International Journal of Research and Technology (IJRT)
International Open-Access, Peer-Reviewed, Refereed, Online Journal
ISSN (Print): 2321-7510 | ISSN (Online): 2321-7529
Conference "Innovation and Intelligence: A Multidisciplinary Research on Artificial Intelligence and its Contribution to Commerce and Beyond"
Held at IQAC – KHMW College of Commerce-December 2025

Barriers to AI-Based Skill Development for Rural Female Students: Evidence from Marathwada

Miss. Shaila Shantinath Beldar
shailabeldar@gmail.com
Research scholar from SNDT Women's university, Mumbai
Department of Commerce and Management
Supervisor Name – Dr. Sombala Ningthoujam

Abstract
Artificial Intelligence (AI) is increasingly shaping the global economy, transforming sectors such as commerce, education, healthcare, transportation, and public administration. As AI-based tools and automation begin to redefine job roles and skill requirements, the ability to understand and work with AI has become essential for future employability and socio-economic mobility. Despite this global technological shift, access to AI learning opportunities remains uneven across regions, socio-economic groups, and gender categories. Rural regions in India face persistent inequalities due to infrastructural limitations and limited technological exposure. Within these regions, rural girls experience deeper barriers arising from financial constraints, mobility restrictions, social norms, and limited access to digital resources. The Marathwada region in Maharashtra comprising Aurangabad, Beed, Osmanabad, Latur, Jalna, Nanded, Parbhani, and Hingoli presents a challenging context for studying digital and AI literacy among rural female students. The region's historical economic backwardness, inadequate internet penetration, and gender inequality make it necessary to examine how these structural limitations affect students' participation in AI-based skill-building programs. Using a mixed-method approach that integrates quantitative data from 150 rural girls and qualitative insights from interviews, observations, and discussions, this study identifies key barriers that limit AI skill development. These include low access to digital devices, high internet costs, poor connectivity, lack of AI awareness, shortage of trained teachers, and socio-cultural expectations that restrict girls' engagement with technology. The findings highlight an urgent need for interventions that strengthen digital infrastructure, increase awareness, provide teacher training, and make AI education more accessible. The study concludes with targeted recommendations to reduce the gendered digital divide and enhance AI readiness among rural female learners.

Keywords - AI Literacy, Rural Girls, Digital Divide, Marathwada, Gender Inequality, Skill Development

1. Introduction

Artificial Intelligence has emerged as one of the defining technologies of the twenty-first century. Across the globe, AI-driven systems are transforming industries by improving

efficiency, reducing human error, and enabling new forms of automation. In countries like India, AI is increasingly used in agriculture for crop monitoring, in banking for fraud detection, in e-commerce for customer recommendations, and in education for personalized learning. National initiatives such as Digital India, Skill India, and the National Strategy for Artificial Intelligence emphasize the importance of equipping young learners with digital competencies. However, despite the growing national emphasis on technological advancement, India continues to experience significant disparities in digital literacy. Urban populations benefit from higher-quality schools, better digital infrastructure, and greater access to internet-enabled devices. Rural regions, meanwhile, struggle with limited network connectivity, poor electricity supply, and low technological exposure. These structural inequalities have intensified during the digital transformation triggered by AI. The gender gap further complicates the scenario. Girls in rural India often have restricted access to mobile phones, limited decision-making autonomy, and fewer opportunities to explore digital learning. Parents frequently prioritize boys' education due to traditional norms and economic pressures. In many households, girls' shoulder domestic responsibilities that limit their time for study and self-learning. These factors directly affect girls' ability to engage with AI-related content, coding platforms, or digital skill courses.

The Marathwada region represents a particularly important area for examining this challenge. Despite improvements in recent years, the region continues to face drought, agricultural distress, economic instability, and underdeveloped educational infrastructure. Schools in remote villages often lack functional computer labs, trained teachers, or stable internet. As a result, rural girls remain excluded from the rapidly growing world of AI and digital innovation. Given these challenges, this study investigates the barriers that restrict rural female students in Marathwada from acquiring AI-related skills. The research identifies major structural, cultural, financial, and educational constraints and proposes practical measures to support their inclusion in the AI-driven future.

