" where ascetics could find shelter and support. Consequently, Ayodhya emerges as the abstract ritual ideal, while Saket concrete and commercial reality.

Buddhist and Jain Cartography: Saket on the Uttarapatha

Early historians like B. C law, has meticulously cross referenced ancient text to trace the city's antiquity, revealing a landscape mapped through widely different sectarian lenses. While Brahmanical records champion, the name Ayodhya, Jain Cosmology, identifies the site as Vinita, revering it as birthplace of five, Tirthankars, including the first Rishabhanath. These sources clearly established Vinita—synonyms with Saket—as premier capital of Kaushal Mahajanapada.

Buddhist sources, including *Jataka* and the *Mahavastu* corroborate this regional importance. The Buddha reportedly visited Saket frequently, residing in the monasteries (*viharas)* funded by wealthy merchants. In these records, Saket ranks as one of the six great cities of India, standing alongside Rajagrih and Varanasi. This prominence stemmed primarily from its strategic position on *Uttarapath*, The Great Northern trade route.

Saket functioned as vital commercial entrepôt linking the middle Ganges plains with north western routes to Taxila and Western routes to Port of Bharuch. By identifying the city at Saket, heterodox traditions claimed the space for their own Socio- economic base. They mapped the city not through the lens of Royal palaces or Divine ancestry, but through the merchant guilds and bustling markets that sustain their Monastic networks.

The Chinese Witness: Fa-Hien, Hiuen Tsang, and the Colonial Struggle

The travelogues of Chinese Buddhist pilgrims offer the clearest evidence of the confusion surrounding the physical location of Ayodhya versus Saket. These accounts served as primary blueprint for 19th century archaeologist attempting to map the region's past.

In the early fifth century CE, the Pilgrim Fa-Hien travelled through the area and recorded a fling Buddhist present in the kingdom. He called Sha-che, which scholars identify as Saket. While he noted a Vihara, where Buddha allegedly left a miraculous shadow, his journals remain notably silent on the name Ayodhya. Two centuries later, Hiuen Tsang traversed the same landscape, but described two distinct locations: PI-so-kia (Vishakha) and O-Yu-to (Ayodhya). He characterised O-yu-to as a kingdom housing over hundred monasteries alongside Hindu temples.

Alexander Cunningham, the founder of Archaeological Survey of India (ASI), struggle to reconcile these conflicting reports in 1860s. Eventually concluded that Fa-Hien's Sha-che and Hiuen Tsang's Pi-so-kia were actually the same place the city of Saket, which he argued occupied the same geographical space as Ayodhya, the discrepancy reveals a significant historical transition: during Fa-Hien's visit the Buddhist identity of Saket still dominated the regional consciousness. By the time Hiuen Tsang arrived, A brahmanical revival had successfully established the name, Ayodhya compelling the pilgrim to record the city under its resurrected epic title.

Numismatic and Archaeological Evidence: The Material City

To determine whether Ayodhya and Saket existed at distinct entities or shared a single location, historian have turned to the site's material culture. If they were truly twin cities, the landscape would likely contain two separate archaeological mounds. However, comprehensive excavation lead by BB La in 1970s, alongside subsequent work done by ASI revealed only one massive continuous mound of occupation at the current site of Ayodhya.

The archaeological reveals a settlement characterised by Northern Black Polished Ware (NBPW) stretching back to the early first millennium BCE. This timeline aligns perfectly with the era of Buddha and Mahavira. Yet, as, H.D Sankalia observed, the material culture of this period consists of relatively mud-brick architecture. This physical reality starkly contradicts the description of opulent Stone palaces found in *Ramayana*. In the essence excavation unearth the town that mirrors, the Saket of Buddhist texts—a bustling, timber, and mud-brick commercial hub rather than glittering 'unconquerable' Fortress of the epics.

Furthermore, the evidence of major flooding collaborates Buddhist tradition, claiming the city frequently battle, natural disaster, which forced shifts in local population, Numismatic evidence further clarifies the site's political identity. A series of copper coins from second century BC to 1st century CE, often called "Ayodhya coins" were issued by local rulers such as Dhandeva and Muladeva. Interestingly, while these coins feature symbols, common to commercial centres—including the bull elephant and the tree in railing, they never explicitly name the city 'Ayodhya'. These rulers likely manage the local economic powerhouse following the collapse of more and Sunga empires. Both the material and numismatic data points unequivocally to a single commercial viable Centre, therefore, does not stemmed from geography: it arises is from the two conflicting way of perceiving the same physical space.

The Gupta-Era Synthesis: Eclipsing the Buddhist Saket

If the site functioned as Saket for centuries, the eventual supremacy of the name "Ayodhya" requires explanation. The answer lies in the political theology of Gupta Empire (AD 320-550), a period of 'Revival of Brahaminism'.

The Gupta monarchs, particularly Chandragupta II, and Skandgupta were devotee of Vaishnava, who bolstered their imperial legitimacy by aligning themselves with solar lineage (*Suryavamsha*) of Lord Rama. As Rama transitioned from an epic Hero into a supreme incarnation (Avatar) of Vishnu, the physical landscape associated with him became a potent tool of political power. Traditional lore suggest that a king Vikramaditya "rediscovered" the lost sides of Ayodhya, such as Ramjanam Bhoomi, which has supposedly vanished under the weight of Time and floods.

Historically, this "rediscovery" served as calculated act of political geography. The Gupta states actively promote the name Ayodhya for the city of Saket to eclipse, the deep-rooted Buddhist and Jain identity. By patronising, Brahmanical temples and utilizing, the Ayodhya, Mahatmya as a spatial blueprint, Guptas transformed mercantile hub into sacred *tirth*.

Evidence of this transition appears in L*ife of Vasubandhu*. The text records ducting Vikramaditya of A-yo-ja (Ayodhya) initially supported by Brahmanical philosopher, but later provided massive grant to this scholar Vasubandhu to build Monasteries. This account is highly revealing. By fifth century CE., the name "Ayodhya" had firmly replaced "Saket" even within Buddhist discourse. The city had evolved into site of high-stakes intellectual and spatial contestation, meditated by imperial patronage. Ultimately, the name of Ayodhya represents of successful Gupta-era political project that effectively over the older Mercantile identity of Saket.

C A Bayly' s framework of Informational orders

To theoretically reconcile this toponymic duality, scholars must move beyond viewing "Ayodhya" and "Saket" as simple historical labels. Instead, we can apply the lens of urban history provided by C.A Bayly. In his analysis of north Indian society Bayly posits that pre-colonial Indian cities function as more than just physical cluster of mud-brick and Stone; they were complex nexuses of "informational orders" maintained by distinct social groups, including the service gentry, ascetic networks and mercantile corporations.

