

## Internal morphological studies of crab burrows with special reference to *Barytelphusa cunicularis*

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### Abstract

Burrows may be of different shape and size, simple or complex, having many branches or a single opening depending upon the animal. Various techniques have been used by biologists to determine the morphological patterns and other environmental effects on the burrow architecture. Burrows are simple tunnels, descending downwards either straight or slightly slanted, with or without branches. The burrow exhibits L, S, or Y like shapes. The relationship between Area of burrow opening (Sq. cm) and crab carapace width (mm) and burrow depth at Asna River were ( $r = 0.268$  and  $r = 0.160$ ) and at Lendi river it was ( $r = 0.046$  and  $r = 0.160$ ).

**Keywords:** Burrow, frequency, width, depth, cunicularis, river

### Introduction

Organisms usually do not live in isolation. They interact with other organisms, inhabit a particular environment. Habitat is the place where organisms live and interact with their changing environments. The structure and architecture of burrows play a significant role and provide morphological support in the life of an organism [1, 8]. The activities of burrow construction promote the remobilization of sediment grain and nutrient cycling, thus changing the physical and chemical features of the local environments. It may be of different shape, size, simple or complex, may have single or multiple opening. By comparing the morphology, architecture and different patterns of burrows, it may be possible to suggest ecological differences between concern or associated species and their interaction with the surrounding environment. Burrow morphology depends on physical characteristics of the soil [2]. There is a difference between juvenile and adult crabs. Juveniles produce shallow J-shaped burrows, which incline vertically into the substratum. Larger crabs have Y-shaped and spiral burrows [3]. The study of crab burrows becomes important as the crab collectors use various methods to collect crabs [9]. To better understand the morphology and characteristics of burrows, we study the habitat of the crab *Barytelphusa cunicularis* with its burrow dimensions, found in Godavari River and its tributaries (Asna River and Lendi River) of Nanded, Maharashtra state.

### Materials and Methods

#### 1. Field study

*Barytelphusa cunicularis* excavates burrow at the shore of river when water level is high in rainy seasons. This study was conducted for measuring crab burrow openings with the help of measuring tape and calculated burrow dimensions. The empty, abandoned burrows were filled with thin slurry of Plaster of Paris. The mixture was poured through the mouth of the burrow openings and was allowed to harden for 2–3 h, depending upon environmental conditions. Burrow characterization was done using the following formula by [4].

$$\text{Area} = \pi \times a \times b/4$$

Where, a = length of burrow opening.

b = width of burrow opening.

$\pi$  (Pie) = 3.14

#### 2. Burrow casting

This study was conducted in February and March 2018. The burrows were selected randomly upstream and downstream side at Asna River, tributaries of Godavari River Nanded. To know the burrow structure of *Barytelphusa cunicularis*, a semisolid mixture (slurry) of Plaster of Paris (POP) was poured into burrows until the burrow was filled. Casting work was conducted only if there was a relatively high burrow density/frequency. The solidified burrow casts were (approximately after 2 h) dug out and brought to the laboratory for further measurement.



**Fig a):** Single opening of burrow



**Fig b):** Double opening of burrow



**Fig c):** Quadruplet burrow opening



**Fig d):** Burrow-opening measurement



**Fig e):** Burrow opening measurement



**Fig f):** Burrow-opening measurement

**Fig 1 (a-f):** A field study for characterization of burrows of *Barytelphusa cunicularis* In Godavari River and its tributaries in Nanded



**Fig a):** Poring of POP in burrows



**Fig b):** Active crab



**Fig c):** POP cast structure of burrow



**Fig d):** POP structure a burrow

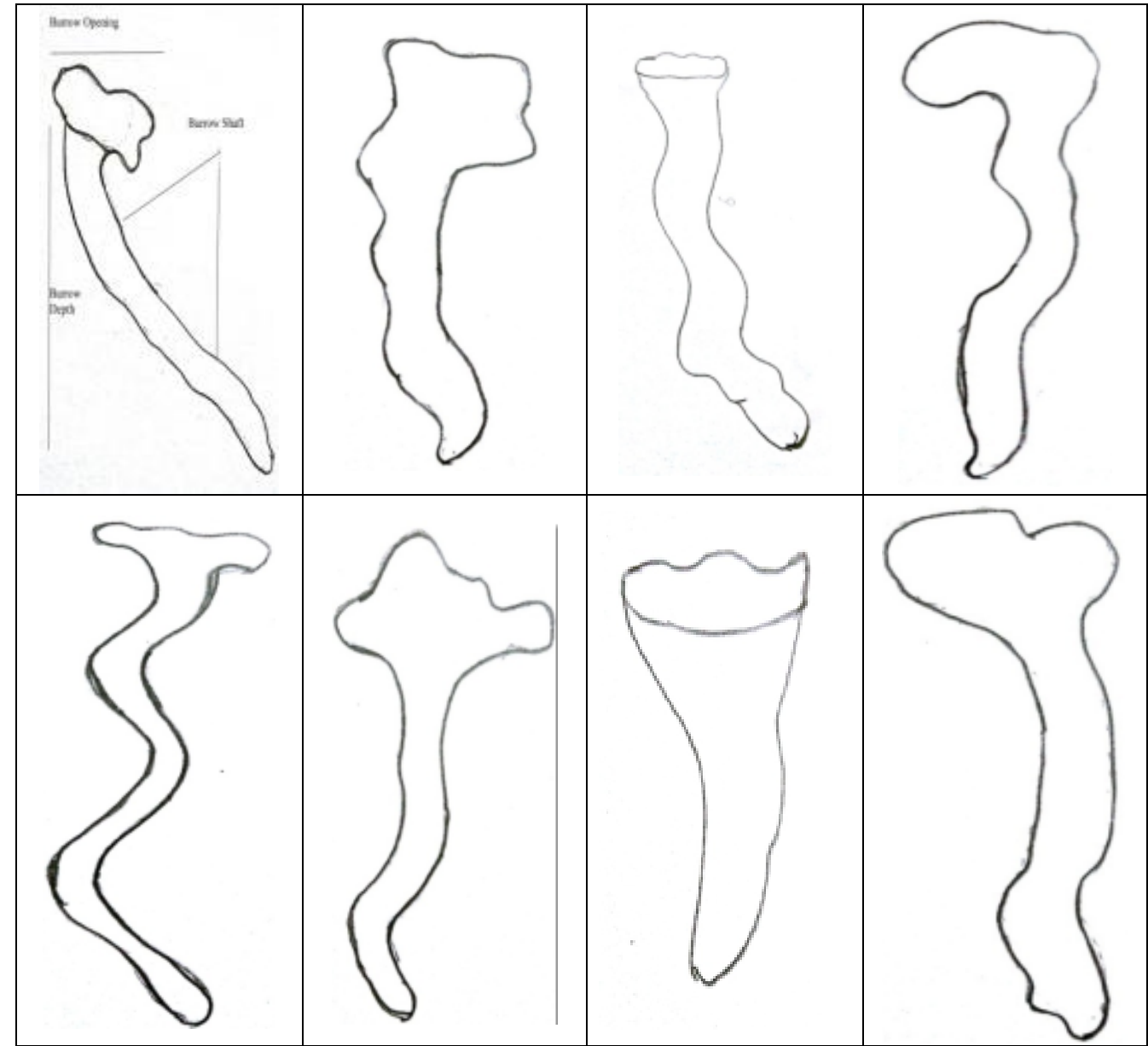




**Fig e):** Measurement of burrow depth

**Fig f):** POP cast structure of burrow

**Fig 2 (a- f):** Casting of burrow in *Barytelphusa cunicularis* on field at Asna and Lendi River (Godavari basin) using Plaster of Paris slurry (POP)



**Fig 3:** Schematic diagrams of dried excavated burrows after poring Plaster of Paris

**Results**

**1. Burrow morphology and characteristics**

*Barytelphusa cunicularis* excavate burrows of different shapes and size. Burrows pattern was simple tunnel and

descending downward in any direction until reaches to the water level in wet area. It also excavates under big stone or rocks. Various shapes of burrows have been reported, such as unbranched, spiral, strait, gently curved, flask shape, etc.

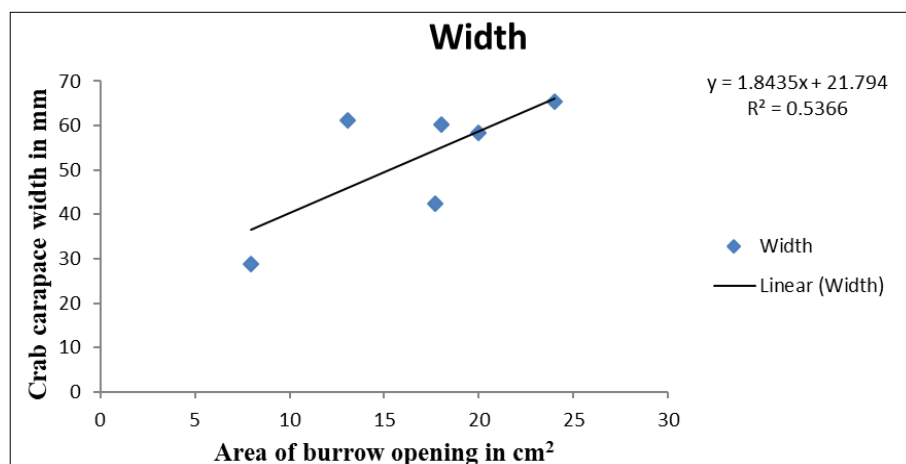
## 2. Data analysis

The relationship between Area of burrow opening (Sq. cm) and crab carapace width (mm) and burrow depth at Asna River were ( $r = 0.268$  and  $r = 0.160$ ) and at Lendi river it was ( $r = 0.046$  and  $r = 0.160$ ).

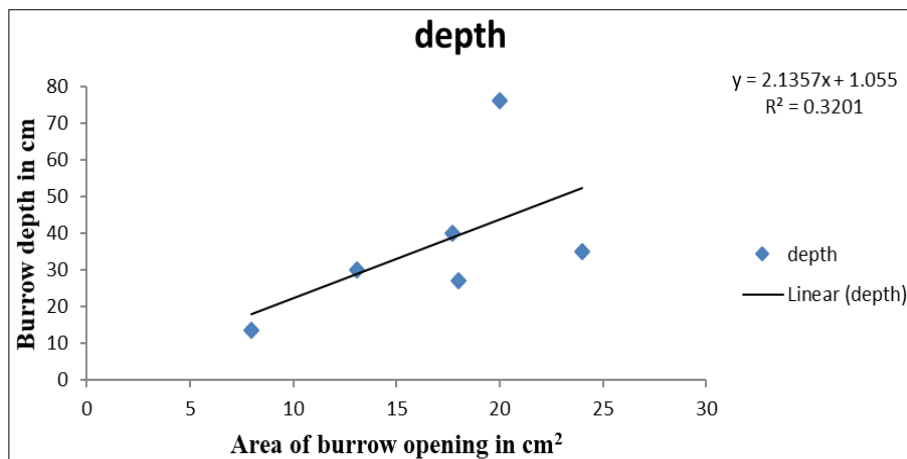
One-way ANOVA showed that when comparing six burrow characteristics at three levels (Surface area opening, carapace width and burrow depth), there was a significant difference between them ( $P = 0.0032$ ) at Asna river. It was not shown any significant difference at Lendi River (6.0288).

**Table 1:** Comparative account of burrow characteristics (BC) and carapace width of *B. cunicularis* at Asna River during 2017-2018

| Cast Number | Burrow opening (Cm) |       | Surface area of opening (cm <sup>2</sup> ) | Carapace width of crabs (mm) | Burrow depth (Cm) |
|-------------|---------------------|-------|--|------------------------------|-------------------|
|             | Major               | Minor |  |                              |                   |
| BC 1        | 5.1                 | 4.5   | 18.01                                      | 60.18                        | 27                |
| BC 2        | 6.0                 | 5.1   | 24.02                                      | 65.32                        | 35                |
| BC 3        | 4.5                 | 3.7   | 13.07                                      | 61.16                        | 30                |
| BC 4        | 5.5                 | 4.1   | 17.70                                      | 42.52                        | 40                |
| BC 5        | 5.2                 | 4.9   | 20.00                                      | 58.48                        | 76                |
| BC 6        | 3.9                 | 2.6   | 7.95                                       | 28.83                        | 13.5              |



**Fig 4:** Relationship between Area of burrow opening (cm<sup>2</sup>) and crab carapace width (Mm) at Asna River



**Fig 5:** Relationship between Area of burrow opening (cm<sup>2</sup>) and Burrow depth (cm) at Asna River

**Table 2:** One-way ANOVA for the mean of Burrow characteristics (Surface area, crab carapace width and burrow depth) of *Barytelphusa cunicularis*

| ANOVA               |           |    |          |          |         |         |
|---------------------|-----------|----|----------|----------|---------|---------|
| Source of Variation | SS        | df | MS       | F        | P-value | F crit  |
| Between Groups      | 3897.0783 | 2  | 1948.539 | 8.632866 | 0.0032  | 3.68232 |
| Within Groups       | 3385.6759 | 15 | 225.7117 |          |         |         |
| Total               | 7282.7542 | 17 |          |          |         |         |

$P < 0.05$

**Table 3:** Comparative account of burrow characteristics and carapace width of *B. cunicularis* at Lendi River during 2017-2018

| Cast Number | Burrow opening (Cm) |       | Surface area of opening (cm <sup>2</sup> ) | Carapace width of crabs (mm) | Burrow depth (Cm) |
|-------------|---------------------|-------|--|------------------------------|-------------------|
|             | Major               | Minor |  |                              |                   |
| BC 1        | 5.1                 | 4.9   | 19.61                                      | 58.1                         | 8.5               |
| BC 2        | 4.6                 | 3.8   | 13.72                                      | 48.4                         | 6.3               |

|      |     |     |       |      |      |
|------|-----|-----|-------|------|------|
| BC 3 | 4.7 | 3.9 | 14.38 | 45.6 | 11.2 |
| BC 4 | 3.7 | 3.6 | 10.45 | 53.3 | 21.3 |
| BC 5 | 5.8 | 4.6 | 20.94 | 55.4 | 9.9  |
| BC 6 | 5.2 | 4.8 | 19.59 | 46.5 | 11.2 |