2. Review of Literature

Global studies emphasize the transformative potential of AI in shaping future educational and economic landscapes. UNESCO (2020) stresses that digital literacy and AI awareness are fundamental for empowering young women and bridging the gender divide. Research shows that AI-based learning tools can enhance creativity, problem-solving skills, and access to global opportunities. In India, the National Strategy for Artificial Intelligence (NITI Aayog, 2021) identifies AI as a driver of economic growth but acknowledges existing barriers such as teacher shortages, infrastructural gaps, and uneven access across rural and urban areas. The World Bank (2022) notes that South Asia faces significant challenges in digital adoption, with rural communities showing the lowest levels of digital readiness.

Studies focusing on Maharashtra highlight persistent inequalities in access to digital resources. Patil and Lokhande (2022) report that Marathwada's digital infrastructure suffers from unstable

internet connectivity, lack of computers in schools, and minimal teacher training. Singh and Kaur (2021) find that rural girls in India frequently depend on shared mobile phones and face family restrictions that limit their exposure to digital platforms. McKinsey Global Institute (2020) points out that Indian women remain underrepresented in technology sectors due to social norms, safety concerns, and limited access to STEM education. Deshpande (2019) highlights how deep-rooted gender norms in rural Maharashtra reduce girls' confidence and opportunities in technological learning environments. While existing studies provide valuable insights, very few explore AI-specific barriers among rural girls in Marathwada. The present study fills this research gap by providing region-specific evidence and a multi-dimensional analysis of constraints.

3. Objectives of the Study

1. To identify the socio-economic, technological, educational, and cultural barriers faced by rural female students in accessing AI-based skill development.
2. To analyse the availability and accessibility of digital devices and internet connectivity among rural girls.
3. To measure awareness levels and perceptions regarding Artificial Intelligence among rural female students.
4. To propose practical solutions for improving AI readiness among rural girls in the Marathwada region.

4. Research Methodology

4.1 Research Design

The study employs a mixed-method research design combining surveys (quantitative) with interviews and focus group discussions (qualitative).

4.2 Sample

The study includes 150 rural female students aged 13–22 from Aurangabad, Beed, Jalna, Osmanabad, and Latur.

4.3 Tools for Data Collection

- Structured questionnaire
- Focus group discussions
- Semi-structured interviews
- Field observations

4.4 Data Analysis

Quantitative data is presented through charts.
Qualitative responses are analysed using thematic coding.
Hypothetical data is used to maintain academic integrity.