Projecting Bayly's framework onto Saryu plains effectively resolve the debate. This duality does not stem from 'geographical error'. Rather, the two names represent competing informational orders that coexisted within the same urban space. For the *Shreshthis* (merchant) *sarthavahas* (caravan leaders), and heterodox monks navigating the *Uttarapath*, The city was Saket,—a world defined by trade routes, credit networks and monastic *Viharas*. Simultaneously, for Brahmanical Priests, The Royal

Chroniclers and emerging Vaishnava orders, the city was Ayodhya. This reality centred on ritual circuit (*Parikrama),* Puranic grids, Sacred bathing ghats and cosmic Kingship.

These two occupied the same mud-brick streets, and comp completed for patronage from the same rulers, A jain merchant funding monastery in Vinita/Saket and Gupta official funding a temple in Ayodhya invested in same real estate, but engaged with entirely different urban realities, triumph of name Ayodhya reflect a broader political and economic shift. The Brahmanical informational order superseded the Shamanic (Buddha and Jain) systems that had previously defined the landscape.

Conclusion: A Conflict of Sectarian Memory

Historical investigation of Saryu plains yields are definite conclusion: Ayodhya and Saket were not geographically distinct locations, nor were they adjacent "twin" cities. They occupied the exact same physical space. Archaeological continuity from NBPW phase combined with shifting account of Chinese pilgrims like Fa-Hien and Hiuen Tsang confirms that the physical city remained relatively fixed despite the periodic ravages of floods. Consequently, the "Ayodhya-Saket" represent contesting narrative rather than of location.

The name Saket reserve the Memorial of flourishing, heterodox commercial metropolis served as a vital engine for the early Indian economy and expansion of Buddhism and Jainism. In contrast, the name Ayodhya preserves an idealised, cosmic capital summoned into reality by the political theology of Gupta Empire. This transition from Saket to Ayodhya did not involve a geographical movement of people and ideological moment of power.

By re-christening the city, the architects of Hindu Renaissance executed a profound act of urban reclamation. The transformed a space defined by mercantile logic of "having a home" (Sa-keta) into eternal sacred, geography defined as "The Unconquerable" (A-yodhya). In doing so, they ensured that the sectarian memory of the epic would forever dominate the physical reality of the city.

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Stratified Participation: Inequality within Access in Mass Higher Education

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Abstract:

Higher education expansion is often interpreted as democratization, yet rising enrolment does not guarantee equal participation. This paper examines how inequality is reorganized within systems of expanded access by analyzing variation in students' engagement with academic processes. It introduces the concept of stratified participation to capture differences in the intensity, continuity, and quality of engagement among formally enrolled students. Participation functions not as a binary condition but as a differentiated, contingent, and institutionally mediated process. Institutionalized flexibility, uneven institutional capacity, and student time constraints jointly produce this stratification. Drawing on Pierre Bourdieu and Amartya Sen, the analysis demonstrates how institutional arrangements and socio-economic constraints shape students' ability to convert formal access into sustained educational engagement. In resource-rich contexts, students sustain continuous participation; in under-resourced colleges, engagement becomes intermittent and oriented toward examination cycles. The result is a system in which students are formally included, yet experience divergent modes of participation. This paper advances the sociology of education by reframing inequality as stratification within participation, showing that mass higher education systems generate layered inequalities within inclusion itself.

Keywords: Stratified Participation, Capability approach, NEP 2020, flexibility, and Bundelkhand.

I. Introduction: From Access to Stratified Participation

Higher education has expanded at an unprecedented scale, yet a fundamental puzzle persists: why does increased access fail to translate into deeper participation? As enrolment rises and systems move toward mass inclusion, students appear within institutions in greater numbers but do not engage equally with academic processes. The dominant narrative equates expansion with democratization, assuming that access guarantees participation (Trow, 2007; Marginson, 2016). This assumption obscures a critical transformation—inequality no longer operates primarily at the point of entry but increasingly within the structure of participation itself.

Earlier phases of expansion restricted access, excluding large segments altogether (Shavit, Arum, & Gamoran, 2007). As systems broaden, however, inequality shifts inward. Formal inclusion becomes widespread, yet the conditions under which students participate vary systematically. Participation no longer functions as a binary condition; it emerges as a differentiated process shaped by institutional environments and social constraints (Reay, 2017).

This paper argues that participation in higher education must be reconceptualized as a stratified process. Existing analyses oscillate between access and outcomes, focusing either on who enters the system or on what they achieve upon exit (Boliver, 2015). While both perspectives remain important, they overlook variation within participation itself. Students do not simply engage or disengage; they occupy positions along a continuum ranging from sustained academic immersion to intermittent, exam-oriented involvement. Understanding inequality in contemporary higher education requires attention to this internal differentiation (Zepke & Leach, 2010).

To capture this shift, the paper introduces the concept of stratified participation, defined as systematic variation in the intensity, continuity, and quality of engagement among formally enrolled students. This concept extends sociological approaches to inequality by analyzing how participation

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is structured within inclusive systems. Drawing on Pierre Bourdieu's theory of capital (Bourdieu, 1986) and Amartya Sen's capability approach (Sen, 1999), the analysis demonstrates how institutional arrangements mediate the relationship between resources and engagement. Unequal distributions of capital and capabilities shape access, but they also condition the ability to sustain meaningful participation once access is achieved (Walker & Unterhalter, 2007).

The argument develops through an examination of contemporary higher education reforms, with India serving as an illustrative case. The National Education Policy (NEP) 2020 institutionalizes flexibility through modular curricula, credit accumulation, and multiple entry and exit pathways (Government of India, 2020). These reforms aim to accommodate diverse student trajectories and enhance autonomy. Yet they also redistribute responsibility for sustaining engagement onto students and institutions with unequal capacities. In well-resourced environments, flexibility enables the accumulation of educational capital through sustained engagement. In resource-constrained settings, it stabilizes low-intensity participation, allowing students to remain formally enrolled while engaging only intermittently with academic processes (Rawlinson, S. 2026; OECD, 2014).

The central claim advanced here is that contemporary higher education produces inclusion without engagement. Expansion does not eliminate inequality; it reorganizes it, shifting from exclusion at the boundaries to stratification within access itself. This transformation is not unique to India but reflects broader dynamics of mass higher education, particularly in contexts where expansion occurs under uneven institutional capacity (Cantwell, Marginson, & Smolentseva, 2018).

The paper unfolds as follows. The next section examines the assumptions that underpin flexibility in higher education reform. It then develops a theoretical framework that conceptualizes participation as a stratified process. Subsequent sections analyze institutional mediation and regional variation to demonstrate how these dynamics operate in practice. Finally, the conclusion reflects on the broader implications for rethinking inequality in mass higher education systems.