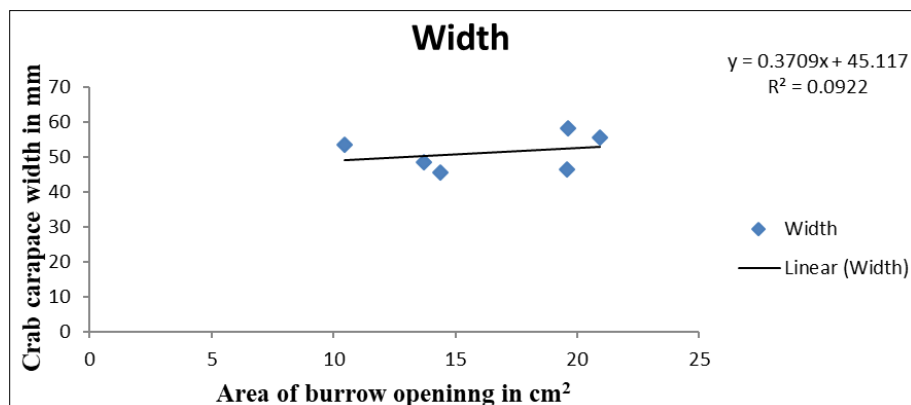


Fig 6: Relationship between Area of burrow opening (cm<sup>2</sup>) and crab carapace width (mm) at Lendi River

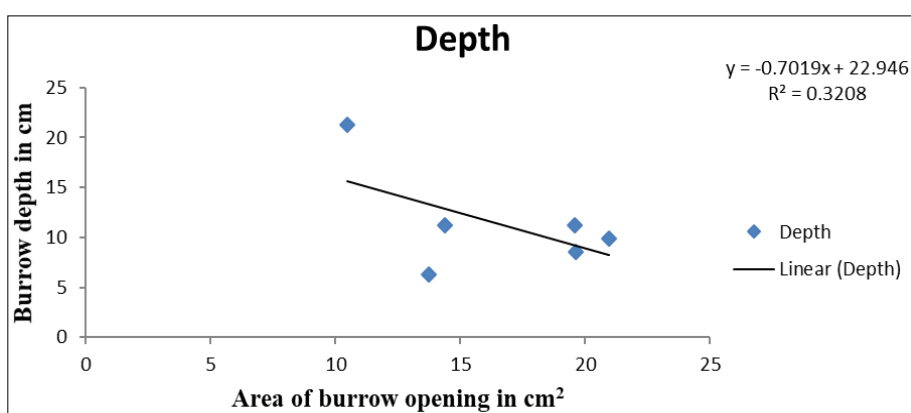


Fig 7: Relationship between Area of burrow opening (cm<sup>2</sup>) and Burrow depth (cm) at Lendi River

Table 4: One-way ANOVA for the mean of Burrow characteristics (Surface area, crab carapace width and burrow depth) of *Barytelphusa cunicularis*

| ANOVA               |             |    |          |          |             |             |
|---------------------|-------------|----|----------|----------|-------------|-------------|
| Source of Variation | SS          | df | MS       | F        | P-value     | F crit      |
| Between Groups      | 5639.379233 | 2  | 2819.69  | 119.6638 | 6.02883E-10 | 3.682320344 |
| Within Groups       | 353.4514167 | 15 | 23.56343 |          |             |             |
| Total               | 5992.83065  | 17 |          |          |             |             |

P > 0.05

## Discussion

Burrow morphology of brachyuran crab *Ocypode ceratophthalmus* was studied at two sites located at the Saurashtra [5]. In the present investigations, total 55 burrow casts were obtained and 8 types of burrows shape were recorded. The crab carapace width showed significant correlation with burrow-opening diameter, burrow volume and burrow total length. Present Study also showed a significant relationship between areas, carapace width and burrow depth at Asna river (Tributary of Godavari River) study site but not at Lendi River.

Burrow architecture of the ghost crab, *Ocypode ceratophthalmus* was studied [6], total 67 burrows were analyzed out of 131 burrows were excavated in their studies. compared with the young and juvenile crab burrows result of this study provides evidence that the J and U-shaped burrows could be precursors of Y-shaped burrows in the excavation process. [7], studied the engineering impact of burrowing crabs on distribution of organic matter. In their

investigations, burrowing activities of these crabs and passive deposition of materials in their burrows have a significant impact on the organic matter and nutrient distributions in subtropical mangrove sediments.

Tunnels can be of various shapes and sizes, basic or complex, having numerous branches or a solitary opening depending upon the idea of the creatures [8]. In this examination the tunnels of *B. cunicularis* were found to have ellipsoidal openings at both rivers. Straightforward, at times spread either straight or somewhat inclined plummeting downwards many times burrows were spiral in shape.

## Conclusion

This study provides one of the first descriptions of the morphology and ecology of burrows of freshwater crab *Barytelphusa cunicularis* in Nanded region of Maharashtra. The result shows significant variation in the burrow morphology. The complex morphology of these burrows

suggests that they are created, maintained the burrows. Crab burrow acts as an indicator crab population abundance and represent the interconnectivity of the burrow systems.

#### List of Abbreviations:

BC= Burrow Cast

Mm= Millimeter

Cm= centimeter

POP= Plaster of Paris

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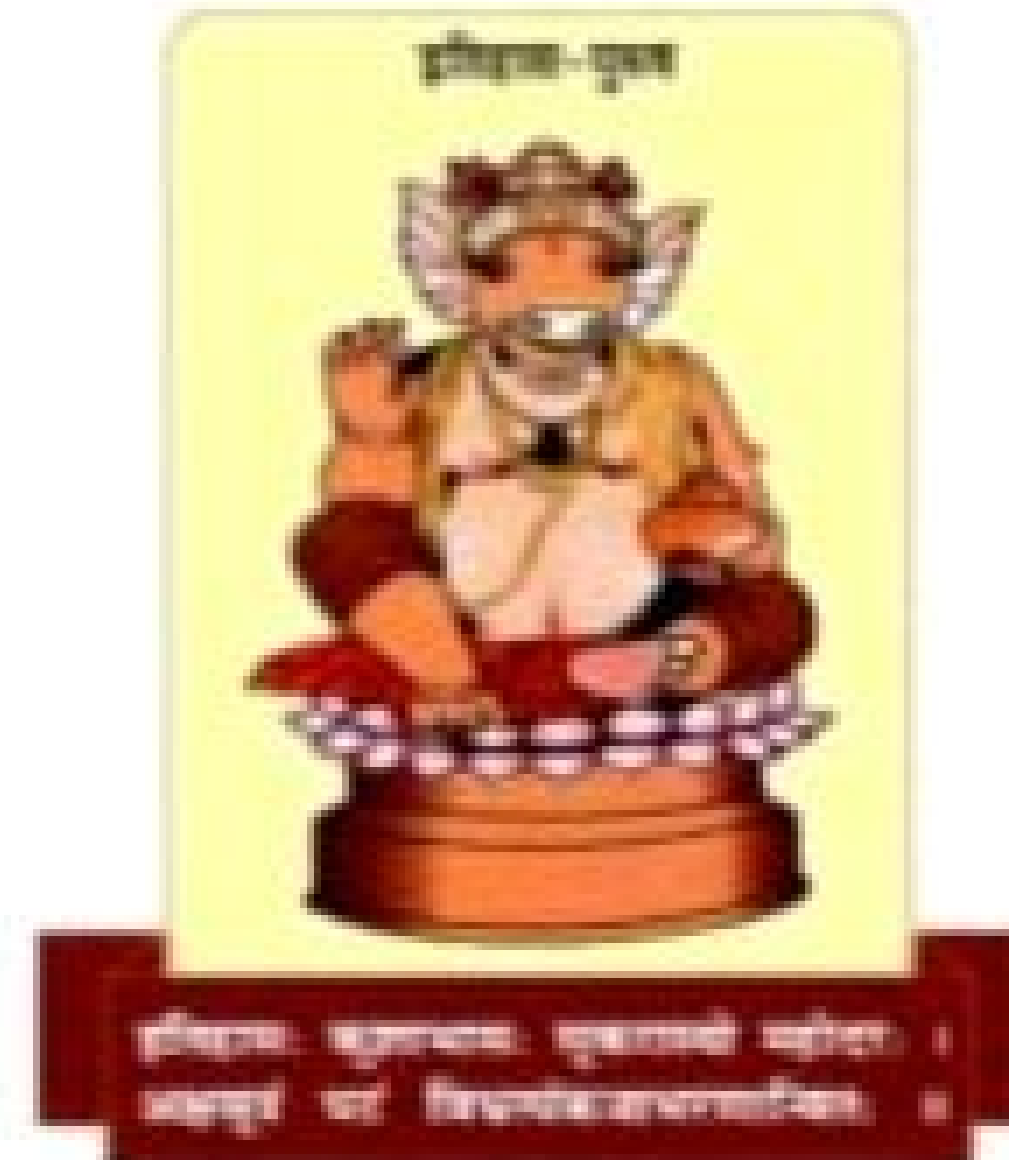
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## AKHIL BHARATIYA SANKALAN YOJANA

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## 6. The Evolution of Women's Rights: From Struggles to Successes

**Prof. R. A. Nakshine**  
M. S. P College, Manora.

### Abstract

This report presents an overview of the evolution of women's rights, emphasizing both global developments and the Indian context. It traces the history of women's struggles, from early social reform movements to modern-day campaigns for equality. Through examples from India's legal and political reforms—such as the abolition of Sati and the recent Women's Reservation Bill—it showcases the progress achieved. While significant strides have been made in areas like education, employment, and governance, the fight against gender discrimination is far from over. This report concludes by underscoring the need for sustained efforts to achieve full equality.

This report examines the evolution of women's rights with a focus on India, highlighting key historical struggles, milestones, and ongoing challenges. Throughout history, Indian women faced social restrictions such as Sati (widow immolation), child marriage, and exclusion from education and political participation. Reform movements during the 19th and 20th centuries, led by visionaries like Raja Ram Mohan Roy and Ishwar Chandra Vidyasagar, initiated changes by abolishing Sati and promoting widow remarriage and education for women.

The freedom struggle provided a platform for women leaders like Sarojini Naidu and Annie Besant to assert their rights. Post-independence, progressive legislation—such as the Hindu Succession Act (1956), Equal Remuneration Act (1976), and Dowry Prohibition Act (1961)—helped secure women's rights in areas like property ownership, equal pay, and protection from harassment.

India has achieved significant progress in recent decades. Campaigns like Beti Bachao, Beti Padhao aim to improve the status of girls by promoting education and preventing gender discrimination. The 73rd Amendment Act (1992) reserved 33% of seats for women in Panchayati Raj institutions, enabling greater political participation at the grassroots level. More recently, the passage of the Women's Reservation Bill (2023) aims to ensure 33% representation for women in Parliament and state legislatures, marking a historic step toward gender equality.

However, challenges such as gender-based violence, workplace harassment, and the wage gap persist. Campaigns like #MeToo India (2018) have brought workplace harassment to light, while grassroots initiatives empower rural women through Self-Help Groups (SHGs). This report concludes by acknowledging the progress made while emphasizing the need for continuous efforts to eliminate social and economic disparities.

The evolution of women's rights in India demonstrates that change is possible through persistent efforts by reformers, activists, and the government. With continued advocacy and collaborative efforts, India can ensure a more inclusive and equal society for future generations.

### **Introduction**

The journey of women's rights is marked by struggles, sacrifices, and significant milestones. Across centuries, women have challenged oppressive practices to claim their rightful place in society. This seminar focuses on the evolution of women's rights, from being denied basic freedoms to achieving legal, political, and economic equality. In particular, we will explore India's journey toward gender equality and the global movements that inspired it. While many victories have been won, challenges remain, making it essential to continue working toward a more just and equitable society.

The fight for women's rights has been a long and transformative journey, spanning centuries and covering various aspects of life—social, political, economic, and cultural. In many societies, including India, women were traditionally confined to domestic roles and denied access to education, economic participation, and political power. Over time, movements emerged to challenge these norms, with women and allies advocating for equality, dignity, and justice. The evolution of women's rights reflects both the challenges of dismantling patriarchal systems and the successes achieved through legal reforms, protests, and social change.

Globally, the suffrage movement gave women voting rights, marking the first major victory. In India, the freedom struggle provided a platform for women to assert their rights and question social norms. Post-independence, the government introduced progressive laws promoting equality, education, and employment for women. Today, India's social campaigns, legal frameworks, and women's representation in politics reflect these efforts toward gender equality.

Despite progress, the fight for equality is ongoing. Modern issues such as gender-based violence, workplace harassment, and wage gaps highlight the need for further reforms and cultural shifts. This seminar explores the evolution of women's rights—from historical struggles to current

achievements—while focusing on the road ahead to ensure complete equality for women across the world.

This report emphasizes the importance of collective efforts, government support, and individual responsibility in shaping a future. Despite progress, the fight for equality is ongoing. Modern issues such as gender-based violence, workplace harassment, and wage gaps highlight the need for further reforms and cultural shifts. This seminar explores the evolution of women's rights—from historical struggles to current achievements—while focusing on the road ahead to ensure complete equality for women across the world.