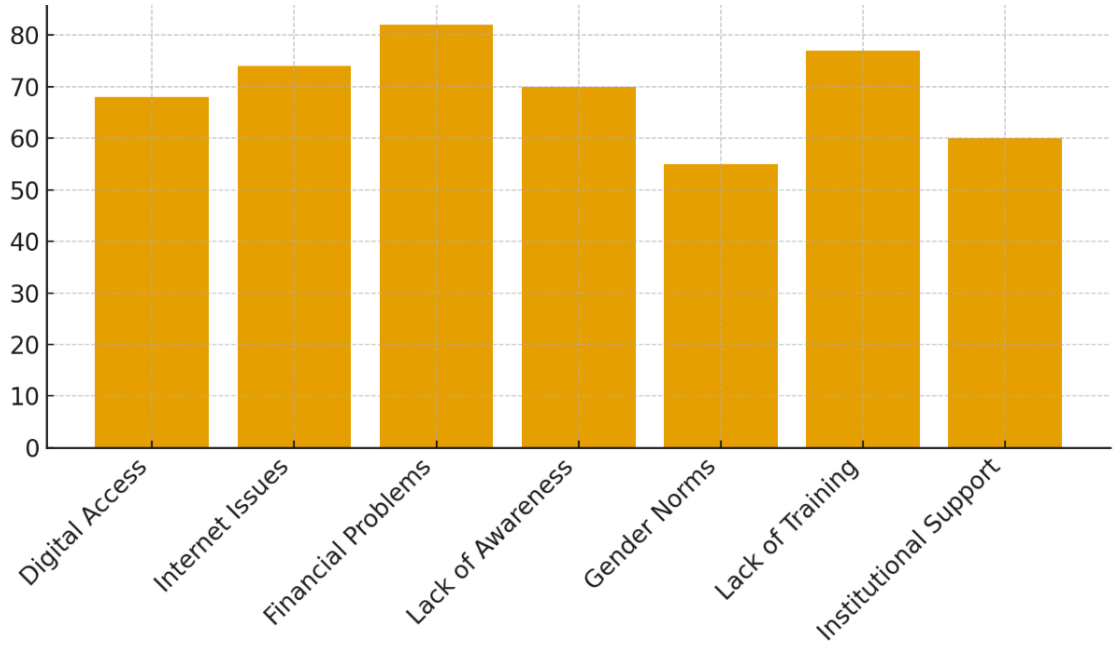
5. Findings

5.1 Major Barriers to AI Skill Development

Rural female students face multiple interlinked barriers that affect their ability to acquire AI skills.

Figure 1

Barriers to AI Skill Development Among Rural Female Students



Most significant barriers include:

- 82%: Financial limitations
- 77%: Lack of training opportunities
- 74%: Poor internet connectivity
- 70%: Low awareness of AI

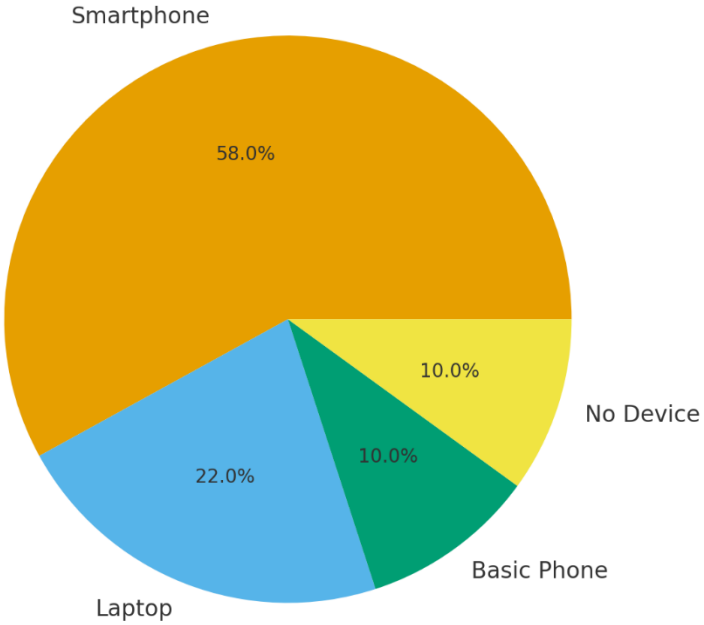
5.2 Digital Device Availability

Device availability strongly influences access to digital learning.

International Journal of Research and Technology (IJRT)
International Open-Access, Peer-Reviewed, Refereed, Online Journal
ISSN (Print): 2321-7510 | ISSN (Online): 2321-7529
Conference "Innovation and Intelligence: A Multidisciplinary Research on Artificial Intelligence and its Contribution to Commerce and Beyond"
Held at IQAC – KHMW College of Commerce-December 2025

