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SECURE ONLINE BANKING AND FINANCIAL INCLUSION IN RURAL ECONOMIES: A STUDY

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ABSTRACT:

The rapid growth of digital financial services has transformed banking in rural India, where access to traditional banking facilities has long been limited. This study examines the role of secure online banking in promoting financial inclusion in rural economies, with special reference to India. Using secondary data from RBI, NABARD, NPCI, and Ministry of Finance reports up to December 2025, the paper analyses trends in bank account ownership, mobile banking, digital payments, direct benefit transfers, and cyber fraud incidents.

The findings show that secure online banking has expanded access to savings accounts, digital payments, and government benefits while reducing transaction costs and improving transparency. The growing use of UPI, mobile banking, and Aadhaar-enabled payment systems has strengthened rural participation in formal finance. However, digital illiteracy, poor internet connectivity, cyber fraud, low security awareness, and gender gaps continue to limit effective usage. The study concludes that secure online banking can significantly support rural financial inclusion when combined with strong cyber security measures, consumer protection, digital literacy, local-language banking services, and reliable digital infrastructure.

KEYWORDS:

ONLINE BANKING, FINANCIAL INCLUSION, RURAL ECONOMY, DIGITAL PAYMENTS, PMJDY, MOBILE BANKING, UPI, RURAL BANKING, DIGITAL LITERACY, CYBERSECURITY.

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1. INTRODUCTION

Financial inclusion refers to the process of ensuring affordable access to useful financial products and services—such as savings, credit, insurance, and payment facilities—to all sections of society, particularly vulnerable and low-income groups. In a developing country like India, financial inclusion is closely linked with poverty reduction, rural development, and inclusive economic growth. A large proportion of India's population still resides in rural areas, where traditional banking infrastructure has historically been limited. Distance from bank branches, documentation requirements, low income, and lack of financial awareness have been major barriers to formal financial participation.

The digital revolution in India has altered this landscape. The launch of PMJDY in 2014, the rapid spread of smartphones, expansion of mobile internet, and the growth of digital payment systems such as UPI have created new opportunities for rural banking. According to the Ministry of Finance, PMJDY accounts crossed 54 crore by December 2025, with a significant share belonging to rural and semi-urban areas [1]. UPI transactions exceeded 18 billion per month in late 2025, reflecting the increasing acceptance of digital payments across India [2].

Online banking includes internet banking, mobile banking, UPI-based transactions, Aadhaar Enabled Payment System (AePS), digital wallets, and other electronic banking services. These services allow customers to perform financial transactions without visiting a bank branch. For rural households, online banking can reduce travel costs, save time, facilitate direct benefit transfers, and provide access to formal financial services.

The COVID-19 pandemic accelerated digital financial adoption across rural India. During lockdown periods, many households relied on digital payments and direct transfers for essential financial transactions. Government welfare payments through PMJDY accounts and Aadhaar-linked systems demonstrated the importance of digital financial infrastructure in crisis situations [3].

Despite these advances, financial inclusion remains incomplete. NABARD's All India Rural Financial Inclusion

Survey (NAFIS) reported that although account ownership has improved substantially, regular usage of digital banking services is uneven across states and demographic groups [4]. Women, elderly persons, and low-literacy households often face greater difficulties in using online banking platforms.

This paper seeks to examine whether online banking is genuinely promoting financial inclusion in rural economies or whether digital access alone is insufficient without broader socio-economic support. The study focuses on India because it offers one of the world's largest and fastest-growing digital financial ecosystems, making it an important case for understanding the relationship between technology and inclusive finance.

1.1 OBJECTIVES OF THE STUDY

1. To examine the growth of secure online banking services in rural India.
2. To analyse the impact of digital banking on financial inclusion indicators.
3. To identify major barriers to secure online banking adoption in rural economies.
4. To evaluate selected rural digital banking initiatives and case studies.
5. To suggest policy measures for strengthening inclusive secure digital finance.