### **Objectives**

- To understand the historical context of women's struggles for equality across different eras and cultures.
- To examine the impact of global movements like the suffrage movement, second-wave feminism, and #MeToo on women's rights.
- To explore India's contribution to the women's rights movement, including social reforms, legal initiatives, and grassroots activism.
- To analyze key legal frameworks and policies in India, such as the Hindu Marriage Act, Equal Remuneration Act, and the Women's Reservation Bill.
- To assess the progress made in areas like education, employment, and political participation.
- To identify ongoing challenges, such as wage gaps, gender-based violence, and underrepresentation of women in leadership.
- To highlight the role of education and awareness in shaping societal attitudes toward gender equality.
- To inspire future actions and initiatives for promoting women's empowerment and achieving sustainable gender equality.
- To encourage a collaborative approach by involving government, civil society, and individuals in advancing women's rights.
- To provide recommendations for addressing existing challenges and ensuring an inclusive and equal society for future generations.
- To analyze how culture and traditions influence women's rights and gender roles in India.
- To explore the role of education in empowering women and reducing inequality.



- To examine the importance of women's health and access to healthcare in achieving equality.
- To investigate the role of men in supporting women's rights and promoting gender equality.

### Summary

In my exploration of the evolution of women's rights in India, I have observed a significant transformation from social oppression to legal empowerment, driven by reform movements, legislation, and activism. Historically, women faced severe injustices, including child marriage, lack of education, and gender discrimination. However, pioneers like Raja Ram Mohan Roy and Ishwar Chandra Vidyasagar fought against these practices, laying the groundwork for change.

During the freedom struggle, women such as Sarojini Naidu, Kamala Nehru, and Aruna Asaf Ali actively participated in political protests, demanding equality and challenging gender stereotypes. After India gained independence, several progressive laws were enacted, including the Hindu Succession Act (1956), which granted women the right to inherit property, and the Equal Remuneration Act (1976), which ensured equal pay for equal work.

I found it inspiring that initiatives like the 73rd and 74th Constitutional Amendments (1992) reserved 33% of seats for women in local governance, significantly increasing their political participation. Women like Kiran Bedi, the first female IPS officer in India, and Mary Kom, a renowned boxer, have also broken barriers and become role models for many.

In more recent times, movements such as #MeToo India have shed light on workplace harassment, prompting discussions and policy changes. Campaigns like Beti Bachao, Beti Padhao aim to promote gender equality from a young age, while Self-Help Groups (SHGs) empower rural women by providing them with micro-financing and entrepreneurship opportunities.

Despite these achievements, I have also recognized that challenges persist, such as the wage gap, underrepresentation in leadership roles, and issues of safety and harassment. However, the passage of the Women's Reservation Bill (2023), reserving 33% of seats in Parliament and state legislatures for women, is a promising step toward greater representation.

Overall, the evolution of women's rights in India demonstrates that change is possible through collective effort and persistent advocacy. With ongoing reforms, education, and activism, I believe India is on the path to creating a more inclusive and equitable society for women.

In my analysis of the evolution of women's rights in India, I have witnessed a profound transformation that reflects the tenacity and strength of women across generations. Historically, Indian women faced numerous challenges, including practices like child marriage, lack of access to education, and systemic exclusion from political and economic spheres. These injustices sparked the early reform movements of the 19th century, where visionaries like Raja Ram Mohan Roy and Ishwar Chandra Vidyasagar advocated for social change, leading to the abolition of practices such as Sati and promoting the education of girls.

### **Conclusion**

In conclusion, my exploration of the evolution of women's rights in India reveals a remarkable journey filled with resilience, transformation, and empowerment. This narrative is not just about struggles; it is also about the courage and determination of countless women and men who have fought against injustice and inequality. The story of women in India—transitioning from being marginalized and oppressed to becoming leaders and changemakers—serves as an inspiring example for the world.

I believe that we cannot overlook the profound impact of legal reforms, such as the Hindu Succession Act (1956), which empowered women with property rights, and the Protection of Women from Domestic Violence Act (2005), which provides essential safeguards against abuse. These laws are more than just words on paper; they represent a significant shift in societal attitudes toward gender equality.

Moreover, the ongoing efforts of grassroots movements, such as Self-Help Groups (SHGs), demonstrate the power of community in transforming lives. For instance, women like Vasanti Kshirsagar, who turned her life around through an SHG, exemplify what can happen when women are given the opportunity and support to thrive.

While I reflect on these achievements, I am also acutely aware of the challenges that remain. Issues like gender-based violence, wage disparities, and underrepresentation in leadership roles still need our attention and action. The recent passage of the Women's Reservation Bill (2023), reserving 33% of seats in Parliament and state legislatures for women, is a landmark achievement that signifies a commitment to greater representation and equality in governance. This change not only enhances women's voices in decision-making but also sets a positive precedent for future generations.

The evolution of women's rights in India is not just a narrative of struggles and victories; it is a call to action for all of us. As we move forward, I believe we must strive for a society where every woman can realize her potential, live free from violence and discrimination, and participate fully in all aspects of life. By working together—governments, civil society, and individuals—we can create an inclusive and equitable future, honoring the legacy of those who came before us while paving the way for the next generation of women leaders.

As I reflect on this remarkable journey, I remain committed to the ongoing fight for gender equality, ensuring that the ideals of justice, dignity, and equality are not just aspirations, but a lived reality for all women in India and beyond.

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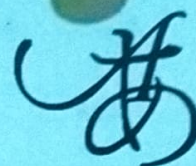
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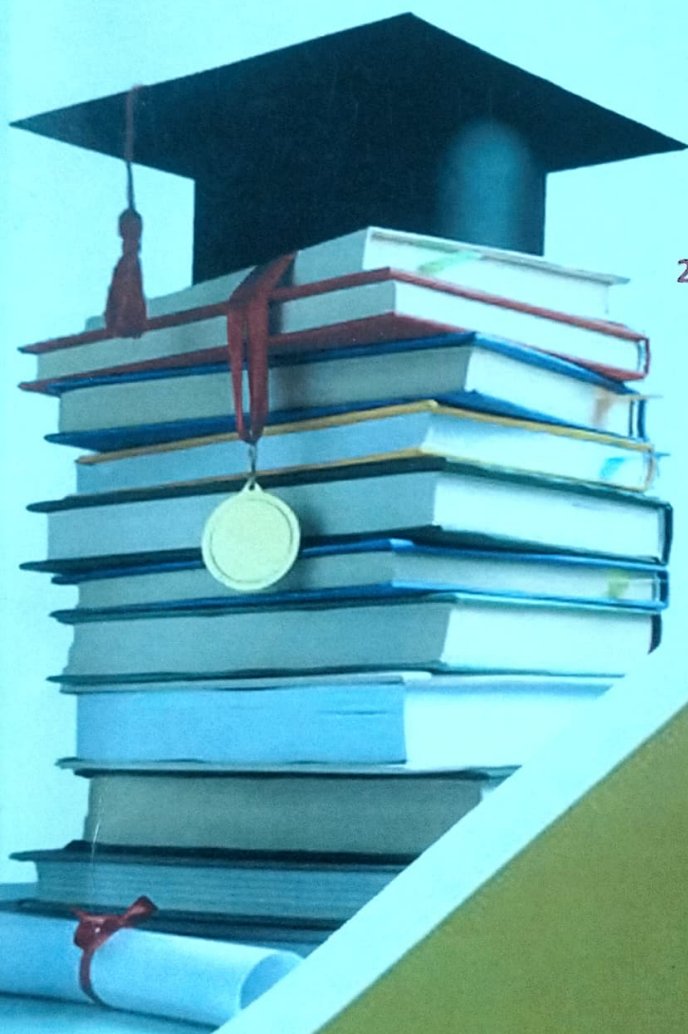
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# 1. Identity Crisis, Power Dynamics and in A Song of Ice and Fire

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## Introduction

The phenomenon of identity crisis in literature paves the way for character development. Characters in fiction undergoes transformation as the plot develops. The experience in the narrative shapes the identity of the characters. They could bring forth their hidden qualities or they could be affected by the changed circumstances and use their agency to manipulate the situation to their advantage. The discussion of various definitions of identity crisis makes the matter our investigation clearer.

During an identity crisis, a person "tries on" different identities and ways of being. They may question their family's values and cultural norms, and begin developing their own system of values and unique personality, separate from their family.

According to oxford dictionary identity crisis means a period of uncertainty and confusion in which a person's sense of identity becomes insecure, typically due to a change in their expected aims or role in society.

An identity crisis happens at a time when some change makes you re-evaluate who you are.

A Song of Ice and Fire is the series of fantasy novels written by American writer George R.R. Martin. The main topics he has dealt with in his series are politics, power dynamics and political intrigue. The series portrays fictional continents of Westeros and Essos. He has also painted the wild picture of the wild world of forest where wild tribes live in proximity with nature.

## Identity crisis and character development

Most of the characters in the series A Song of Ice and Fire face the dilemma of identity crisis. George R.R. Martin has introduced an aura of multi-dimensional characters. There are heroes who acts like villains and there are villains who show the tender feelings like sympathy and kindness. The utterly dishonest men show the streaks of honor. The world of the fantasy series A



Song of Ice and Fire is full of people with their unique strength and weakness, with their own features. The meek ladies as well as female knights. There are honest fools and utterly dishonest people like Jaime Lannister and Cersei Lannister. The world introduced is medieval in setting. There are seven kingdoms in the realm called Westeros and the seven families rule the different kingdoms. The North is ruled by the honest men Stark, the series portrays them as the descendants of the first men of the realm. Casterly Rock is ruled by the powerful and rich lord Tywin Lannister. The Lannisters are powerful but extremely ambitious and treacherous. The Lannisters are Tywin, Jaime, Cersei and Tyrion. There are Martells of Dorne, the Martells are poisonous in nature. They are brooding over the vengeance of the murder of Princess Elia who was wife to the prince Rheagar Targaryen. Rheagar Targaryen was murdered in the battle of Trident. The Greyjoys rule the Iron Island, these people want to assert their own identity. They are not in alliance with any house of the realm. The Tullys rule the river lands. Catlyn Tully is married to Eddard of house Stark. The Baratheon rule from Dragonstone, they are three brothers Robert king of the realm Stannis and Renly. The Targaryen family presently include Viserys and Daenerys rest of the members of the Targaryen family are killed in the Baratheon Rebellion. The Targaryens are the descendants of dragon. They are from the old Valeria which is destroyed in the fire.

The characters in the story change their personalities according to the development of the story. Martin has emphasized to portray morally grey characters not entirely heroes nor villains. Martin's characters are real life figure. They suffer as men and women suffer in the real life. They respond to their emotions as normal human being. There is less fantasy and more reality in Martins novels.

The above picture shows that the realm is ruled by various families each aspiring for the power and want to rule the kingdom under one banner. The seat that represent the whole realm is iron throne at kings landing. The rivalry among the lords of the realm disrupt the realm and chaos follows.

The follies committed by mad king Aerys II are grievous. King Aerys II in his fit of madness banished Tywin Lannister from the position of kings Hand. In order to diminish his power in the realm he appointed Jaime Lannister as the member of the king's guard. This made Tywin Lannister heirless. The king Aerys II refused Rheagar's marriage with Tywin's daughter Cersei. Prince Rheagar on the other hand chose Lyanna Stark as the queen of love and beauty. The battle that followed destroyed the realm beyond count. Robert Baratheon who was betrothed to Lyanna

Cersei's character development. If the things had gone as expected we would have seen different aspects of Cersei's nature but the changed situation changed her disposition and we got one of the rare female protagonist who dominated the war narrative of the series *A Song of Ice and fire*. Cersei is the force that played the game of throne she manipulated things in such a way that everything in the power game revolves around her. Her relationship with her husband, with her brothers and even with the members of king's guard reveal her political prudence. She represents the Machiavellian principles in the series. Cersei's every move is toward accumulation of power. She altered her plan according to the situation. She used Jaime Lannister to her own end. She manipulated the appointments in king's court to serve her ends. She even played the game with the faith, she appointed the septons who serve her end and replaced people who were hurdle in her way. When her twin brother Jaime Lannister is captured by Robb Stark and her father is away from Kings Landing to fight the war she establishes relationship with Lancel Lannister then with Osmund and Osfryd Kettleback to her end. Throughout the series she plays various political game with the various character of the series. She offers Eddard Stark her own self until Jaime returns to kings Landing.

Her game reverts when her trusted people betray her and confess the crime she compelled them to commit. Her fortune turn against her when her well-orchestrated plan fail. She herself becomes victims of her own plan. Her brother Jaime Lannister is captive of the Starks, he loses his sword hand while returning to kings landing. Her son Joffrey is murdered on his wedding night. Her father died at the hand of his own child Tyrion. She suffers tremendously. She is made to walk the walk of atonement all naked before the common people of the kings landing. She is humiliated beyond limit. People curse her, they call her whore and pelt rotten vegetable at her. When Jaime learns about her relationship with other people of the court he abandons her to her faith. He did not return to save his twin sister.

Eddard Stark is honorable man who follows the simple life and straight traditions of the North. He is unaware of the courtly politics of the southern court. He is dear friend of the king Robert. He helped him win the iron throne and avenge the murder of his sister Lyanna Stark. Jon Arryn's death compels Eddard to walk south and accept the position of king's Hand the lord is so honorable that he does not make any changes in his behavior according to the customs of the southern courtly politics. He follows the simple rule of differentiating the truth from the false. He accuses Cersei of her incest, he questions Joffrey's legitimacy as Robert's heir. And extend his



support to Stannis Baratheon as the proper heir to the iron throne. He suffers a lot just for the sake of his honesty. Many people tell him to change his disposition and change his pursuit of the Joffrey's legitimacy. Eddard Stark continues his investigation and brings about his down fall. The death of Robert Baratheon changed the situation for him changed situation changed the result.