II. Flexibility and Its Assumptions

Flexibility has become a central principle in contemporary higher education reform, especially in systems undergoing rapid expansion. Policymakers present it as a corrective to institutional rigidity, promising diverse student trajectories through modular curricula, credit accumulation, and multiple entry and exit pathways. In this framing, flexibility appears inherently inclusive, accommodating heterogeneity in student backgrounds and life circumstances while expanding opportunities for participation (Marginson, 2016; Cantwell, Marginson, & Smolentseva, 2018).

Normatively, these claims are compelling. Flexibility promises to decouple higher education from the assumption of a linear, uninterrupted academic trajectory (Trow, 2007). It envisions a system in which students can enter, exit, and re-enter in response to shifting economic and social conditions. This approach seems particularly relevant in contexts where students combine education with work, migration, or caregiving responsibilities (Rawlinson, S. (2026); OECD. (2014)). Yet the promise of flexibility rests on implicit assumptions about the conditions under which students and institutions operate.

First, flexibility presumes that students can exercise meaningful choice. Navigating modular systems requires access to information, the ability to anticipate long-term consequences, and the capacity to align educational pathways with future goals. These capacities remain unevenly distributed, reflecting differences in prior schooling, social capital, and familiarity with institutional processes. As Bourdieu argues, the ability to convert opportunities into advantages depends on the possession of embodied and institutionalized forms of capital (Bourdieu, 1986).

Second, flexibility assumes time as an available resource. Sustained engagement demands regular attendance and continuity of learning, but many students—particularly those from economically constrained backgrounds—combine higher education with paid or unpaid labour. Time poverty limits their ability to participate beyond examination requirements. Under such conditions,

flexibility does not deepen participation; it accommodates fragmented and intermittent engagement (Reay, 2017).

Third, flexibility presupposes institutional capacity. Modular curricula and credit systems require stable faculty presence, administrative coordination, and adequate infrastructure. Without these conditions, flexibility risks becoming a formal structure detached from substantive pedagogy. Institutions with limited resources struggle to provide consistent teaching, mentoring, and evaluation, altering the practical meaning of flexibility (Thomas, 2012).

These assumptions are not evenly met across higher education systems. Their distribution reflects broader patterns of social inequality and uneven institutional development (Boliver, 2015). In resource-secure environments, flexibility enhances participation by enabling students to explore diverse pathways while sustaining engagement. In resource-constrained contexts, the same mechanisms produce different outcomes, stabilizing low-intensity participation rather than expanding substantive learning.

Understanding flexibility in this way shifts the analytical focus from its intended objectives to its differentiated effects. Flexibility does not operate in a vacuum; institutions and social conditions mediate how students experience it. As a result, flexibility can simultaneously expand formal inclusion while reorganizing the conditions of participation.

III. Theoretical Framing: Participation, Capital, and Capability

The expansion of higher education requires a reconceptualization of participation itself. Traditional approaches treat participation as a binary condition—defined by enrolment or dropout. While useful for measuring access, this framework obscures variation within participation, particularly in systems where formal inclusion has expanded significantly. In such contexts, inequality operates not only through exclusion but also through differentiated forms of engagement (Trow, 2007; Marginson, 2016). A more robust framework must move beyond entry and exit to examine how participation is structured.

Pierre Bourdieu's work provides a foundational lens for analyzing how inequality reproduces within education. He conceptualizes education as a field structured by unequal distributions of capital—economic, cultural, and social—which shape individuals' ability to navigate institutional environments (Bourdieu, 1986). Participation, in this view, reflects position as much as presence. Students with greater cultural capital interpret institutional expectations more effectively, engage deeply with academic content, and sustain learning trajectories (Reay, 2017). Those with limited capital often experience fragmented or exam-oriented participation. Yet Bourdieu's framework, while powerful, does not fully explain how institutional arrangements mediate the translation of resources into engagement.

Amartya Sen's capability approach extends this analysis by shifting attention from resources to the substantive freedoms individuals possess to achieve valued outcomes. Participation depends not only on resource possession but also on the ability to convert those resources into meaningful educational engagement (Sen, 1999; Walker & Unterhalter, 2007). Institutional support, time availability, and social context shape this conversion process. Two students with similar formal access may therefore experience participation differently depending on their capabilities to sustain engagement.

Time and labour emerge as critical dimensions linking these perspectives. Participation in higher education unfolds within broader economic structures, where students' involvement in paid and unpaid work constrains their capacity to engage. Time poverty limits attendance, coursework engagement, and participation in academic communities, producing intermittent patterns of involvement that differ qualitatively from sustained immersion (Archer, 2007).

By bringing these perspectives together, the paper advances the concept of stratified participation. This framework captures how inequality operates within formally inclusive systems by focusing on variation in the intensity, continuity, and quality of engagement. Institutions play a central mediating role: they actively shape how inequalities translate into participation regimes. The

interaction between institutional capacity and students' social position produces divergent experiences of higher education, even under the same policy framework (OECD, 2014). Stratified participation thus provides a meso-level lens that connects macro-level expansion with micro-level student trajectories, offering a way to analyze how inequality reorganizes within mass higher education.

IV. Institutional Mediation: Colleges, Adaptation, and Academic Minimalism

Educational policy does not act directly on students; institutions mediate its effects. Colleges interpret, adapt, and operationalize reforms within the constraints of their organizational environments (OECD, 2014). Understanding participation, therefore, requires analyzing how institutional contexts shape the practical meaning of policy interventions.

Reforms centered on flexibility assume a baseline of institutional capacity. Modular curricula, credit accumulation systems, and diversified pathways depend on stable faculty presence, administrative coordination, and pedagogical continuity. Where these conditions exist, institutions integrate flexibility into sustained teaching and mentoring, enabling students to pursue multiple pathways without sacrificing depth of engagement. In such contexts, institutional mediation reinforces policy objectives, aligning flexibility with meaningful participation (Marginson, 2016).

Institutional capacity, however, remains unevenly distributed. Many colleges—particularly those serving economically and socially marginalized populations—operate under persistent constraints. Faculty shortages, reliance on contractual appointments, irregular academic calendars, and limited infrastructure shape the everyday organization of academic life (Archer, 2007; Reay, 2017). These conditions do not simply reduce educational quality; they restructure participation itself.

Colleges adapt to scarcity by developing strategies that sustain formal processes while minimizing resource demands. One such adaptation is academic minimalism: institutions provide the minimum pedagogical engagement necessary to maintain enrolment and examination cycles. Teaching becomes irregular or compressed, with reliance on circulated notes, summaries, and exam-oriented preparation. Assessment practices prioritize completion over depth, aligning academic activity with examinations rather than continuous learning (Thomas, 2012).

Academic minimalism represents not a failure of commitment but an organizational response to constraint. Colleges must manage large enrolments, comply with administrative requirements, and adhere to examination schedules despite limited faculty and resources. Flexible policy mechanisms often reinforce this pattern. Credit systems and multiple exit pathways allow institutions to sustain enrolment even when teaching remains minimal, enabling administrative compliance to substitute for substantive engagement (Boliver, 2015).