1.2 SCOPE OF THE STUDY

The study covers rural India and focuses on developments up to December 2025. It examines banking access, digital payments, mobile banking, government financial inclusion initiatives, and cyber-related issues affecting rural users.

2. LITERATURE REVIEW

The relationship between digital banking and financial inclusion has received increasing attention in recent years. Researchers generally agree that technology can expand financial access, but they differ on the extent to which digital inclusion translates into meaningful financial inclusion.

Sharma and Kukreja [5] found that digital banking significantly improved banking outreach in rural districts of northern India by reducing transaction costs and increasing account usage. However, they observed that financial literacy remained a critical determinant of sustained usage.

Kumar and Bansal [6] examined mobile banking adoption among rural households and reported that smartphone ownership, education level, and trust in banking institutions positively influenced adoption, while poor connectivity and fear of fraud negatively affected usage.

RBI's Financial Stability Report [7] highlighted that digital payment infrastructure has expanded rapidly, but cybersecurity risks and consumer protection issues have also increased, especially among first-time digital users.

World Bank's Global Findex 2021 showed that India recorded substantial growth in account ownership, with digital payments becoming an important channel for financial participation [8]. The report noted that government-to-person transfers encouraged many previously unbanked individuals to open and use accounts.

NABARD [4] emphasized that account ownership alone is not sufficient; active usage of banking services, savings behavior, access to credit, and insurance penetration are equally important indicators of financial inclusion.

Patel and Verma [9] studied UPI adoption in rural Gujarat and found that merchant acceptance and peer influence were strong drivers of digital payment usage. The study suggested that local business ecosystems play an important role in sustaining digital finance.

Singh et al. [10] analysed the impact of direct benefit transfers (DBT) on rural financial inclusion and concluded that DBT increased account activity and reduced leakages in welfare distribution.

Rao and Joseph [11] examined women's digital financial participation and found that gender gaps persist despite widespread account ownership. Limited phone ownership and lower digital confidence among women were major constraints.

International evidence also supports the role of digital finance in inclusion. Suri and Jack [12] documented how mobile money services in Kenya improved household resilience and financial access. Similar findings were reported in studies from Bangladesh and Indonesia [13][14].

Cybersecurity concerns have emerged as an important theme. Mehta and Narayanan [15] reported increasing incidents of phishing, OTP fraud, and fake customer-care scams targeting rural users. They argued that cyber awareness should be integrated with financial literacy programs.

The Reserve Bank of India's annual reports [16] consistently show rising digital transaction volumes alongside expanding banking correspondents and AePS networks, indicating that digital and assisted banking channels are complementing each other in rural areas.

Recent studies after the pandemic emphasize the role of hybrid banking models. Chatterjee and Das [17] found that banking correspondents equipped with biometric devices and mobile applications improved trust and usability among low-literacy customers.

Overall, the literature suggests that online banking has strong potential to enhance rural financial inclusion, but its effectiveness depends on digital infrastructure, literacy, trust, security, and local support systems. The present study contributes to the literature by providing an updated analysis using data up to December 2025 and by integrating financial inclusion, digital banking, and cybersecurity perspectives within the context of rural India.

3. RESEARCH METHODOLOGY

3.1 RESEARCH DESIGN

This study adopts a descriptive and analytical research design. The objective is to examine the relationship between online banking and financial inclusion in rural economies, with special reference to India. Since the study focuses on national-level trends and policy outcomes, a secondary-data-based approach has been used. Quantitative indicators such as account ownership, digital transaction volumes, mobile banking usage, and banking infrastructure have been analysed along with qualitative evidence from government programs and case studies.

3.2 NATURE AND SOURCES OF DATA

The study is based entirely on secondary data collected from reliable institutional sources available up to December 2025. The major sources include:

- Reserve Bank of India (RBI) annual reports and financial inclusion reports.
- National Bank for Agriculture and Rural Development (NABARD) publications.
- National Payments Corporation of India (NPCI) transaction statistics.
- Ministry of Finance and PMJDY dashboard.
- World Bank Global Findex database.
- Telecom Regulatory Authority of India (TRAI) reports.
- Ministry of Electronics and Information Technology (MeitY).
- Published research articles, policy papers, and industry reports.