Arya Stark is daughter of Eddard Stark, she is small wilful child of nearly six to seven years old. George R. R. martin has portrayed her as tomboy from her early childhood she is indomitable. She rejects the gender role allotted to her, she enjoys being boy and doing the work of boy. She tends horses and learns sword fight. As a girl she never shows interest in girly things like sewing and dancing. Her father's death changes her entire universe she hides her identity and disguises herself as boy, she frequently changes her name. In search of her lost home she hurtles from one place to another place. In the end of the series she joins the faith of R'hllor and chooses to become faceless assassin.

Sansa Stark is daughter to Eddard Stark and Catelyn Stark she is comely girl who is waiting her flowering to finalize her marriage with Joffrey Baratheon. Sansa is a dreamy girl who is much interested in the knightly tales and romantic love stories. She is betrothed to Joffrey Baratheon the heir to iron throne. She is completely naïve player in the game of thrones. She learns her harsh lesson after her father's execution. She had pleaded for the mercy for her father but Joffrey didn't listen her. She is ill-treated at kings landing after her father's death. She is used as catspaw to advance their agenda. In reality Sansa was hostage at kings landing. Peter Baelish tells her that life is not a song and she would learn it one day. Sansa Stark is married to the dwarf of Tywin Lannister Tyrion.

Daenerys Targaryen is another one more important character in the fantasy series A Song of Ice and Fire. She was borne in tumultuous time when the Targaryen dynasty came to end. She and her brother Viserys are the last surviving members of the dragon family. In the beginning she suffers hardship. She is sold to the war lord Khal Drogo at the age of thirteen, after enjoying her marital bliss she loses her husband and even her son her supporters. She undergoes hardship and carve out her own kingdom. Her subjects call her *mhysa* or mother in the free cities of Meeren, Astapor Yi Ti she sets free the slaves and becomes their mother. She also hatches three dragon eggs and gives them life to make them formidable force in the game of thrones and herself a formidable player.



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# The Role of Digital Tools in Enhancing Academic Writing: A Case Study of Maharashtra Universities

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## Abstract

In the automated aeon, academic writing has been gone through a significant change, largely guided by the introduction of various digital assets. This paper high-lights the role of virtual tools in improving the academic writing, especially focusing on research scholars and faculty members in Maharashtrian universities. The study explores how this digital tool such as citation managers, grammar checkers, plagiarism detection software, and writing platforms help improve the quality, accuracy, and efficiency of academic writing. This paper tries to achieve its objective through interviews and surveys, this research study examines the extent to which digital tools have been utilized, the benefits using these tools, and the threats encountered by users.

## Keywords

Digital tools, academic writing, Maharashtra universities, citation managers, grammar checkers, plagiarism detection, writing platforms.

## Introduction

Academic writing is one the most desired skill in the field of the higher education. The research work is a very complex and cumbersome task requires amalgamation of various things, needs painstaking attention to structure, language, citation, and novelty for the research activities. But this process of academic writing has simplified due to the advance modern tools in the field of literature management software. These tools are playing a remarkable role in the enhancement of the productivity of research works. Nowadays with the help of this technologies many things can be done with one single click of the mouse.

Enhancing Academic Writing with Digital Tools



Maharashtra is hub of world acclaimed universities and institutions, and also known as research factory on India. Here a large number of research scholars and faculty members are involved in producing academic research activities, these research studies are coupled with digital tools in facilitating the writing process. This virtual software helps its users to organize ideas, assure proper grammar, manage citations, and avoid duplication. I through this research paper tries to investigate the impact of these virtual tools on academic writing in Maharashtrian universities and institutions. The main focus is to understand how this advance technology help researchers to write better papers and what challenges they face in using them.

### ***The Importance of Academic Writing***

Academic writing is the heart and soul to the dissemination of knowledge. It needs crystal clear communication of ideas, proof-based arguments, and suitable reference system. According to Steve Graham academic writing is "a disciplined, structured approach to writing that adheres to specific rules regarding style, format, and accuracy." The credibility and originality of research work shows that effective academic writing improves the credibility of the author and the quality of research activities.

### ***Digital Tools in Academic Writing***

Twentieth century is the century of advancement in the technologies and this is visible in every hemisphere of the man-kind. In the last ten years, a large number of digital tools have been developed to help authors in the academic world. Evans et al. (2020) highlight many types of digital application that have proven as an essential part of academic writing:

Tools such as Mendeley, EndNote, Zotero, RefWorks and BibTex help researchers organize references and ensure accurate citations. This software become a boon for the research scholars and the faculty members in the Maharashtrian Universities. Now researchers not need to spend too much time in bygone research activities.

Software like ProWritingAid, Ginger, and Hemingway Editor, are widely used to improve the clarity and correctness of language. These tools now are playing a vital role in the research works around the world; therefore, we are witnessing huge influx of the research works.

Tools such as Plagscan, Quetext, and Duplichecker help writers ensure the originality of their work. Less than one-minute researchers can scan their content and modify accordingly, due to this applications duplication can avoided easily. These tools are complying writers to create original works. All these literature management tools playing vital role in the field of research activities.

Tools such as Google Docs, Microsoft Word, and Evernote offer collaborative features and advanced writing functionalities. These platforms are performing a remarkable role in the academic writing.

### ***Methodology***

I this research study I applied a trio combination of the methods, first I did a survey of Maharashtrian scholars and faculty members. In this survey we engaged near about 200 scholars from the prominent universities across the state. In the survey we gave them a questionnaire set; these questions were related to their research works. Another approach we applied here we took one to one interviews of the faculty members and the research scholars from famous institutions of the Maharashtrian universities, all the selected scholars and faculty members are having pre knowledge about these tools. The data was compiled and analysed by using quantitative and qualitative approaches to present a comprehensive understanding of the impact of digital tools on academic writing.

### ***Results and Discussion***

The survey resulted that 70 % of scholars and 85 0% of faculty members regularly utilized digital tools for academic writing. Mendeley and Zotero, are the most commonly used tools were citation management software in the same manner as far as grammar checkers Grammarly and Ginger play a vital role for the rectification of the content, and for plagiarism detection tools such as Turnitin and Duplichecker are very handy.



According to the research scholars to improve the readability of the research works the depend on the grammar checkers and for the managing and organising referential data they use citation tools. Plagiarism also found a great place in the works of faculty members.

**“Ensuring that my papers are original and free from plagiarism is a priority. I use Turnitin to check my work before submission to journals.”**

### ***Benefits of Digital Tools***

**Improved Citation Accuracy:** According to many research scholars and faculty members Citation managers were found to be particularly helpful in managing complex citation formats such as APA, MLA, and Chicago. According several research scholars while using these tools they noted that these applications are time-saver and they have reduced time at a great extent for citation errors. One scholar opined:

**“Before using Mendeley, I used to struggle with citations. Now, it automatically formats them for me.”**

**Enhanced Language and Grammar:** Another most important contribution made by these tools is identify and erasing common grammatical errors, enhance sentence structure, and improve the overall clarity of their academic works. Many of the faculty members mentioned that grammar checkers were especially useful in ensuring that their papers met the high standards of international journals.

**Plagiarism Prevention:** Plagiarism detection is the most needed in the arena of academic writing, this tool helped both research scholars and faculty members avoid unintentional plagiarism. Plagiarism is dark mark in the educational field, many research scholars without doing any research activity tried to copy other scholars' work. But genuine participants appreciated the ability to check their work for similarities with other published papers before submission.

**Omnipresent Writers:** Writing applications such as Ginger Google Docs permitted multiple authors to work on the same research work in. This is the most incredible feature of these advanced tools was especially design for faculty members working on joint research projects.

### ***Digital Tools and Academic Writing Quality***

Overall, the study found that digital tools had a positive impact on the quality of academic writing. 90% of the respondents felt that their writing had improved after using these tools. In a nutshell we can say we can say these tools helped academic scholar and the faculty members to shine their skills. All advance tools are the heart and soul of the modern academic writings In particular, research scholars noted that the tools helped them produce more polished papers with fewer grammatical errors and better citation management. According to many Faculty members also found that using digital tools helped them meet the stringent requirements of academic journals more easily. However, the study also highlighted the need for balanced usage. While digital tools offer valuable support, they cannot replace the critical thinking and analytical skills that are essential for good academic writing.

### ***Conclusion***

The findings of this study indicate that digital tools play a significant role in enhancing academic writing among research scholars and faculty members in Maharashtra universities. Citation managers, grammar checkers, plagiarism detection software, and collaborative writing platforms help users improve the accuracy, clarity, and originality of their work. Universities should provide workshops and online tutorials to help students and faculty members learn how to use digital tools effectively.

Institutions should negotiate with software providers to offer free or discounted access to premium features, particularly plagiarism detection tools. By addressing these issues, In a nutshell, we can say that these remarkable tools are much needed for the productive and qualitative works. Maharashtra universities can ensure that research scholars and faculty members are better equipped to produce high-quality academic writing that meets international standards.

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# **(m,n) - Type Holographic Dark Energy Bianchi Type-V Cosmological Model in General Relativity**

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## **ABSTRACT**

Investigations currently underway aimed at the self-propelling study of  $(m,n)$ -type HDE cosmological model within the circumstance of theory of General Relativity (GR). The solutions of the field equations correspond to special form hybrid expansion law (HEL) which provides singular model. Also some physical and dynamical aspects and its behavior with the present day universe of the cosmological model have been discussed.

**Keywords:**  $(m,n)$ - type HDE, General Relativity (GR), Bianchi type-V metric.

## **I. INTRODUCTION**

The geometric theory of General Relativity (GR) explains gravitational phenomena. It is also helpful for building mathematical models in cosmology, which studies the universe's large-scale structure. The fast expansion of the universe has been proven by contemporary cosmological observations. Additionally, it has been confirmed that Dark Energy (DE), an unusual force with negative pressure, is the cause of this late time acceleration [1-6]. GR and modified theories of gravitation have been studied to explain this DE model. The most straightforward candidate to cause this cosmic acceleration was thought to be the cosmological constant, which stands for the energy density connected to the quantum vacuum. However, this straightforward DE model suffers from the coincidence and other grave issues in

GR. Therefore, in an effort to explain this cosmic acceleration of the cosmos, various dynamical DE models have been studied.

DE is a unique kind of energy that fills the entire space and accelerates the universe's expansion overall. The DE is typically displayed in two ways: first, using a particular parameterization, and second, by changing gravity at incredibly large scopes. There are three main approaches to determine the DE condition of state from observational data: solving the scalar field conditions, building a helpful framework for the condition of state border, and implementing a boundary-free methodology. A dynamical scalar field and the vacuum energy thickness are two important alternatives for DE. As a result, in most core scenarios, the condition equation of state (EoS) associated with

the vacuum energy thickness is consistent and a temporal component [7-9].

A number of investigators and writers examined Holographic Dark Energy (HDE), an alternative kind of DE. HDE models rely on a field-theoretical relationship between shorts in the infrared and brilliant energy domains. Different choices made at the infrared end resulted in different models, and it was also discovered that the universe's thickness is independent of its spatial shape [10–11]. [12] Established a link in the Bianchi Type-V universe between the HDE models and the quintessence scalar field DE models. For this anisotropic speeding up model of the cosmos, the quintessence scalar field and its core potential are rebuilt. [13–19] studied five-dimensional HDE models and minimally interacting models. A few writers [20–25] talked on the dynamics, cosmic evolution, and implications of HDE models of the universe in relation to various cosmological theories. Another class of HDE models in LRS Bianchi Type-I was obtained by signature flipping of isotropic homogeneous space-time with HDE in  $f(G)$  gravity focused by [26] and [27]. Various HDE models, such as the Tsallis HDE and the Barrow HDE models, have also been studied [28–29]. In light of the previous discussion of DE and HDE, we can now investigate  $(m,n)$ -type HDE cosmological models, which provide DE models that resemble age graphs in both kinematical and physical senses [30–31]. We have taken into consideration a General Relativity theory to describe the current universe's behaviour for these  $(m,n)$ -type HDE cosmological models.

Up to now, a number of GR cosmological models have been proposed to explain how our universe behaves. [32–33] explored the cosmological models in GR. In GR, Bianchi type-V string cosmological models were studied by Yadav et al. [34]. [35–36] have obtained the Bianchi type-V DE cosmological model in GR and the FLRW non-singular. A cosmological model in which the viscous fluid in GR

and the time-dependent  $\Lambda$  and  $G$  are investigated [37]. Our paper is structured as follows in relation to the cosmological discussion and extension mentioned above:

We discuss the metric and GR in **Section II**. In **Section III**, the metric solutions of a specific GR theory and the model are shown using the unique HDE form known as  $(m,n)$ -type HDE. In **Section IV**, the graphical representations of the model's physical and dynamical behavior using the  $(m,n)$ -type HDE are presented. **Section V** contains the conclusions.

## II. METRIC AND GENERAL RELATIVITY

We consider a Bianchi type-V space-time of the form  $ds^2 = dt^2 - A^2 dx^2 - e^{-2\mu x} [B^2 dy^2 + C^2 dz^2]$ , (2.1) where,  $A$ ,  $B$  and  $C$  are the potential functions of cosmic time  $t$  only and  $\mu$  is constant.

The energy momentum tensor for dark matter (DM) and HDE is taken as,

$$T_{ij} = \rho_{mat} u_i u_j + (\rho_{de} + p_{de}) u_i u_j + p_{de} g_{ij} \quad (2.2)$$

Here,  $\rho_{mat}$  is the matter density of DM,  $\rho_{de}$  being the energy density and  $p_{de}$  is the pressure. The Holographic Dark Energy (HDE) model is one of the numerous approaches that have been put out to address this challenging problem.