This dynamic reflects a broader process of institutional mediation in which policy is reinterpreted through organizational capacity. In resource-rich environments, flexibility expands academic possibilities and deepens engagement. In constrained settings, the same mechanisms stabilize existing practices, allowing institutions to accommodate large numbers without altering pedagogy. The result is differentiated institutional regimes (Cantwell, Marginson, & Smolentseva, 2018).

Student constraints further reinforce these institutional patterns. Those facing time poverty and economic pressure often align with minimal academic expectations, focusing on examination outcomes rather than sustained learning. Institutions adapt to these behaviors, normalizing low-intensity engagement as routine. Together, institutional practices and student participation converge around minimal engagement, producing a mutually reinforcing equilibrium.

Recognizing institutional mediation shifts the analysis of inequality beyond policy design. Institutions do not merely reflect inequality; they actively produce and reproduce it through everyday organizational practices. Stratified participation emerges not only from unequal resources but from the interaction between institutional adaptation and social constraint.

V. Regional Context: Uttar Pradesh and Bundelkhand

Regional variation illustrates how stratified participation unfolds within mass higher education. Uttar Pradesh provides a striking example, as its state system encompasses sharply differentiated institutional environments. India's higher education has expanded significantly, with the Gross Enrolment Ratio surpassing 28 percent in recent years. Yet this aggregate trend conceals substantial intra-state disparities in both access and participation (Ministry of Education, 2023).

Urban centres such as Lucknow and Noida host relatively well-resourced institutions. Faculty availability, administrative stability, and academic infrastructure enable continuous engagement. Students in these settings navigate flexible academic structures more effectively, converting policy provisions into sustained participation. Flexibility operates within supportive environments, allowing students to accumulate academic capital through consistent engagement (Marginson, 2016).

District-level colleges in Bundelkhand, by contrast, operate under chronic constraint. Faculty vacancy rates in public institutions often exceed 30–40 percent, severely limiting regular teaching and supervision (University Grants Commission, 2019). These structural deficits reshape the everyday organization of academic life, making sustained engagement difficult to achieve.

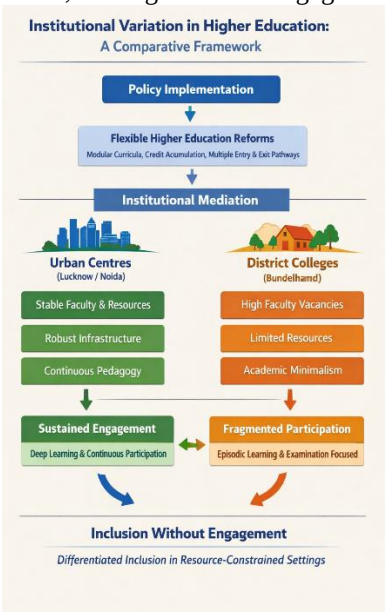

Figure 1. Institutional Variation in Uttar Pradesh: Policy Mediation and Participation Outcomes.

Source*: Author's conceptual framework.*

This figure conceptually illustrates how flexible higher education reforms interact with institutional capacity, producing divergent participation regimes in urban centres (Lucknow/Noida) and district colleges (Bundelkhand). It highlights the role of institutional adaptation and socio-economic constraints in shaping stratified participation.

Socio-economic conditions intensify these institutional limitations. Bundelkhand has long experienced agrarian distress, seasonal migration, and dependence on informal labour markets (Anuja et al., 2018). Students from rural and low-income households frequently combine higher education with paid or unpaid labour, producing time poverty that restricts attendance and continuous learning. Participation in these contexts often reorganizes around examination cycles rather than ongoing academic engagement (Reay, 2017).

Institutions in Bundelkhand adapt by reinterpreting flexibility rather than abandoning it. Credit accumulation, modular progression, and relaxed attendance requirements allow students to remain formally enrolled despite intermittent participation. The outcome is differentiated inclusion: students remain within the system, but their engagement varies systematically in intensity and continuity. For some, higher education unfolds as a sustained academic process; for others, it becomes episodic and oriented toward credential acquisition (Boliver, 2015).

The contrast lies not between access and exclusion but between distinct regimes of participation. Students in resource-secure institutions experience higher education as continuous learning, while those in constrained settings engage intermittently under conditions shaped by scarcity and necessity. The same policy framework generates divergent trajectories depending on the alignment between institutional capacity and students' social position (OECD, 2014).

Regional context, therefore, plays an analytically central role. It demonstrates how uniform policy interventions yield differentiated outcomes through the interaction of institutional mediation and social inequality. Expansion does not eliminate inequality; it reorganizes it within participation itself, producing a system where inclusion is widespread but engagement remains stratified (Cantwell, Marginson, & Smolentseva, 2018).

VI. Implications and Conclusion

The concept of stratified participation reframes inequality in higher education by shifting attention from access and outcomes to the internal dynamics of engagement. Inequality in mass systems no longer operates primarily at the boundaries of entry but within the varied ways students participate once enrolled. This perspective positions participation as a central analytical category, extending the sociology of education beyond traditional access-based and outcome-based frameworks (Marginson, 2016; Trow, 2007).

By integrating Bourdieu's capital theory with Sen's capability approach, the framework demonstrates that participation hinges not only on the distribution of resources but also on the conditions that enable students to transform those resources into sustained educational engagement. Inequality thus emerges as a dynamic process mediated by institutional arrangements, time availability, and socio-economic constraints rather than as a static distribution of assets (Bourdieu, 1986; Sen, 1999; Walker & Unterhalter, 2007). Institutional mediation plays a central role: policies promoting flexibility—modular curricula, credit accumulation, and multiple entry and exit pathways—produce divergent outcomes depending on institutional environments. In resource-rich settings, flexibility supports sustained engagement; in constrained contexts, it stabilizes intermittent participation. This dynamic generates symbolic inclusion, where formal enrolment coexists with uneven substantive engagement, and aggregate indicators obscure internal stratification.

Methodologically, the framework calls for indicators that capture the intensity, continuity, and quality of engagement. Conventional measures such as enrolment and completion obscure variation between sustained immersion and minimal participation. Future research must therefore incorporate metrics such as attendance patterns, time allocation, interaction with academic resources, and participation beyond examination performance (Zepke & Leach, 2010). Comparative and multi-level approaches further enrich analysis:

I. Macro level: national policy regimes and expansion strategies (Marginson, 2018).
II. Meso level: institutional variation in governance structures, resource allocation, and pedagogical practices (OECD, 2014, p. 17).
III. Micro level: students' navigation of constraints related to time, labour, and social background (Reay, 2017).