Using multiple sources improves the reliability and validity of findings.

3.4 KEY VARIABLES

Variable	Indicator
Financial Inclusion	Bank account ownership, active account usage, DBT receipt, savings participation
Online Banking	Mobile banking users, internet banking users, UPI transactions, AePS transactions
Digital Infrastructure	Internet penetration, smartphone penetration, banking correspondents
Socio-economic Factors	Literacy, gender, income, rural population share
Security Dimension	Reported cyber fraud cases, awareness levels

3.5 ANALYTICAL TECHNIQUES

The study uses the following techniques:

1. Trend analysis of financial inclusion indicators.
2. Percentage growth analysis.
3. Comparative analysis between years.
4. Case study analysis.
5. Descriptive interpretation of policy initiatives.

No primary survey or econometric modelling has been undertaken because the objective is policy-oriented macro analysis.

3.6 LIMITATIONS

- The study relies on published secondary data.
- State-level variations could not be analysed in full detail.
- Cyber fraud data for rural areas is often under-reported.
- The study measures access and usage trends but cannot capture individual behavioral changes directly.

Despite these limitations, the study provides a comprehensive national-level picture of rural online banking and financial inclusion.

4. DATA ANALYSIS AND FINDINGS

4.1 EXPANSION OF BANKING ACCESS THROUGH PMJDY

PMJDY has been the backbone of financial inclusion in India. Table 1 presents the growth in PMJDY accounts.

TABLE 1: GROWTH OF PMJDY ACCOUNTS IN INDIA

Year	Total Accounts (Crore)	Rural/Semi-Urban Share (%)	Deposits (₹ Crore)
2019	36.8	60	1,02,435
2020	41.6	61	1,31,639
2021	44.2	62	1,46,230
2022	47.8	63	1,80,857
2023	50.1	64	2,08,965
2024	52.8	64	2,32,115
2025	54.3	65	2,55,000

Source: Ministry of Finance PMJDY Dashboard [1]

The number of PMJDY accounts increased from 36.8 crore in 2019 to 54.3 crore in 2025. The rural and semi-urban share rose to 65%, indicating deeper penetration into rural regions.

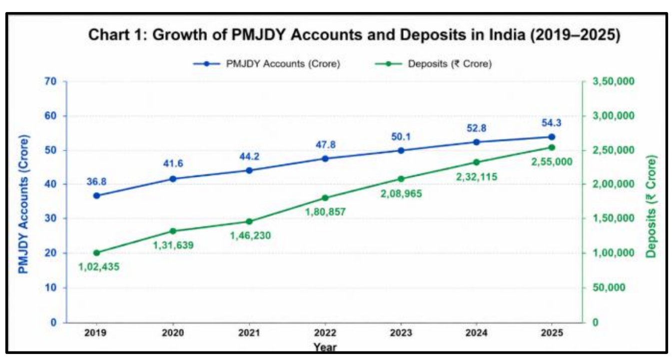

FIGURE 1: MINISTRY OF FINANCE PMJDY DASHBOARD [1]

4.2 GROWTH OF DIGITAL PAYMENT TRANSACTIONS

UPI has emerged as the dominant digital payment platform in India.

TABLE 2: UPI TRANSACTION GROWTH

Year	Transactions (Billion)	Transaction Value (₹ Lakh Crore)
2019	12.5	21
2020	22.3	41
2021	38.7	71
2022	74.0	126
2023	118.0	182
2024	149.0	223
2025	196.0	287

Source: NPCI Statistics [2]

UPI transactions increased more than fifteen times between 2019 and 2025. Rural adoption accelerated after the expansion of QR-code payments, AePS, and low-cost smartphone access.