For the energy momentum tensor (2.2) and for the space-time (2.1), the Einstein's field equation,

$$R_i^j - \frac{1}{2} R g_{ij} = -8\pi T_{ij}, \quad (2.3)$$

yields the following five independent equations called as non-linear differential equations:

$$\frac{\ddot{A}}{A} + \frac{\ddot{B}}{B} + \frac{\dot{A}\dot{B}}{AB} - \frac{\mu^2}{A^2} = p_{de} \quad (2.4)$$

$$\frac{\ddot{A}}{A} + \frac{\ddot{C}}{C} + \frac{\dot{A}\dot{C}}{AC} - \frac{\mu^2}{A^2} = p_{de} \quad (2.5)$$

$$\frac{\ddot{B}}{B} + \frac{\ddot{C}}{C} + \frac{\dot{B}\dot{C}}{BC} - \frac{\mu^2}{A^2} = p_{de} \quad (2.6)$$

$$-\left[ \frac{\dot{A}\dot{B}}{AB} + \frac{\dot{A}\dot{C}}{AC} + \frac{\dot{B}\dot{C}}{BC} - \frac{3\mu^2}{A^2} \right] = (\rho_{mat} + \rho_{de}) \quad (2.7)$$

$$\frac{2\dot{A}}{A} - \frac{\dot{B}}{B} - \frac{\dot{C}}{C} = 0 \quad (2.8)$$

Here, in the all above equations the overhead dot denotes the differentiation with respect to  $t$ .

We shall now define cosmological parameters which would help solving the above filled equations. The volume  $V$  and the average scale factor  $a(t)$  are given by;

$$V = a(t)^3 = a^3 = ABC \quad (2.9)$$

The average Hubble parameter  $H$ , scalar expansion  $\theta$ , shear scalar  $\sigma^2$  and the anisotropy parameter  $\Delta$  are defined as:

$$H = \frac{\dot{a}}{a} \quad (2.10)$$

$$\theta = 3H \quad (2.11)$$

$$\Delta = \frac{1}{3} \sum_{i=1}^3 \left[ \frac{H_i - H}{H} \right]^2 \quad (2.12)$$

$$\sigma^2 = \frac{3}{2} H^2 \Delta \quad (2.13)$$

Also the deceleration parameter ( $q$ ) is given by,

$$q = \frac{d}{dt} \left[ \frac{1}{H} \right] - 1 \quad (2.14)$$

### III. SOLUTIONS OF THE FIELD EQUATIONS

In order to present a DE model in the presence of  $(m,n)$ -type HDE here, we solve the field equations (2.4-2.8).

On integrating (2.8) and absorbing the constant of integration, we get

$$A^2 = BC \quad (3.1)$$

Now by utilizing the set of five independent Eqs. (2.4-2.8) having seven unknowns  $A, B, C, \rho_{mat}, \rho_{de}, p_{de}$  and  $V$ . Hence to find determinate solution we use the following physically significant expressions:

The shear scalar of the line element is proportional to the expansion scalar, so that we have:

$$A = C^\tau, \quad (3.2)$$

where  $\tau \neq 1$  is a positive constant which preserves the anisotropy of the line element.

Also by using Eqs. (2.4-2.8) we get

$$B = \eta C = B = C; \eta = 1 \quad (3.3)$$

Let us consider the special form of deceleration parameter in terms of average scale factor

$$a = (e^{k\beta t} - 1)^{1/\beta} = (e^{\beta t} - 1)^{1/\beta}; k = 1 \quad (3.4)$$

Now utilizing Eqs. (2.9) and (3.2-3.4) we get the values of the potential functions as:

$$B = (e^{\beta t} - 1)^{\frac{3}{\beta(\tau+2)}} = C \quad (3.5)$$

$$A = (e^{\beta t} - 1)^{\frac{3\tau}{\beta(\tau+2)}} \quad (3.6)$$

Also we've chosen to frame the cosmological model in this instance using an assumed scale factor. Additionally, we must ascertain the pressure, matter density and energy density with respect to cosmic time in order to frame a cosmological model of the universe. We adopt the power law form of the scaling factor.

With the help of Eqs.(3.5-3.6) in Eq. (2.1) the Bianchi type-V cosmological model with  $(m,n)$ -Type HDE source within the framework of GR becomes:

$$ds^2 = dt^2 - \left[ (e^{\beta t} - 1)^{\frac{3\tau}{\beta(\tau+2)}} \right]^2 dx^2 - e^{-2\mu x} \left[ (e^{\beta t} - 1)^{\frac{3}{\beta(\tau+2)}} \right]^2 (dy^2 + dz^2) \quad (3.7)$$

### IV. PHYSICAL AND DYNAMICAL PROPERTIES OF THE MODEL

Using Eqs.(3.4) and (3.5-3.6) in the Eqs. (2.10-2.14) we get the different kinematical and physical parameters of the model which help us to describe the characteristics of the universe:

- Hubble Parameter:  $H = \left\{ \frac{e^{\beta t}}{e^{\beta t} - 1} \right\}, \quad (4.1)$

- Expansion Scalar:  $\theta = \left\{ \frac{3e^{\beta t}}{e^{\beta t} - 1} \right\},$

$$(4.2)$$



- Anisotropy Parameter:  $\Delta = \left\{ \frac{2(\tau-1)^2}{(\tau+1)^2} \right\}$ , (4.3)

- Shear Scalar:  $\Delta = \left\{ \frac{3(\tau-1)^2}{(\tau+1)^2} \right\} \frac{e^{2\beta t}}{(e^{\beta t} - 1)^2}$ , (4.4)

- Deceleration Parameter:  $q = \beta e^{\beta t} - 1$ . (4.5)

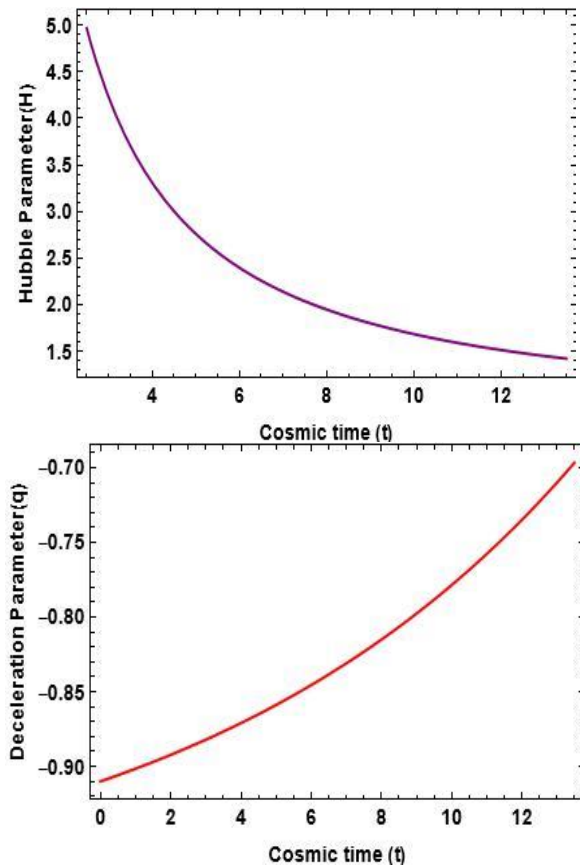


Figure 4.1: Shows the behavior  $H$  &  $q$  Vs cosmic time ( $t$ )

So, by using Eqs. (3.5-3.6) in the Eq. (2.6) we get the pressure of the universe as:

$$\left[ \left( \frac{-3}{\tau+2} \right) \left\{ \frac{e^{\beta t}}{e^{\beta t} - 1} \right\} \left[ \left( \frac{9}{\tau+2} \right) \left\{ \frac{e^{\beta t}}{e^{\beta t} - 1} \right\} + 2\beta \left\{ \frac{e^{\beta t}}{e^{\beta t} - 1} - 1 \right\} \right] + (e^{\beta t} - 1)^{\frac{4(1-\tau)}{\beta(\tau+2)}} \right] = p_{de} \quad (4.6)$$

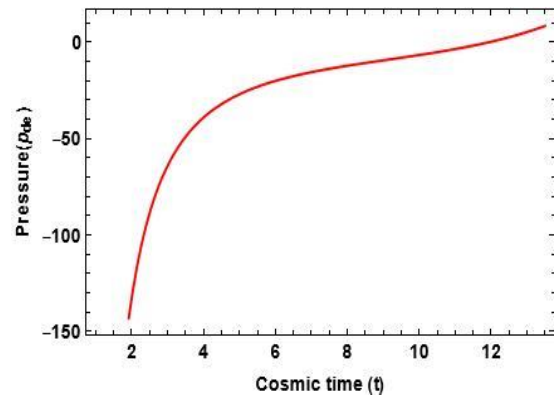


Figure 4.2: Shows the behavior  $p_{de}$  Vs cosmic time ( $t$ )

#### • $(m,n)$ -Type H.D.E

Here, the idea of  $(m,n)$ -Type HDE is the extension of HDE with the parameters  $m$  and  $n$  with the chosen IR cut-off as,

$$L = \frac{1}{a^m(t)} \int_0^t a^n(t') dt' \quad (4.7)$$

Specifically, for a few explicit upsides of  $(m,n)$  the condition of state can normally develop cross ghost split even without presenting cooperation among DE and dark matter (DM). Additionally when  $(m,n)$  take some particular worth all the age graphic-like DE models can be recuperated. This development is likewise relevant to the models with summed up future occasion skyline as the holographic size in a similar soul. For age-like holographic models, when  $m=n$  it appears to be that DE has a similar way of behaving as the prevailing fixing in the early epochs of the universe which infer that DE may be bound together with DM. In any case, we need to acquaint some component with make DE go amiss from DM state, and at last become predominant and be answerable for the speed increase of the universe.

Now for the construction of  $(m,n)$ -Type HDE models we define the energy density [38-40] as,

$$\rho_{de} = \frac{3b^2}{L^2} \quad (4.8)$$

here  $b$  is treating as a constant and  $L$  is given by (4.7).

As we have constructed our model on the basis of  $(m, n)$ -type HDE in the GR theory and hence by utilizing Eq. (3.4), (4.7) and (4.8) we get the energy density of  $(m, n)$ -Type HDE cosmological model as:

$$3b^2 \left[ (e^{\beta t} - 1)^{-\frac{2(n+\beta)}{\beta}} \left\{ \frac{e^{-2\beta t}}{(n+\beta)^2 (e^{\beta t} - 1)^{2m/\beta}} \right\} \right] = \rho_{de} \quad (4.9)$$

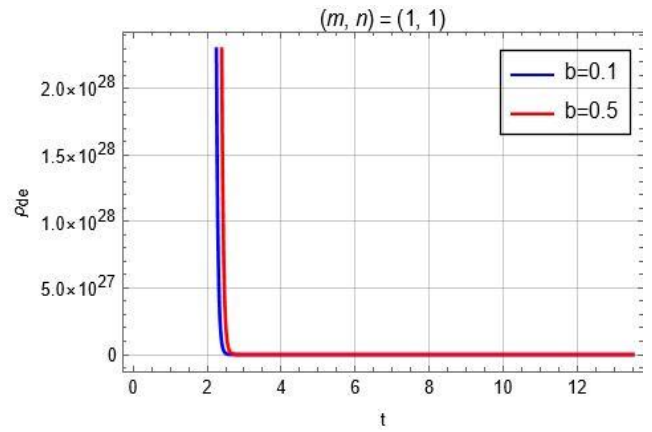
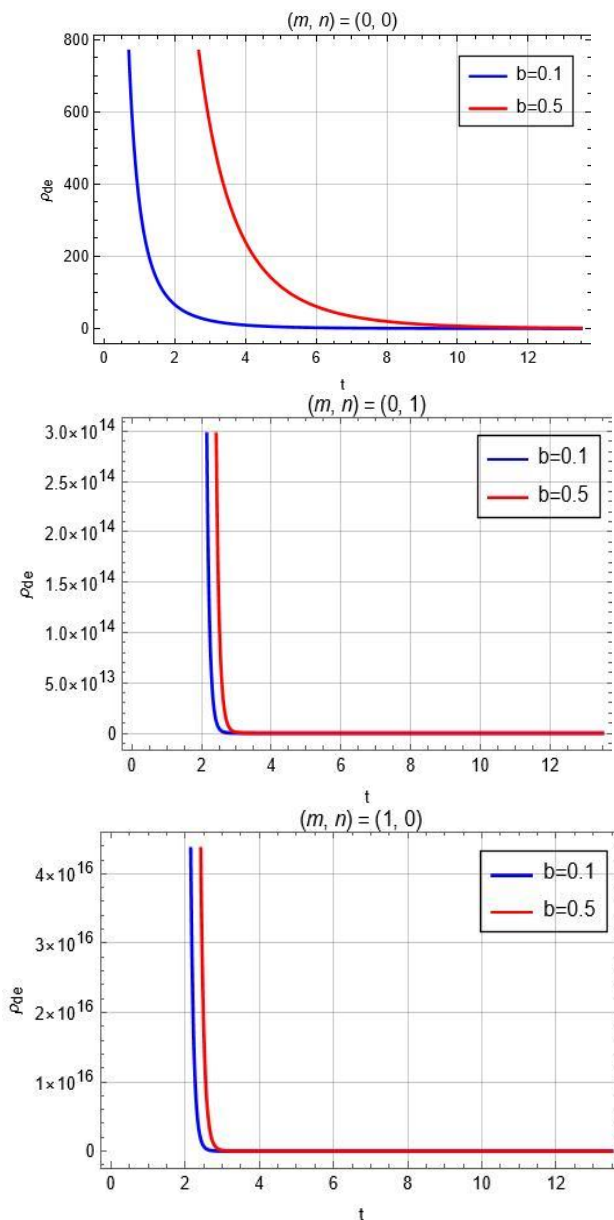
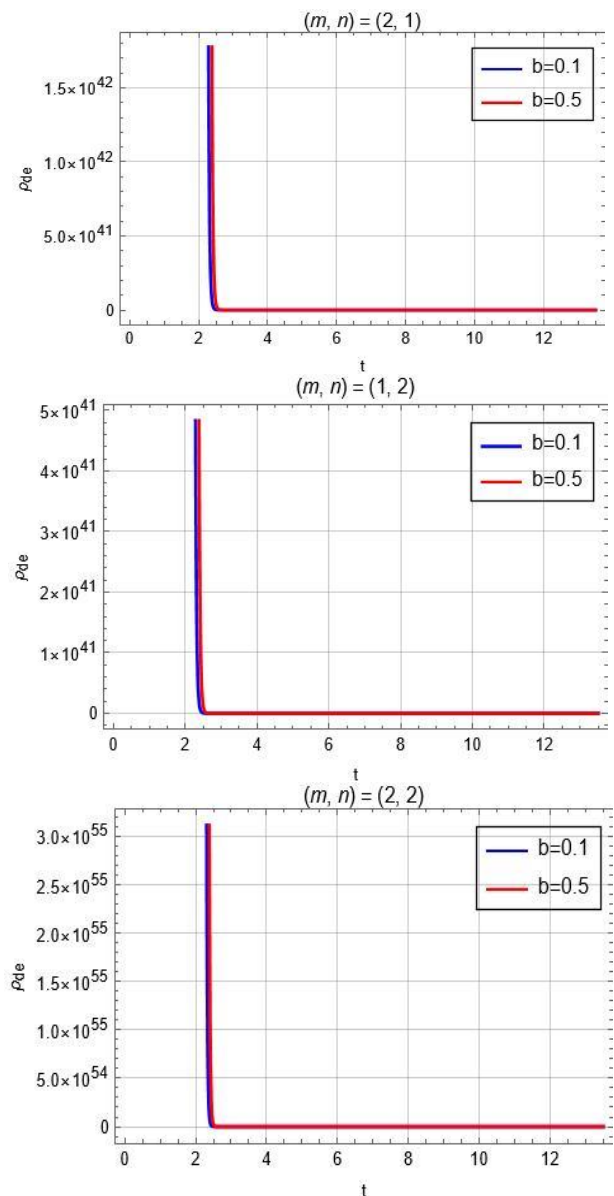