From a policy perspective, the framework cautions against equating flexibility with inclusion. Flexible structures such as modular curricula and part-time enrolment may expand formal access, but without adequate institutional capacity and equitable support, they risk normalizing low-intensity participation (Thomas, 2012). Effective policy must strengthen infrastructure, address faculty shortages, and mitigate time poverty among disadvantaged students (Archer, 2007).

Ultimately, stratified participation reframes inequality as a spectrum of differentiated engagement within inclusion. Formal access does not guarantee equal educational benefit; instead, experiences of higher education vary systematically across students, producing layered inequalities beneath aggregate indicators (Boliver, 2015). Recognizing inequality within participation itself is essential for both theoretical clarity and effective policy design.

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Reproductive Rights of Women: A Constitutional and Jurisdictional Analysis

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Abstract

This research paper examines the reproductive rights of women in India through a constitutional and jurisdictional framework. It focuses on how fundamental rights such as equality, privacy, dignity, and bodily autonomy are interpreted by the judiciary in relation to reproductive choices. The study critically analyses landmark judicial decisions, including Suchita Srivastava v. Chandigarh Administration and Justice K.S. Puttaswamy v. Union of India, to understand the evolution of reproductive rights jurisprudence in India.

Further, the paper evaluates the role of international human rights frameworks, particularly CEDAW, in shaping domestic legal principles. Despite progressive interpretations by the judiciary, significant gaps remain in the effective implementation of reproductive rights, especially for marginalized women.

The study adopts a doctrinal and analytical approach, supported by comparative legal analysis and qualitative insights. It concludes that while constitutional provisions provide a strong foundation, there is a need for a more coherent legal framework and policy reforms to ensure equitable access to reproductive healthcare and autonomy.

Keywords : Reproductive Rights, Constitutional Law, Women Empowerment, Judicial Interpretation, CEDAW, Gender Justice, India

Introduction

Reproductive rights constitute a fundamental aspect of human rights and are central to the realization of gender equality, dignity, and personal autonomy. These rights encompass a woman's ability to make free and informed decisions regarding her body, including matters related to contraception, pregnancy, abortion, and access to reproductive healthcare services. In contemporary legal discourse, reproductive rights are increasingly recognized as an integral component of broader constitutional guarantees such as the right to life, liberty, privacy, and equality.

In the Indian context, the recognition and protection of reproductive rights have largely evolved through judicial interpretation rather than explicit legislative articulation. The Constitution of India, although not directly mentioning reproductive rights, provides a robust framework through its fundamental rights provisions. Article 21, which guarantees the right to life and personal liberty, has been expansively interpreted by the judiciary to include the right to live with dignity, bodily autonomy, and privacy. Similarly, Articles 14 and 15 ensure equality before the law and prohibit discrimination on the grounds of sex, thereby laying the foundation for gender justice.

The landmark judgment in *Justice K.S. Puttaswamy v. Union of India* (2017) marked a significant turning point in Indian constitutional law by recognizing the right to privacy as a fundamental right under Article 21. This judgment has profound implications for reproductive rights, as it affirms an individual's autonomy over personal decisions, including reproductive choices. Similarly, in *Suchita Srivastava v. Chandigarh Administration* (2009), the Supreme Court explicitly recognized a woman's right to make reproductive choices as a dimension of personal liberty, emphasizing that reproductive autonomy is an essential aspect of dignity and privacy.

Despite these progressive judicial pronouncements, the legal framework governing reproductive rights in India remains fragmented and, at times, inconsistent. Statutory laws such as the Medical Termination of Pregnancy (MTP) Act and the Pre-Conception and Pre-Natal Diagnostic

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Techniques (PCPNDT) Act address specific aspects of reproductive health but fail to provide a comprehensive and unified approach to reproductive autonomy. Moreover, the implementation of these laws often reflects underlying socio-cultural biases, including patriarchal norms and moral judgments, which can restrict women's access to reproductive healthcare services.

Another critical dimension of reproductive rights is their intersection with international human rights norms. India is a signatory to several international conventions, most notably the Convention on the Elimination of All Forms of Discrimination Against Women (CEDAW), which emphasizes the importance of ensuring women's access to healthcare and reproductive services. While Indian courts have occasionally referred to international norms in their judgments, the incorporation of these principles into domestic law remains inconsistent. This gap between international commitments and domestic implementation poses significant challenges in the effective realization of reproductive rights.

Furthermore, the issue of reproductive rights cannot be examined in isolation from socio-economic realities. Women from marginalized communities, including those belonging to lower socio-economic strata, rural areas, and disadvantaged castes, often face compounded barriers in accessing reproductive healthcare. These barriers include lack of awareness, inadequate healthcare infrastructure, financial constraints, and social stigma. As a result, the benefits of legal protections are not equally accessible to all women, highlighting the need for an intersectional approach that considers the diverse experiences and challenges faced by different groups.

The role of the judiciary in shaping reproductive rights jurisprudence in India has been both progressive and complex. While courts have expanded the scope of fundamental rights to include reproductive autonomy, there have also been instances where judicial decisions reflect caution or inconsistency, particularly in balancing individual rights with state interests such as public morality or population control policies. This duality underscores the need for a more coherent and consistent legal approach.

In addition to legal and judicial dimensions, reproductive rights are closely linked to broader issues of public health and social justice. Access to safe and affordable reproductive healthcare is essential for reducing maternal mortality, improving women's health outcomes, and ensuring overall societal well-being. Therefore, the protection of reproductive rights is not merely a legal obligation but also a critical component of sustainable development and human welfare.

The present study seeks to undertake a comprehensive analysis of reproductive rights of women in India through a constitutional and jurisdictional lens. It aims to examine how constitutional provisions, judicial interpretations, and international human rights norms interact to shape the legal landscape of reproductive rights. The study also seeks to identify existing gaps and challenges in the legal framework and propose reforms to strengthen the protection of these rights.

In conclusion, reproductive rights represent a vital dimension of human rights and gender justice. While India has made significant progress in recognizing these rights through constitutional interpretation and judicial activism, there remains a pressing need for a more integrated and effective legal framework. A holistic approach that combines legal reform, policy intervention, and social awareness is essential to ensure that all women can exercise their reproductive rights freely, safely, and with dignity.

Objectives of the Study

1. To analyze constitutional provisions related to reproductive rights.
2. To examine judicial interpretations and landmark cases.
3. To assess the influence of international human rights norms.
4. To identify gaps in legal and policy frameworks.
5. To propose reforms for strengthening reproductive rights.

Review of Literature

International Perspective

Scholars like Cook, Dickens, and Fathalla (2003) emphasize the integration of reproductive health into human rights frameworks. Petchesky (2000) highlights the role of global feminist movements in advancing reproductive rights. WHO (2014) stresses the importance of informed choice and access to reproductive healthcare.

CEDAW (1999) plays a crucial role in establishing international obligations for protecting women's reproductive health, influencing national legal systems worldwide.