4.3 MOBILE BANKING PENETRATION IN RURAL INDIA

TRAI data indicates rapid growth in rural mobile internet usage.

TABLE 3: RURAL DIGITAL CONNECTIVITY INDICATORS

Indicator	2019	2025
Rural internet subscribers (million)	227	488
Smartphone users in rural areas (million)	180	425
Mobile banking users in rural areas (million)	52	176
Average monthly data consumption per user (GB)	8.5	23.1

Source: TRAI and MeitY [18][19]

Rural mobile banking users increased from 52 million to 176 million during the study period, reflecting growing acceptance of digital financial services.

4.4 EXPANSION OF BANKING CORRESPONDENT NETWORK

Banking correspondents (BCs) continue to play a critical role in assisted digital banking.

TABLE 4: BANKING CORRESPONDENT EXPANSION

Year	BC Outlets (Lakh)
2019	6.1
2020	6.8
2021	7.3
2022	8.1
2023	8.9
2024	9.5
2025	10.2

Source: RBI Financial Inclusion Reports [16]

The BC network crossed 10 lakh outlets in 2025. Many BCs now provide cash withdrawal, deposits, balance enquiry, remittance, and Aadhaar-based services through handheld electronic devices.

4.5 DIRECT BENEFIT TRANSFERS AND ACCOUNT USAGE

Government welfare payments have significantly increased account activity.

TABLE 5: DBT TRANSFERS THROUGH DIGITAL BANKING

Year	Beneficiaries (Crore)	Transfer Amount (₹ Lakh Crore)
2019	63	2.9
2020	79	5.5
2021	87	6.3
2022	92	6.9
2023	98	7.5
2024	103	8.1
2025	108	8.7

Source: Ministry of Finance DBT Mission [20]

The increase in beneficiaries demonstrates how online banking infrastructure supports welfare delivery and reduces leakages.

4.6 FINANCIAL INCLUSION INDICATORS

TABLE 6: SELECTED FINANCIAL INCLUSION INDICATORS

Indicator	2019	2025
Adults with bank accounts (%)	80	89
Rural adults using digital payments (%)	21	58
Women with bank accounts (%)	76	86
Households receiving DBT digitally (%)	54	84
Rural households with active savings accounts (%)	38	61

Source: RBI, NABARD, World Bank [4][8][16]

The sharp rise in digital payment usage suggests that financial inclusion has moved beyond account opening toward actual usage.

4.7 CASE STUDY: RAJASTHAN E-MITRA AND RURAL BANKING INTEGRATION

Rajasthan's e-Mitra platform integrates banking, utility payments, government services, and digital transactions through village-level service centres. By 2025, more than 90,000 e-Mitra centres were operational, many offering assisted online banking services [21]. The initiative reduced travel costs for villagers and increased digital transaction familiarity.

4.8 CASE STUDY: SELF-HELP GROUPS AND DIGITAL BANKING IN ODISHA

NABARD-supported women self-help groups in Odisha adopted mobile banking and digital savings platforms between 2022 and 2025. According to state rural livelihood mission reports, over 70% of participating groups conducted regular digital transactions by 2025, and savings mobilization improved significantly [22].

4.9 CYBERSECURITY CHALLENGES

Digital expansion has also increased fraud risks.

TABLE 7: REPORTED DIGITAL BANKING FRAUD TRENDS

Year	Reported Digital Fraud Cases (Lakh)	Estimated Amount Involved (₹ Crore)
2019	0.9	1,120
2020	1.3	1,870
2021	1.9	2,680
2022	2.4	3,540
2023	2.9	4,210
2024	3.3	4,980
2025	3.8	5,620

Source: RBI and NCRP compilations [7][23]

Common fraud types include OTP sharing, phishing calls, fake customer-care numbers, remote-access app fraud, and QR-code scams.