Figure 4.3: Shows the behaviour  $\rho_{de}$  Vs cosmic time  $(t)$

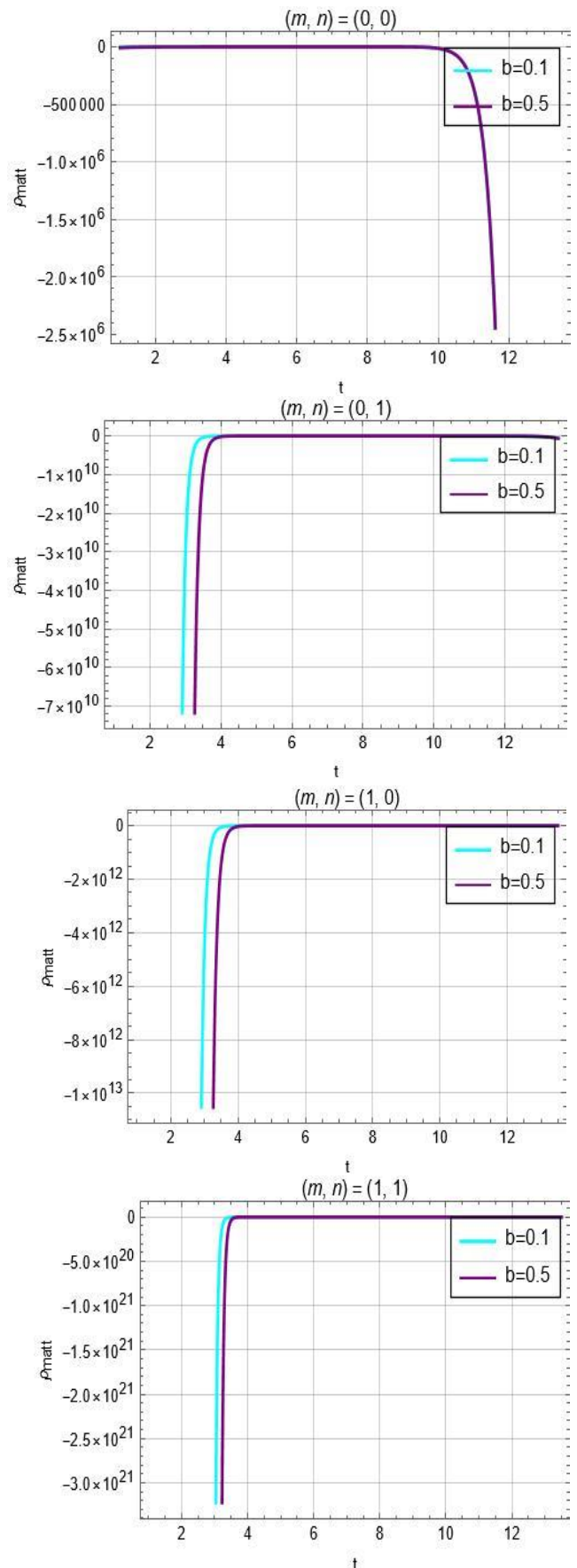


In Figure 4.3 we have plotted the graph of energy density with cosmic time ( $t$ ) for various positive values of  $(m,n)=(0,0),(0,1),(1,0),(1,1),(1,2),(2,1) \& (2,2)$ . Here for the value of constant  $b=0.1 \& b=0.5$  we got two  $(m,n)$ -type HDE cosmological models in the framework of GR as shown in Figure 4.3. Based on the analysis above, it is anticipated that this alteration will significantly alter the dark energy's asymptotic behaviour.

For  $(m,n)=(0,0),(0,1),(1,0),(1,1),(1,2),(2,1) \& (2,2)$  the nature of energy density for both the models shows decreasing behaviour with varying cosmic time and for large values of  $t$  it became asymptotic. For  $m=n=0$  both the models decreasing distinctly and for the large values of  $t$  it shows a constant asymptotic behaviour also here we can say that the model behaves like an ordinary HDE model. For  $(m,n)=(1,2),(2,1) \& (2,2)$  etc., shows constant behaviour for all values of  $t > 0$  (Ref. Figure 4.3). When the parameters  $(m,n)$  are taken values in the authorized domain the model looks like a stable for HDE.

Also by utilizing Eqs.(3.5-3.6) together with Eqs.(4.8) and (2.7) we get the matter density of  $(m,n)$ -Type HDE cosmological model as:

$$\left[ \frac{9(2m-1)}{(m+2)^2} - 3(e^{\beta t} - 1)^{\frac{4(1-m)}{\beta(m+2)}} \right] - 3b^2 \left[ (e^{\beta t} - 1)^{-\frac{2(n+\beta)}{\beta}} \left\{ \frac{e^{-2\beta t}}{(n+\beta)^2 (e^{\beta t} - 1)^{2m/\beta}} \right\} \right] = \rho_{\text{matt}} \quad (4.10)$$





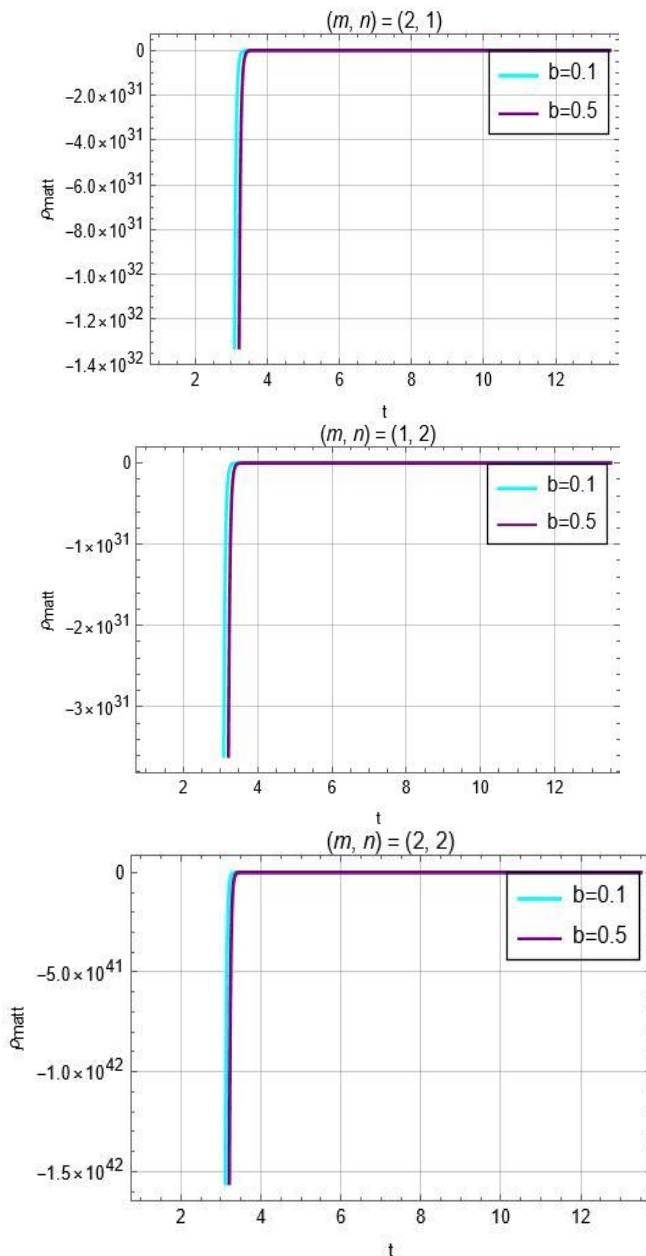


Figure 4.4: Shows the behaviour  $\rho_{matt}$  Vs cosmic time (t)

In Figure 4.4 we have plotted the graph of matter energy density with cosmic time ( $t$ ) for various positive values of  $(m, n) = (0, 0), (0, 1), (1, 0), (1, 1), (1, 2), (2, 1) \& (2, 2)$ . Here for the value of constant  $b = 0.1 \& b = 0.5$  we got two  $(m, n)$ -type HDE cosmological models in the framework of GR as shown in Figure 4.4. Based on the analysis above, it is anticipated that this alteration

will significantly alter the dark matter shows asymptotic behaviour.

For  $(m, n) = (0, 0), (0, 1), (1, 0), (1, 1), (1, 2), (2, 1) \& (2, 2)$  the nature of matter energy density for both the models shows decreasing behaviour with varying cosmic time and for large values of  $t$  it became asymptotic. For  $m = n = 0$  both the models have merged and for the large values of,  $t$  it shows the constant asymptotic behaviour and here we can also say that, the model behaves like an ordinary HDE model. For  $(m, n) = (1, 2), (2, 1) \& (2, 2)$  etc., shows a constant behaviour for all values of  $t > 0$  (Ref. Figure (4.4)). For the suitable choice of  $(m, n)$  in the authorized domain the model looks like a stable for DM.

The overall energy density parameter of the  $(m, n)$ -Type HDE cosmological model is found out as:

$$\Omega = \left[ \Omega_{de} \left( \frac{\rho_{de}}{3H^2} \right) + \Omega_{matt} \left( \frac{\rho_{matt}}{3H^2} \right) \right] = \left[ \frac{\left\{ 3(2m-1)(e^{\beta t} - 1)^2 - (m+2)^2(e^{\beta t} - 1)^{\frac{4(1-m)}{\beta(m+2)} - 2} \right\}}{(m+2)^2 e^{2\beta t}} \right] \quad (4.11)$$

## V. CONCLUSION

As a generalization of the common holographic dark energy (HDE) models seen in the literature, we have developed a  $(m, n)$  type HDE model in this study. Such a generalization gives us greater theoretical room to accommodate the observable evidence at the phenomenological level. We have determined the fundamental limits on the values of  $(m, n)$  and examined the general characteristics of age-like HDE models in different epochs of the cosmos. In the situation of  $m = n$ , age-like holographic representations are unique. We have discovered that our model meets every prerequisite needed to be considered a dark energy (DE) candidate. According

to the initial numerical study, our model fits the observational data quite well.

The model's graphical behaviour led us to make the following discussions:

For the various values of  $(m,n) = (0,0), (0,1), (1,0), (1,1), (1,2), (2,1) \text{ \& } (2,2)$  we experienced the pressure of  $(m,n)$  -type HDE cosmological model which is negative (Figure 4.2), energy density of  $(m,n)$  -type HDE cosmological model is positive (Figure 4.3) and also the nature of matter density of  $(m,n)$  -type HDE cosmological model shown in (Figure 4.4). We therefore draw the conclusion that the above model is stable for the current universe or the most recent astronomical measurements based on these findings.

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# इतिहासाचार्य वि. का. राजवाडे मंडळ, धुळे या संस्थेचे त्रैमासिक ॥ संशोधक ॥

पुरवणी अंक १३ – जून २०२४ (त्रैमासिक)

- शके १९४६
- वर्ष : ९२
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- प्राचार्य डॉ. अनिल माणिक बैसाणे
- प्रा. श्रीपाद नांदेडकर

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## श्री. संजय मुंदडा

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सकाळी ९.३० ते १.००, सायंकाळी ४.३० ते ८.०० (रविवारी सुट्टी)

लेख सदस्यता वर्गणी : रु. २५००/-

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**अक्षरजुळणी :** सौ. सीमा शिंदे, पुणे.

टीप : या नियतकालिकेतील लेखकांच्या विचारांशी मंडळ व शासन सहमत असेलच असे नाही.