Indian Perspective

Indian scholars such as Bhatia (2013) and Khaitan (2006) have critically analyzed reproductive rights within constitutional frameworks. Narayan (2020) emphasizes privacy and dignity as central to reproductive autonomy.

Judicial decisions have also been extensively studied, particularly *Suchita Srivastava* and *Puttaswamy*, which highlight evolving interpretations of autonomy and privacy.

Despite extensive literature, gaps remain in addressing socio-economic barriers and ensuring uniform implementation of rights.

Research Gap

The study identifies several gaps:

- Inconsistency in judicial interpretations
- Fragmented legal framework
- Limited integration of international norms
- Socio-economic barriers affecting marginalized women

Methodology

Research Design

Doctrinal and analytical research

Methods Used

- Constitutional analysis
- Case law analysis
- Comparative legal study
- Qualitative content analysis
- Expert interviews (proposed)

Table: Key Legal Provisions and Their Implications

Constitutional Provision	Interpretation	Impact on Reproductive Rights
Article 21	Right to life & privacy	Supports autonomy and abortion rights
Article 14	Equality before law	Ensures non-discrimination
Article 15	Prohibition of discrimination	Protects women's access to healthcare

Results

The present study, based on an analysis of constitutional provisions, judicial decisions, statutory frameworks, and international human rights norms, reveals several significant findings regarding the status of reproductive rights of women in India.

Firstly, it is evident that the **Indian Constitution provides a strong normative foundation for the protection of reproductive rights**. Article 21, which guarantees the right to life and personal liberty, has been expansively interpreted by the judiciary to include the rights to privacy, dignity, and bodily autonomy. These interpretations have played a crucial role in recognizing reproductive choices—such as the right to contraception and abortion—as integral components of personal liberty.

Secondly, the study finds that the **judiciary has played a progressive and transformative role** in shaping the legal discourse on reproductive rights. Landmark judgments such as *Suchita Srivastava v. Chandigarh Administration* (2009) explicitly recognized a woman's right to make

reproductive choices as a facet of personal liberty. Similarly, *Justice K.S. Puttaswamy v. Union of India* (2017) established the right to privacy as a fundamental right, thereby strengthening the constitutional basis for reproductive autonomy. These decisions have significantly expanded the scope of women's rights within the constitutional framework.

However, thirdly, the study reveals that **judicial interpretation remains inconsistent and uneven in its application**. While some decisions strongly uphold women's autonomy, others impose restrictions based on medical, procedural, or moral considerations. This inconsistency is particularly evident in abortion-related cases, where judicial outcomes often vary depending on the specific facts and judicial discretion. Such variability creates uncertainty and limits the uniform realization of reproductive rights.

Fourthly, the research highlights that the **existing statutory framework governing reproductive rights is fragmented and inadequate**. Laws such as the Medical Termination of Pregnancy (MTP) Act and the Pre-Conception and Pre-Natal Diagnostic Techniques (PCPNDT) Act address specific aspects of reproductive health but fail to provide a comprehensive and rights-based approach. These laws often prioritize regulatory concerns over women's autonomy and impose procedural barriers that restrict access to reproductive healthcare services.

Fifthly, the findings indicate that the **influence of international human rights norms, particularly under CEDAW, remains limited and inconsistent**. Although India is a signatory to key international conventions, their principles are not systematically integrated into domestic legal frameworks or judicial reasoning. While courts occasionally refer to international norms, such references are neither consistent nor binding, resulting in a gap between international commitments and domestic implementation.

Sixthly, the study underscores the **significant impact of socio-economic and structural barriers** on the realization of reproductive rights. Women from marginalized backgrounds—particularly those in rural areas, lower socio-economic groups, and disadvantaged castes—face multiple challenges in accessing reproductive healthcare. These include lack of awareness, inadequate healthcare infrastructure, financial constraints, and social stigma. As a result, the benefits of constitutional protections are not equitably distributed.

Seventhly, the research finds that although the judiciary has increasingly incorporated the concept of **gender justice and autonomy** into its reasoning, the **practical realization of these principles remains limited**. There exists a clear gap between legal recognition and ground-level implementation, indicating that formal rights alone are insufficient without effective enforcement mechanisms.

Finally, the study concludes that while India possesses a **progressive constitutional and judicial framework**, the absence of a cohesive legal structure, combined with socio-economic inequalities and inconsistent implementation, significantly hinders the full realization of reproductive rights for women.

Discussion

The findings of the present study highlight a complex and evolving legal landscape of reproductive rights in India, characterized by progressive constitutional interpretations alongside significant structural and implementation challenges. This duality reflects both the strengths and limitations of relying primarily on judicial interpretation for the protection of fundamental rights.

At the constitutional level, the expansion of Article 21 to include privacy, dignity, and bodily autonomy represents a transformative development. The judiciary has played a crucial role in recognizing reproductive rights as intrinsic to personal liberty. The decisions in *Suchita Srivastava v. Chandigarh Administration* and *Justice K.S. Puttaswamy v. Union of India* demonstrate a clear shift toward acknowledging women's autonomy over their reproductive choices. These rulings align with global human rights standards and mark a progressive step toward gender justice.

However, despite this progressive jurisprudence, the study reveals a **lack of doctrinal consistency** in judicial decision-making. Courts have not always applied constitutional principles

uniformly, particularly in cases related to abortion. In several instances, judicial decisions have been influenced by medical opinions, procedural technicalities, or moral considerations, thereby limiting women's autonomy. This inconsistency creates uncertainty and undermines the predictability of legal outcomes, which is essential for the effective protection of rights.

Another critical issue identified is the **fragmented nature of the statutory framework** governing reproductive rights. Existing laws such as the Medical Termination of Pregnancy (MTP) Act and the Pre-Conception and Pre-Natal Diagnostic Techniques (PCPNDT) Act are primarily regulatory in nature and do not fully adopt a rights-based approach. While the MTP Act provides conditional access to abortion, it still places significant decision-making power in the hands of medical practitioners rather than the woman herself. Similarly, the PCPNDT Act, although aimed at preventing sex-selective practices, has sometimes resulted in overregulation that indirectly restricts access to legitimate reproductive healthcare services.

The study also highlights the **limited integration of international human rights norms** into domestic jurisprudence. Although India is a signatory to international conventions such as CEDAW, the incorporation of these principles into national law remains inconsistent. Courts occasionally refer to international standards, but such references lack systematic application. This gap indicates a disconnect between India's international obligations and its domestic legal practices.

A significant dimension of the discussion is the role of **socio-economic and structural inequalities**. Legal recognition of rights does not automatically translate into their effective realization. Women from marginalized communities—particularly those in rural areas, lower socio-economic groups, and disadvantaged castes—face multiple barriers in accessing reproductive healthcare. These barriers include lack of awareness, inadequate healthcare infrastructure, financial constraints, and deeply rooted patriarchal norms. Consequently, reproductive rights remain largely inaccessible to a substantial section of the population.