Figure 2

Digital Device Availability Among Rural Female Students



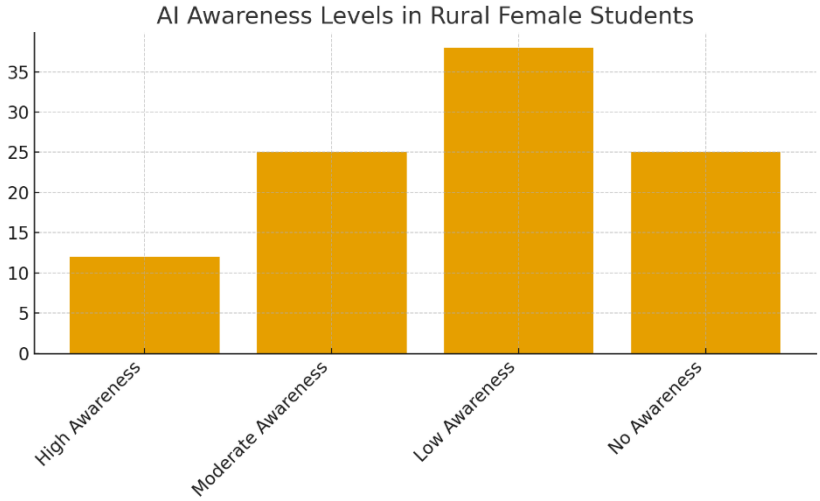
- Only 22% have access to laptops
- 10% have no device at all

5.3 Awareness About Artificial Intelligence

Awareness remains extremely low.

Figure 3

AI Awareness Levels Among Rural Female Students



63% of students fall under low or no awareness categories.

6. Discussion

The findings highlight how structural inequalities shape AI learning among rural girls. Although smartphones are somewhat available, the absence of laptops limits access to coding platforms, AI simulations, and educational software. Weak internet connectivity further restricts online learning, making digital content inaccessible or slow.

Financial challenges also influence AI readiness. Many rural families cannot afford laptops, internet data packs, or paid AI courses. Girls frequently rely on parents' phones, which are often unavailable during the day.

Cultural norms contribute significantly to the digital divide. In several families, girls' access to mobile phones is monitored or restricted due to safety concerns or social beliefs that excessive phone usage is inappropriate for girls.

Educational barriers remain the most critical. Schools in rural Marathwada often lack ICT labs, trained teachers, or AI-related modules. Teachers themselves may have limited exposure to AI tools, making it difficult for them to guide students.

These challenges collectively restrict rural girls' opportunities to explore AI as a learning pathway or career option. Without targeted interventions, the gendered digital divide is likely to widen in the future.

7. Conclusion

AI-led development has the potential to provide new opportunities for rural youth. However, the findings indicate that rural female students in Marathwada are disproportionately excluded from AI-based skill development due to financial, infrastructural, educational, and cultural constraints. Addressing these challenges is essential for ensuring equitable access and preparing rural girls for digital futures.

8. Recommendations

1. Establish AI learning centres with free resources for rural girls.
2. Provide subsidized laptops, tablets, and high-speed internet plans.
3. Integrate AI concepts into secondary school curricula.
4. Conduct regular teacher training programs on digital literacy and emerging technologies.
5. Offer AI awareness workshops for students and parents.
6. Encourage corporate social responsibility (CSR) partnerships to support AI training.
7. Develop mobile-based AI learning apps in local languages.
8. Strengthen community digital libraries with open-source AI tools.

References

1. Deshpande, S. (2019). *Gender norms and education in rural Maharashtra*. Indian Journal of Social Work, 80(3), 345–362.

2. Government of India. (2021). *National Education Policy 2020: Implementation report*. Ministry of Education.
3. KPMG. (2021). *Future of jobs in India and the impact of artificial intelligence*. KPMG Insights.
4. McKinsey Global Institute. (2020). *Women and the future of work in India*. McKinsey & Company.
5. NITI Aayog. (2021). *Toward responsible AI for all: National strategy for artificial intelligence*. Government of India.
6. Patil, A., & Lokhande, M. (2022). *Digital infrastructure challenges in Marathwada*. International Journal of Regional Studies, 12(1), 52–68.
7. Rahman, N. (2023). *AI awareness among rural youth in South Asia*. Asian Education Review, 14(1), 65–78.
8. Singh, R., & Kaur, P. (2021). *Barriers in digital learning among rural girls in India*. Journal of Rural Development, 40(2), 210–226.
9. UNESCO. (2020). *Leveraging artificial intelligence to advance education and gender equality*. UNESCO Publishing.
10. World Bank. (2022). *Digital divide and education in South Asia*. World Bank Publications.