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प्रा.डॉ.जयवंत निवृत्ती कांबळे

मा.सु.पा.महाविद्यालय मानोरा

## प्रस्तावना :

भारतीय संविधानाच्या चौथ्या भागामध्ये राज्यनितीच्या मार्गदर्शक तत्वांचे विवेचन करण्यात आले आहे. स्पेनच्या राज्यघटनेमध्ये अशा प्रकारची तत्वे सर्वप्रथम समाविष्ट करण्यात आली होती. त्यानंतर आयर्लंडच्या राज्यघटनेमध्ये अशा प्रकारचे प्रकरण समाविष्ट करण्यात आले. आधुनिक काळातील श्रीलंकेच्या राज्य घटनेत सुद्धा मार्गदर्शक तत्वे आढळून येतात. भारतीय संविधानातील अनेक प्रकरणापैकी राज्यनितीच्या मार्गदर्शक तत्वांचे अतिशय महत्वाचे एक प्रकरण आहे. किंबहुना ते एक प्रमुख प्रकरण आहे. राज्यनितीची मार्गदर्शक तत्वे भारताच्या राज्यघटनेचे एक प्रमुख वैशिष्ट्ये होय. लोकशाही राज्यव्यवस्था परिणामकारक व यशस्वी रितीने कार्यान्वित करायची असेल तर त्यासाठी सरकारांनी कसे वागावे या विषयीचे मार्गदर्शन या तत्वातून करण्यात आले आहे. प्रस्तुत लघुशोध निबंधामध्ये भारताच्या राज्यघटेतील राज्यनितीच्या मार्गदर्शक तत्वांनी कोणती जबाबदारी पार पाडली याची मांडणी करण्यात आली आहे.

## मार्गदर्शक तत्वांचे स्वरूप :

केंद्र व राज्य सरकारांनी निरनिराळ्या बाबतीत कायदे करतांना कोणते धोरण स्विकारले पाहिजे याबाबतीत अतिशय सुंदर सुचना या प्रकरणामध्ये देण्यात आल्या आहेत. भारतीय राज्यघटनेच्या चौथ्या भागातील कलम ३६ ते ५१ पर्यंतच्या कलमापर्यंत या प्रकरणाचे सविस्तर विवेचन करण्यात आले आहे. ३७ व्या कलमामध्ये या तत्वांच्या स्वरूपाचे विवेचन करण्यात आले आहे. या कलमात असे नमुद करण्यात आले आहे की, कोणत्याही न्यायालयामार्फत राज्यनितीच्या मार्गदर्शक तत्वांची अंमलबजावणी होणार नाही. तथापी देशाचा कारभार चालवत असतांना हि तत्वे मुलभूत समजली जातील व विधीनियम तयार करतांना या तत्वांना प्राधान्य देणे हे सरकारचे कर्तव्य राहिल.

भारतीय जनतेच्या विकासाठी अनेक आदर्शभूत तत्वे मान्य करणे आवश्यक आहे, याची घटनाकार डॉ. बाबासाहेब

आंबेडकर यांना जाणीव होती. परंतु या सर्व तत्वांचा मुलभूत हक्कामध्ये समावेश करणे शक्य नव्हते. त्यामुळे हि राज्यनितीची मार्गदर्शक तत्वे एका स्वतंत्र प्रकरणामध्ये सांगण्यात आली आहेत. थोडक्यात सांगायचे झाल्यास ज्या तरतुदी करणे आवश्यक होते परंतु आर्थिक व सामाजिक परिस्थितीमध्ये शक्य नव्हते. त्या तरतुदीचा समावेश या प्रकरणामध्ये करण्यात आला आहे. या तत्वाची सरकारने अंमलबजावणी केली नाही तर सरकारला न्यायालयात खेचले जाऊ शकत नाही.

संविधान सभेमध्ये भाषण करतांना मार्गदर्शक तत्वांच्या स्वरूपाविषयी डॉ. बाबासाहेब आंबेडकरांनी पुढीलप्रमाणे उद्गार काढले, मार्गदर्शक तत्वे हे दुसरे तिसरे काही नसून १९३५ च्या कायद्याने गव्हर्नर जनरल व प्रांतांचे गव्हर्नर यांना जे सुचनापत्रक पाठविले जात असे त्यांचेच दुसरे नाव होय. दोघात फरक इतकाच आहे की, सुचनापत्रक फक्त कार्यकारी सत्तेला उद्देशून पाठविले जाई आणि मार्गदर्शक तत्वांचा उद्देश राज्याला मार्गदर्शन करणे हा आहे. म्हणजेच कार्यकारी मंडळ व विधीमंडळ या दोघांसाठी हि तत्वे सांगण्यात आली आहेत.

## मार्गदर्शक तत्वांचे वर्गीकरण :

राज्यनितीच्या मार्गदर्शक तत्वांच्या प्रकरणामध्ये आर्थिक, सामाजिक, शैक्षणिक, वैधानिक व परराष्ट्र संबंधाविषयी अनेक प्रश्नांचा उहापोह करण्यात आला आहे. परंतु खुद्द घटनेमध्ये या तत्वांचे तर्कशुद्ध वर्गीकरण देण्यात आले नाही. वेगवेगळ्या लेखकांनी आपआपल्या परिने या तत्वांचे वर्गीकरण करण्याचा प्रयत्न केला आहे. विवेचन करतांना या तत्वांचे चार गट पाडता येतील.

१) आर्थिक तत्वे २) सामाजिक तत्वे ३) राजकीय तत्वे ४) आंतरराष्ट्रीय संबंध विषयक तत्वे.

## मार्गदर्शक तत्वांच्या अनुषंगाने पार पाडलेली कामगिरी :

संविधान सभेमध्ये ज्या पक्षाचे वर्चस्व होते त्याच पक्षाकडे प्रदिर्घकाळ सत्ता राहिल्यामुळे मार्गदर्शक तत्वांचे वेगवेगळ्या क्षेत्रात पालन करण्याचा सरकारने प्रयत्न केल्याचे दिसून येते.



या मार्गदर्शक तत्वामुळे प्रभावीत होऊन सरकारने जे काही सुधारणा विषयक कायदे केले आहेत. त्याचा आढावा खालीलप्रमाणे घेता येईल.

### १) न्याय विभागाला कार्यकारी विभागाकडून वेगळे ठेवण्याचे तत्व :

हे तत्व देशातील बहुतेक राज्यांनी मान्य केलेले आहे. आसाम, महाराष्ट्र, गुजरात, पंजाब, मद्रास, केरळ इत्यादी राज्यांमध्ये अशा प्रकारचे सत्ता विभाजन मोठ्या प्रमाणावर करण्यात आले आहे.

### २) ग्रामपंचायतीचा स्विकार :

शासन व्यवस्थेतील सर्वात लहान घटक म्हणून ग्रामपंचायतीचा स्विकार देशातील सर्वच राज्यांनी केलेला आहे. भारतातील कोणतेही खेडे ग्रामपंचायतीशिवाय राहू नये याची सर्वच राज्यांनी दखल घेतली आहे. आज महाराष्ट्रामध्ये सर्वच खेड्यात ग्रामपंचायती असून त्यांना चांगला विकास निधी सुध्दा मिळत आहे.

### ३) उत्पादनाची साधने खाजगी क्षेत्राच्या हातात राहू नयेत :

यासाठी निरनिराळ्या आणि मोठ मोठे प्रकल्प सरकार स्वतःकडे घेत आहे. भाक्रानांगल, हिराकुंड व दामोदर खोरे ही धरणे, भिलाई दुर्गापूर व राऊरकेला येथील लोखंड व पोलादाचे कारखाने विशाखापटणम येथील जहाजबांधणी कारखाना, सिन्ट्री येथील खताचा कारखाना यासारखे मोठमोठे उद्योगधंदे सरकारी मालकीचे असून त्यामुळे खाजगी व्यक्तीच्या खिशात संपती केंद्रीत होण्याच्या प्रकाराला आळा बसला होता. परंतु आता सरकारने खाजगीकरणाच्या धोरणाला पसंती दिल्यामुळे हळूहळू अनेक सरकारी उद्योग धंद्याचे खाजगीकरण होत आहे आणि त्यामुळे अदाणी, अंबानी सारख्या खाजगी व्यक्तींच्या खिशात देशातील संपत्तीचे केंद्रीकरण होण्याचा धोका निर्माण झाला आहे.

### ४) बँकांचे राष्ट्रीयकरण :

जनतेच्या हिताच्यादृष्टीने जास्तीत जास्त भांडवल सरकारच्या हाती असावे. यादृष्टीने श्रीमती इंदिरा गांधी यांनी प्रधानमंत्री असतांना चौदा बड्या बँकांचे राष्ट्रीयकरण करण्यात आले असून देशातील रिक्षा चालकापासून तर लहान शेतकऱ्यापर्यंत सामान्य माणसाला स्वस्त दरात कर्ज उपलब्ध करून देण्यात येत आहे. तसेच बँकाच्या भांडवलाचा उपयोग जनतेच्या हिताच्यादृष्टीने करणे सरकारसाठी शक्य झाले आहे. आतापर्यंत शेतकऱ्यांना अनेकवेळा कर्ज माफि देणे सुध्दा यामुळे शक्य झाले आहे.

### ५) मागासवर्गीय जनतेचे कल्याण :

आजपर्यंत मागासवर्गीय जाती जमातीच्या कल्याणासाठी त्यांना सवलती देण्यासाठीच्या मार्गातील अडचणी पाहिली घटना दुरुस्ती कायद्याने दूर करण्यात आल्या आहेत. लोकसभा विधानसभेमध्ये अनुसूचित जाती व जमातीसाठी २६ जानेवारी १९६० पर्यंत जागा राखीव ठेवण्याची तरतुद मुळ राज्यघटनेमध्ये होती. परंतु त्यामध्ये आणखी मुदतवाढ देऊन आजपर्यंत ह्या जागा राखीव ठेवण्यात आल्या आहेत. एवढेच नव्हे तर स्थानिय स्वराज्य संस्था, सरकारी नौकर्या व शिक्षण संस्था मधून मागास जाती जमाती साठी जागा राखीव ठेवण्यात आल्या आहेत आणि अजूनही अनेक मागास जातींना आरक्षण देण्याचा सरकार प्रयत्न करतांना दिसत आहे.

### ६) जमिनदारी नष्ट करणे :

देशातील जमिनदारी पद्धत नष्ट करण्यासाठी जवळ जवळ सर्वच राज्य सरकारानी कसोसीने प्रयत्न केले आहेत. त्यासाठी चारवेळा घटना दुरुस्ती करावी लागली. त्यामुळे आज देशातील पुर्वीची जमिनदारी पद्धत नष्ट झाली आहे.

### ७) प्राथमिक शिक्षण सक्तीचे व मोफत :

१४ वर्ष वयोगटापर्यंत सर्वांना प्राथमिक शिक्षण सक्तीचे व मोफत करण्यात आल्यामुळे देशामध्ये शिक्षणाचा मोठ्या प्रमाणावर प्रसार होत आहे.

### ८) दारुबंदीचे धोरण :

देशातील काही राज्यांनी आपआपल्या राज्यात पुर्णपणे दारुबंदी केली आहे आणि उर्वरीत राज्यात सुध्दा दारुबंदीची मागणी होत आहे.

### ९) श्रमीकांच्या शोषणाविरुद्ध कायदे :

मीनिमम वेजेस ॲक्ट, गुमास्ता ॲक्ट, फॅक्टरी ॲक्ट यासारखे कायदे करून कामाचे तास, रजेचे दिवस, विश्रांतीची वेळ, जास्त कामाचा मोबदला, किमान वेतन, मजुरांना द्यायच्या सोयी इत्यादी तरतुदी करण्यात आल्या आहेत. स्त्रि कामगारांना प्रसुतीच्यावेळी पगारी रजा स्त्री व पुरुष कामगारांना समान वेतन दिले जाते. बालकामगारावर प्रतिबंध करण्यात आला आहे.

### निष्कर्ष :

१) स्वतंत्र भारतात आजपर्यंत मानवतेच्या दृष्टीकोणातून सरकारकडून जि कामे झालेली आहेत. त्याचे श्रेय भारतीय राज्यघटनेतील राज्यनितीच्या मार्गदर्शक तत्वांना द्यावे लागेल.



- २) मागासजाती व जमातीच्या उत्कर्षासाठी सरकारने आजपर्यंत जी धोरणे आखुण, त्याची अंमलबजावणी केल्यामुळे पुर्वी पेक्षा या जातींना सामाजिक न्याय देण्याची प्रक्रिया सुरु आहे. हि बाब सुध्दा राज्यनितीच्या मार्गदर्शक तत्वामुळे सरकारांना करता येणे शक्य होऊ शकेल.
- ३) सरकारने मार्गदर्शक तत्वांच्या अंमलबजावणीकडे पाहिजे त्या प्रमाणात लक्ष देण्यात आले नाही. अशी अनेकदा टिका केली जात असते. आजही सामान्य लोकांच्या जिवनात फारसा फरक पडला नाही. त्यांचे जिवन जास्त कठीण व अवघडत बनत आहे. शिक्षण, अन्न व आरोग्यासारखे प्रश्न अजुन पूर्णपणे सुटलेले नाहीत. सरकार हे प्रश्न सोडविण्याचे प्रयत्न करतात. परंतु भ्रष्टाचारांमुळे हे प्रश्न पूर्णपणे सुटत नाहीत.

#### संदर्भ ग्रंथ :

- १) “भारताचे संविधान” लेखक :- प्रा. बि.टि. देशमुख
- २) १९७८ च्या ४४व्या घटनादुरुस्ती कायद्याचे कलम ३८ (१) नंतर ३८ (२)
- ३) “डेमॉक्रॉटीक गव्हर्मेंट इन इंडिया” लेखक :- अलेन ग्लेडहिल
- ४) “दि रिपब्लिकन ऑफ इंडिया” लेखक : अलेन ग्लेडहिल
- ५) राज्यघटनेतील कलम १४ व कलम १९







# IPO PERFORMANCE IN THE INDIAN STOCK MARKET: A COMPREHENSIVE ANALYSIS

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## Abstract

Initial Public Offerings (IPOs) are one of the most significant ways for companies to raise capital and for investors to gain a stake in a company's growth potential. The Indian stock market, particularly in recent years, has seen a dramatic surge in IPO activity. This article presents a comprehensive analysis of IPO performance in India, focusing on the period from 2018 to 2024. Through this analysis, we aim to explore the key trends, factors influencing IPO performance, sector-specific patterns, and the impact of subscription levels and pricing strategies on the post-listing performance of IPOs.