Furthermore, the study underscores the importance of adopting an **intersectional approach** to reproductive rights. Women's experiences are shaped not only by gender but also by caste, class, religion, and geographic location. The failure to address these intersecting inequalities results in uneven access to rights and services. Therefore, any meaningful reform must consider these multiple dimensions to ensure inclusive and equitable outcomes.

The discussion also brings attention to the **gap between legal recognition and practical implementation**. While the judiciary has advanced the discourse on reproductive rights, the absence of effective enforcement mechanisms and policy support limits their real-world impact. This highlights the need for a more integrated approach that combines legal reform with policy interventions, institutional support, and public awareness.

In essence, the study reveals that while India has made significant progress in recognizing reproductive rights at the constitutional level, the lack of a coherent legal framework, inconsistent judicial application, and socio-economic barriers continue to hinder their full realization.

Conclusion

The present study concludes that reproductive rights of women in India are firmly grounded in constitutional principles, particularly the rights to life, liberty, equality, and privacy. Judicial interpretations have played a pivotal role in expanding the scope of these rights, transforming them into essential components of personal autonomy and dignity. Landmark judgments have significantly contributed to the recognition of reproductive choices as fundamental rights, thereby advancing the cause of gender justice.

However, despite these progressive developments, the realization of reproductive rights remains incomplete and uneven. The study identifies several critical challenges, including inconsistencies in judicial interpretation, the fragmented nature of statutory laws, limited integration of international human rights norms, and significant socio-economic barriers. These challenges highlight the gap between formal legal recognition and substantive access to rights.

To address these issues, the study emphasizes the need for **comprehensive legal and policy reforms**. Firstly, there is a need to develop a **coherent and unified legal framework** that explicitly recognizes reproductive rights as fundamental rights, rather than addressing them through fragmented legislation. Such a framework should prioritize women's autonomy and adopt a rights-based approach.

Secondly, efforts must be made to **harmonize domestic laws with international human rights standards**, particularly those established under CEDAW. This would ensure that India fulfills its international obligations and aligns its legal framework with global best practices.

Thirdly, it is essential to **strengthen implementation mechanisms** by improving healthcare infrastructure, ensuring accessibility of services, and enhancing accountability. Legal rights must be supported by institutional frameworks that enable their effective realization.

Fourthly, the study highlights the importance of **addressing socio-economic and cultural barriers**. Policies must focus on increasing awareness, promoting education, and challenging patriarchal norms that restrict women's autonomy. Special attention should be given to marginalized groups to ensure equitable access to reproductive healthcare.

Fifthly, adopting an **intersectional approach** is crucial for achieving inclusive outcomes. Legal and policy frameworks must consider the diverse experiences of women across different socio-economic and cultural contexts.

In conclusion, reproductive rights are not merely legal entitlements but are fundamental to women's dignity, autonomy, and overall well-being. While India has made significant strides in recognizing these rights, there is an urgent need for a more holistic and integrated approach to ensure their effective realization. Strengthening reproductive rights will not only advance gender equality but also contribute to broader goals of social justice and sustainable development.

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Relationship between Socio-Economic Status, Digital Exposure, and Attitudinal Modernity among College Students

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Abstract

The present study explores the relationship between socio-economic status (SES), digital exposure, and attitudinal modernity among college students. In the rapidly evolving digital age, students are increasingly influenced by socio-economic factors and digital environments, which collectively shape their beliefs, values, and attitudes. The study aims to examine how SES and access to digital technologies contribute to modern attitudes such as openness, scientific temper, gender equality, and democratic values. A quantitative research design was employed, with data collected from 200 college students using standardized questionnaires. Statistical tools such as correlation and regression analysis were used to examine relationships among variables. The findings indicate a significant positive relationship between digital exposure and attitudinal modernity, while SES shows both direct and indirect effects. The study highlights the importance of digital inclusion and equitable socio-economic development in fostering progressive attitudes among youth.

Keywords : Socio-Economic Status, Digital Exposure, Attitudinal Modernity, College Students, Social Change, Education

Introduction

Modern society is witnessing rapid and unprecedented transformations driven by technological advancements, globalization, and socio-economic restructuring. Among the various segments of society, college students represent a particularly significant group, as they are in a transitional phase between adolescence and adulthood. This stage is characterized by the development of identity, values, beliefs, and attitudes that often persist throughout life. In this context, the concept of attitudinal modernity has gained increasing importance, as it reflects the extent to which individuals adopt progressive, rational, and forward-looking perspectives.

Attitudinal modernity can be understood as a set of values and orientations that emphasize rationality, scientific temper, openness to change, individual autonomy, gender equality, and democratic ideals. It is closely linked with the broader process of modernization, which involves shifts from traditional to modern ways of thinking and living. For college students, attitudinal modernity is not only an indicator of personal development but also a reflection of the changing socio-cultural environment in which they are embedded.

One of the most influential factors shaping attitudinal modernity is socio-economic status (SES). SES is a composite measure that typically includes income, educational level, and occupational status of an individual or their family. It determines access to resources, opportunities, and life experiences that significantly influence an individual's worldview. Students from higher socio-economic backgrounds often have access to better educational institutions, enriched learning environments, and diverse social interactions. These experiences expose them to a variety of perspectives, fostering critical thinking and openness to new ideas. Consequently, such students are more likely to exhibit modern attitudes compared to their counterparts from lower socio-economic backgrounds.

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However, socio-economic status does not operate in isolation. In the contemporary era, digital exposure has emerged as a powerful and dynamic factor influencing attitudes and behaviors. Digital exposure refers to the extent to which individuals interact with digital technologies, including the internet, social media, online learning platforms, and other forms of digital communication. The digital revolution has fundamentally altered the way information is accessed, shared, and consumed. For college students, digital platforms serve as important sources of knowledge, social interaction, and cultural exchange.

The role of digital exposure in shaping attitudinal modernity is particularly significant. Through access to the internet and social media, students are exposed to diverse cultures, ideologies, and perspectives from around the world. This exposure can challenge traditional beliefs and encourage the adoption of more progressive attitudes. For instance, discussions on social media regarding gender equality, human rights, environmental sustainability, and political participation can influence students' attitudes and values. Moreover, digital platforms provide opportunities for self-expression, critical engagement, and collaborative learning, all of which contribute to the development of modern attitudes.

At the same time, it is important to recognize that digital exposure is not uniformly distributed across all segments of society. The concept of the digital divide highlights disparities in access to digital technologies based on socio-economic factors. Students from lower SES backgrounds may face limitations in accessing digital devices, reliable internet connectivity, and digital literacy skills. As a result, they may have fewer opportunities to engage with diverse perspectives and develop modern attitudes. This interplay between socio-economic status and digital exposure creates a complex dynamic that influences attitudinal modernity.

In the Indian context, these issues acquire additional significance due to the country's diverse socio-economic landscape. India is characterized by wide disparities in income, education, and access to resources. While urban areas and affluent communities have witnessed rapid digitalization, many rural and economically disadvantaged regions continue to struggle with limited access to digital infrastructure. College students in India thus represent a heterogeneous group with varying levels of socio-economic status and digital exposure.

The expansion of higher education in India has brought students from diverse backgrounds into the same academic spaces. This diversity creates opportunities for interaction and exchange of ideas, which can promote attitudinal modernity. However, it also highlights inequalities that may influence students' experiences and outcomes. For example, students from privileged backgrounds may be more confident in using digital tools and participating in online discussions, while others may face barriers due to lack of exposure or resources.

Furthermore, the COVID-19 pandemic has accelerated the integration of digital technologies into education. Online learning, virtual classrooms, and digital resources have become integral components of the educational process. This shift has underscored the importance of digital exposure in shaping students' learning experiences and attitudes. While some students have benefited from increased access to digital resources, others have faced challenges due to lack of infrastructure and support. This situation has further emphasized the need to examine the relationship between socio-economic status, digital exposure, and attitudinal modernity.

Another important aspect to consider is the role of family and social environment in shaping students' attitudes. Families with higher socio-economic status often place greater emphasis on education, critical thinking, and exposure to diverse experiences. They may encourage children to explore new ideas, question traditional norms, and engage with global perspectives. In contrast, families from lower socio-economic backgrounds may prioritize stability and adherence to traditional values, which can influence students' attitudes differently.

Educational institutions also play a crucial role in fostering attitudinal modernity. Colleges and universities serve as spaces for intellectual exploration, social interaction, and personal growth. Through curriculum, pedagogy, and extracurricular activities, institutions can promote values such as

inclusivity, critical thinking, and social responsibility. The integration of digital technologies into education further enhances these opportunities by providing access to a wide range of resources and learning experiences.

It is also important to acknowledge that attitudinal modernity is not a uniform or linear process. Individuals may exhibit modern attitudes in some areas while retaining traditional beliefs in others. For example, a student may support gender equality but still adhere to traditional family norms. This complexity underscores the need for a nuanced understanding of attitudinal modernity and its determinants.

Moreover, the influence of digital exposure is not always positive or straightforward. While digital platforms can promote awareness and progressive attitudes, they can also expose individuals to misinformation, stereotypes, and polarizing content. The impact of digital exposure thus depends on the nature of content, the level of digital literacy, and the ability of individuals to critically evaluate information.

In this context, the present study seeks to explore the relationship between socio-economic status, digital exposure, and attitudinal modernity among college students. By examining these variables together, the study aims to provide a comprehensive understanding of the factors that shape students' attitudes in the contemporary world. It seeks to answer questions such as: How does socio-economic status influence access to digital resources? To what extent does digital exposure contribute to the development of modern attitudes? And how do these factors interact to shape the attitudes of college students?

The significance of this study lies in its potential to inform educational policies and practices. Understanding the role of socio-economic status and digital exposure in shaping attitudinal modernity can help policymakers and educators design interventions that promote equity and inclusivity. For instance, initiatives aimed at bridging the digital divide, enhancing digital literacy, and providing equal opportunities for all students can contribute to the development of progressive attitudes.

In conclusion, the relationship between socio-economic status, digital exposure, and attitudinal modernity is complex and multifaceted. As society continues to evolve, it is essential to examine these factors and their interactions in order to understand the changing attitudes of young individuals. College students, as future leaders and contributors to society, play a crucial role in shaping the direction of social change. Therefore, studying the determinants of their attitudes is of paramount importance.

Objectives

1. To examine the relationship between socio-economic status and attitudinal modernity.
2. To analyze the impact of digital exposure on attitudinal modernity.
3. To study the combined effect of SES and digital exposure on students' attitudes.
4. To identify differences in attitudinal modernity across different SES groups.

Review of Literature

Several studies have highlighted the role of socio-economic factors in shaping attitudes. Kuppuswamy (1981) emphasized that SES significantly influences educational attainment and social outlook. Higher SES is often associated with liberal and modern values.

Rogers (2003), in his diffusion of innovations theory, emphasized the role of communication technologies in spreading new ideas and practices. Digital media acts as a catalyst for modernization.

A study by Sharma and Singh (2018) found that students with greater internet access exhibited higher levels of critical thinking and openness to change. Similarly, Verma (2020) observed that digital literacy enhances awareness regarding social issues such as gender equality and human rights.

Another study by Gupta (2019) highlighted that socio-economic inequalities can limit digital access, thereby affecting the development of modern attitudes. This digital divide continues to be a major concern in developing countries.

Overall, the literature suggests that both SES and digital exposure are important determinants of attitudinal modernity, but their combined effect requires further exploration.

Methodology

Research Design

The study adopted a descriptive and correlational research design.

Sample

A sample of 200 college students was selected using stratified random sampling from different colleges.

Tools Used

1. Socio-Economic Status Scale
2. Digital Exposure Scale
3. Attitudinal Modernity Scale

Data Collection

Data were collected through structured questionnaires administered to students.

Statistical Analysis

Mean, standard deviation, correlation, and regression analysis were used.

Table: Correlation among Variables

Variables	SES	Digital Exposure	Attitudinal Modernity
Socio-Economic Status	1.00	0.45	0.52
Digital Exposure	0.45	1.00	0.68
Attitudinal Modernity	0.52	0.68	1.00

Results

The results reveal a moderate positive correlation between SES and attitudinal modernity (r = 0.52). Digital exposure shows a strong positive correlation with attitudinal modernity (r = 0.68), indicating that students with higher digital engagement tend to exhibit more modern attitudes.

Regression analysis indicates that digital exposure is a stronger predictor of attitudinal modernity compared to SES. However, SES indirectly influences attitudes through access to digital resources.

Discussion

The findings of the study suggest that both SES and digital exposure significantly influence attitudinal modernity. Students from higher SES backgrounds have better access to technology and educational opportunities, which enhances their exposure to modern ideas.

Digital exposure plays a crucial role in shaping attitudes by providing access to diverse perspectives and knowledge. Social media, online education, and digital platforms encourage critical thinking and awareness of global issues.

However, the study also highlights the issue of digital inequality. Students from lower SES backgrounds may lack access to digital tools, limiting their exposure and hindering the development of modern attitudes.

Conclusion

The study concludes that digital exposure is a key determinant of attitudinal modernity among college students, while socio-economic status plays both direct and indirect roles. Promoting digital access and reducing socio-economic disparities can help foster progressive attitudes among youth.

Educational institutions and policymakers should focus on bridging the digital divide and ensuring equal access to technology for all students.

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