## Introduction

The Indian stock market has emerged as one of the fastest-growing equity markets in the world, fuelled by a burgeoning middle class, digitalization, and strong investor interest. One of the most popular methods for companies to raise capital in India is through the IPO process, where they offer shares to the public for the first time. IPOs provide an opportunity for investors to buy into emerging businesses with high growth potential. However, the performance of IPOs, particularly in emerging markets like India, can be volatile and influenced by various factors such as market sentiment, pricing strategies, and overall economic conditions.

In recent years, there has been a substantial increase in the number of IPOs in India, making it a rich area for research. This paper delves into IPO performance across different time periods, sectors, and market conditions, while exploring the factors contributing to the success or failure of these IPOs. The study also includes visual representations of key data trends, helping to illuminate patterns in the performance of Indian IPOs.

## Key Objectives

The objective of this study is to:

1. Evaluate the short-term and long-term performance of IPOs in India.
2. Analyse sectoral trends in the Indian IPO market.
3. Examine the impact of subscription rates on the post-listing performance of IPOs.
4. Assess the role of pricing strategies in IPO outcomes.

## Analyzing IPO Dynamics in India



## Methodology

This research employs both qualitative and quantitative methods, using data from major Indian stock exchanges like the Bombay Stock Exchange (BSE) and the National Stock Exchange (NSE). A data set covering IPOs listed from 2018 to 2024 is analyzed, focusing on variables such as initial listing performance, post-listing returns, and the influence of factors like pricing methods and subscription rates. For graphical representation, data on the year-wise number of IPOs, sectoral performance, and the relationship between subscription rates and IPO returns are presented.

## IPO Activity in India: An Overview

India has witnessed a substantial increase in IPO activity over the past few years. The year 2021 marked a record year for IPOs in India, with companies raising billions of dollars through public offerings. According to data from the National Stock Exchange, 2021 saw the listing of companies such as Zomato, Nykaa, and Paytm, each of which raised significant capital and generated substantial investor interest. However, the performance of these IPOs has varied significantly, with some enjoying strong post-listing growth, while others, such as Paytm, saw steep declines.

## Sectoral Performance of IPOs



The Indian stock market is diverse, with IPOs spanning various sectors including technology, pharmaceuticals, real estate, and finance. Analysing sector-specific performance reveals which sectors are more likely to succeed in the IPO market.

### 1. Technology and Fintech

Technology-driven IPOs, especially in sectors like fintech, digital services, and e-commerce, have seen tremendous success in India. The success of companies like Zomato, Nykaa, and Policybazaar demonstrates that investor appetite for digital-first companies is high. These companies not only raised significant capital but also saw positive returns post-listing.

## 2. Healthcare and Pharmaceuticals

Healthcare IPOs in India have been moderately successful, with companies such as Medanta and KIMS Hospitals gaining investor interest. These companies have performed well due to the growing demand for healthcare services in India, particularly post-pandemic.

## 3. Real Estate and Infrastructure

On the other hand, IPOs in the real estate and infrastructure sectors have been more volatile. While some have shown growth, many have faced challenges due to macroeconomic conditions like rising interest rates and inflation, which affect the affordability of real estate investments.

## Subscription Levels and IPO Performance

One of the key factors influencing IPO performance is the level of subscription during the offer period. A higher subscription rate typically indicates strong investor interest, which often leads to a successful listing.

### 1. Highly Subscribed IPOs

IPOs that are oversubscribed (10x or more) tend to perform well on listing day, as demand for shares exceeds supply, driving up the stock price. Companies like Zomato and Nykaa were highly subscribed and witnessed significant listing gains. These IPOs saw subscription levels in the range of 30x to 100x, reflecting robust investor confidence.

### 2. Moderate Subscription IPOs

IPOs with moderate subscription (3x to 5x) tend to show more mixed results, where some IPOs perform well, while others stagnate or face corrections. Companies in traditional sectors, such as infrastructure, often fall into this category.

### 3. Under-subscribed IPOs

Under-subscribed IPOs are often a cause for concern, indicating lackluster interest from investors. Companies that fail to attract sufficient subscription often face poor listing performance and struggle to gain momentum post-listing.

## Pricing Strategies: Book Building vs. Fixed Pricing

The pricing of an IPO plays a crucial role in determining its performance post-listing. In India, two primary pricing strategies are used: fixed pricing and book-building.

### 1. Book Building Method

Under the book-building method, the company sets a price band, and investors place bids within that range. This method generally leads to more accurate pricing, as it takes into account investor demand. Book-building IPOs have performed better in terms of post-listing gains.

### 2. Fixed Pricing Method

Fixed pricing involves setting a fixed price for the shares, often based on the company's estimated valuation. IPOs using this method can sometimes be overvalued, leading to poor post-listing performance.

## Long-Term Performance of IPOs

While initial returns are an important indicator, the long-term performance of IPOs is also a crucial factor for investors. Research shows that the performance of IPOs varies significantly in the long run, with some IPOs continuing to perform well, while others lose value after the lock-in period expires.

### 1. Successful Long-Term IPOs

IPOs in sectors like technology and e-commerce often perform well over time, as they benefit from continued growth in their respective industries. For example, Zomato and Nykaa have continued to see growth, albeit with fluctuations.

### 2. Underperforming IPOs

IPOs in traditional sectors, especially in infrastructure and real estate, often face a slowdown after their listing due to economic conditions such as rising interest rates or market corrections.

## Conclusion

The Indian IPO market has experienced significant growth in recent years, with many IPOs offering substantial returns to investors. However, the success of these IPOs depends on several factors, including market sentiment, subscription levels, sectoral trends, and pricing strategies. While some sectors, particularly technology and fintech, have consistently outperformed others, IPOs in traditional sectors have faced more volatility. The correlation between high subscription levels and strong listing performance is evident, as is the influence of pricing methods on post-listing gains.

Investors need to carefully analyse various factors, including the company's sector, subscription levels, and market conditions, before investing in IPOs. Future research could explore the role of institutional investors in IPO success and examine the impact of global economic trends on the performance of Indian IPOs.

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# Digital India and E-Commerce Growth: Transforming India's Economic Landscape

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## Abstract

The Digital India initiative, launched in 2015, has been a driving force behind the rapid growth of e-commerce in India. This essay examines the interplay between the two, exploring how advancements in digital infrastructure, policy support, and changing consumer behaviors have contributed to the sector's expansion. It delves into statistical trends, the role of rural markets, and the impact on MSMEs, while also addressing the challenges and future prospects of e-commerce in India. Through case studies and analysis, the essay highlights the transformative potential of digital initiatives in creating a robust and inclusive e-commerce ecosystem.

**Keywords:** Digital India, e-commerce, rural markets, MSMEs, digital infrastructure, policy support, financial inclusion, technological innovation

## Introduction

**Digital India**, launched in 2015, aims to transform India into a digitally empowered society and knowledge economy. The initiative has played a pivotal role in fostering technological innovation, financial inclusion, and socio-economic progress. Among its most significant beneficiaries has been the e-commerce sector, which has experienced exponential growth over the past decade. This essay explores the symbiotic relationship between Digital India and the expansion of e-commerce, delving into its enablers, statistical trends, challenges, and future opportunities while examining the impact of policy measures on creating a vibrant digital commerce ecosystem.

## Growth of E-Commerce in India

India's e-commerce market has witnessed remarkable growth, driven by factors such as increased internet penetration, smartphone adoption, and supportive government initiatives. In 2022, the market was valued at \$83 billion and is projected to reach \$200 billion by 2027. With over 900 million internet users in 2023, approximately half of them are actively participating in online shopping. Mobile platforms have become a dominant channel for these transactions, with more than seventy percent of e-commerce purchases conducted through mobile devices. Furthermore, the rural e-commerce market has emerged as a significant growth area, expanding at an annual rate of thirty percent between 2018 and 2023.

## **Role of Digital Infrastructure**

The Digital India program has laid the groundwork for this e-commerce boom in several ways. One of the key contributions has been the enhancement of digital infrastructure. The BharatNet project, which connects over 2.5 lakh gram panchayats with high-speed internet, has bridged the connectivity gap in rural areas. Additionally, the rollout of 4G and 5G networks has ensured seamless access to digital services across urban and rural regions alike. Another significant factor has been the proliferation of digital payment systems. Platforms like UPI, which recorded ten billion monthly transactions in 2023, have made online transactions quick, secure, and accessible. Initiatives such as the introduction of digital wallets and apps like Paytm and PhonePe have further simplified the payment process for users.

## **Policy Support for E-Commerce Growth**

Policy support has also played a critical role in fostering the growth of e-commerce under the Digital India initiative. E-governance reforms, such as simplifying GST compliance for e-commerce entities, have eased the regulatory burden on businesses. Furthermore, government initiatives like Startup India and Make in India have created an enabling environment for entrepreneurship, encouraging innovation and investment in the digital commerce sector. The Pradhan Mantri Gramin Digital Saksharta Abhiyan (PMGDISHA), aimed at improving digital literacy among rural populations, has equipped millions with the skills necessary to participate in the digital economy.

## **Changing Consumer Behavior**

The widespread adoption of digital technologies has also brought about significant changes in consumer behavior. Online shopping has become the preferred mode for a growing number of Indians, thanks to the convenience, variety, and competitive pricing it offers. Consumers increasingly value the ability to compare products, read reviews, and access personalized recommendations. The advent of omnichannel retailing—where businesses integrate their online and offline operations—has further enhanced the shopping experience by offering greater flexibility and choice. Companies like Reliance Retail and Tata Cliq have effectively implemented this model, blending physical stores with e-commerce platforms to meet the evolving preferences of their customers.

## **Rural India: A New Frontier for E-Commerce**

Rural India, often perceived as a challenging market for e-commerce, has emerged as a promising area for growth. The availability of affordable smartphones and localized logistics solutions has facilitated the expansion of digital commerce in rural areas. Initiatives like Amazon Saheli, which empowers rural women entrepreneurs by providing them access to online markets, have been particularly impactful. For instance, Amazon Saheli reported a sixty percent increase in sales in 2023, underscoring the potential of e-commerce to drive socio-economic empowerment in underserved regions. Government programs like PMGDISHA and the establishment of Common Service Centres (CSCs) have further bridged the digital divide, enabling rural consumers and small businesses to benefit from digital platforms.

## **Contribution of MSMEs to E-Commerce Growth**

Micro, Small, and Medium Enterprises (MSMEs) are another critical segment driving the growth of e-commerce in India. Over 1.5 million MSMEs have joined online marketplaces, leveraging digital platforms to reach a broader customer base. These businesses have benefited not only from increased visibility but also from access to global markets through initiatives like Amazon Global Selling. Government schemes such as MUDRA loans and the Digital MSME Scheme have provided financial and technical support, encouraging MSMEs to embrace digital tools and platforms.

## **Challenges Facing E-Commerce in India**

Despite its impressive growth, the e-commerce sector faces several challenges that need to be addressed to sustain its momentum. Logistics and last-mile delivery remain significant hurdles, particularly in rural and remote areas where infrastructure is underdeveloped. Data privacy and cybersecurity concerns are another pressing issue, with incidents of data breaches and online fraud undermining consumer trust. Regulatory

complexities, including foreign direct investment (FDI) restrictions and evolving e-commerce policies, add to the challenges faced by businesses. Furthermore, a considerable portion of the population still lacks digital literacy, limiting their ability to engage with e-commerce platforms effectively.

### **Government Measures to Address Challenges**

The Indian government has implemented a range of measures to overcome these challenges and foster e-commerce growth. The National E-Commerce Policy outlines guidelines for consumer protection, data privacy, and FDI in e-commerce, providing a clear regulatory framework for the sector. Production-Linked Incentive (PLI) schemes have been introduced to support domestic manufacturing and exports, further strengthening the supply chain. The Open Network for Digital Commerce (ONDC), a government-backed initiative, aims to democratize e-commerce by enabling small retailers to access digital platforms, thereby reducing dependency on major players like Amazon and Flipkart. Digital literacy campaigns continue to be a priority, with training programs designed to equip rural and semi-urban populations with the skills necessary to navigate the digital landscape.

### **Future Prospects for E-Commerce**

Looking ahead, the e-commerce sector in India holds immense potential for further growth and innovation. Technological advancements such as artificial intelligence, blockchain, and the Internet of Things (IoT) are expected to enhance operational efficiency and customer experiences. Personalization and predictive analytics, powered by big data, will allow businesses to offer tailored shopping experiences, increasing customer satisfaction and loyalty. Cross-border trade represents another significant opportunity, with Indian businesses leveraging global marketplaces to expand their reach. Sustainability initiatives, such as eco-friendly packaging and carbon-neutral supply chains, are also gaining importance as consumers become more environmentally conscious.

### **Case Studies: Success Stories in Digital Commerce**

Several case studies highlight the transformative impact of Digital India on e-commerce. Flipkart's Big Billion Days sale, for example, has become an annual phenomenon, with the 2022 event recording a thirty-five percent increase in sales compared to the previous year. This growth was driven largely by participation from rural and Tier-II cities, showcasing the widening reach of e-commerce. Similarly, the pilot phase of the ONDC project has demonstrated the potential of an open network to empower small retailers, enabling them to compete on a level playing field with established e-commerce giants.

### **Conclusion**

In conclusion, the synergy between Digital India and the growth of e-commerce has reshaped India's economic landscape, fostering financial inclusion, entrepreneurship, and technological innovation. While challenges remain, the continued focus on policy reforms, technological advancements, and rural market penetration holds immense promise for the future. By addressing these challenges and leveraging emerging opportunities, India can establish itself as a global leader in the e-commerce domain, driving sustainable economic growth and digital empowerment for its citizens.

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