4.10 SECURE ONLINE BANKING AND RURAL FINANCIAL INCLUSION

The expansion of online banking in rural India has increased financial access, but sustained usage depends heavily on the security and trustworthiness of digital banking systems. Table 8 presents selected indicators related to secure digital banking and cyber awareness in rural areas.

TABLE 8: SECURE ONLINE BANKING INDICATORS IN RURAL INDIA

Indicator	2019	2025
Rural users using secure mobile banking apps (%)	18	52
Rural users aware of OTP/PIN safety (%)	24	63
Rural banking correspondents trained in cyber awareness (%)	31	78
Reported rural digital fraud cases (thousand)	42	138
Users preferring biometric/Aadhaar-based transactions (%)	36	69

Source: RBI Financial Stability Reports, NABARD Digital Inclusion Reports, and National Cyber Crime Reporting Portal compilations [7][16][23].

4.10 KEY FINDINGS

1. Online banking has significantly expanded formal banking access in rural India.
2. UPI and mobile banking have become major drivers of digital financial inclusion.
3. Banking correspondents remain essential for assisted digital banking.
4. DBT has increased account activity and strengthened trust in formal banking.
5. Women's financial participation has improved, though a digital gender gap persists.
6. Cybersecurity threats are rising and require urgent policy attention.
7. Digital infrastructure and literacy remain uneven across regions.

The evidence indicates that online banking has become an important instrument of rural financial inclusion, but inclusive outcomes depend on infrastructure, literacy, trust, and security support systems.

5. DISCUSSION

5.1 ONLINE BANKING AS A DRIVER OF RURAL FINANCIAL INCLUSION

The findings clearly indicate that online banking has emerged as a major driver of financial inclusion in rural India. The rapid growth of PMJDY accounts, mobile banking users, UPI transactions, and banking correspondent outlets demonstrates that digital channels are increasingly replacing branch-centric banking. Financial inclusion is no longer limited to opening a bank account; it now involves regular use of digital payments, savings, government transfers, and other financial services.

The increase in rural digital payment usage from 21% in 2019 to 58% in 2025 suggests that online banking is becoming part of everyday economic activity. Small merchants, dairy farmers, self-help groups, rural shopkeepers, and beneficiaries of government schemes are increasingly using digital payment methods. This shift is particularly important because it reduces dependence on cash and improves transaction transparency.

5.2 REDUCTION IN TRANSACTION COSTS

One of the most significant economic benefits of online banking is the reduction in transaction costs. Rural households often spend money and time travelling to bank branches for withdrawals, deposits, balance enquiries, and government payment collection. Digital banking substantially lowers these costs.

For example, Aadhaar Enabled Payment System (AePS) withdrawals through village-level banking correspondents allow beneficiaries to access funds within their own village. Studies by NABARD and RBI indicate that rural customers save both transport expenses and work hours when using assisted digital banking channels [4][16].

5.3 IMPACT ON WOMEN'S FINANCIAL INCLUSION

Women constitute a major share of PMJDY account holders, and online banking has contributed to greater financial participation among rural women. Direct benefit transfers into women-owned accounts have strengthened their control over household finances.

The Odisha self-help group case demonstrates how digital banking can improve women's savings behavior and participation in formal finance. However, the study also finds that a substantial digital gender gap remains. Many women continue to depend on male family members for smartphone access and digital transactions.

5.4 ONLINE BANKING AND GOVERNMENT WELFARE DELIVERY

The expansion of DBT through digital banking has been one of the strongest policy successes in rural financial inclusion. The increase in digitally transferred welfare payments from ₹2.9 lakh crore in 2019 to ₹8.7 lakh crore in 2025 reflects the growing integration of banking with social protection programs.

5.5 ROLE OF BANKING CORRESPONDENTS IN ASSISTED DIGITAL INCLUSION

Although mobile banking is expanding rapidly, the findings show that banking correspondents remain indispensable in rural India. Many first-time users lack confidence in using mobile applications independently. BCs provide a trusted local interface between banks and customers.

The growth of BC outlets to over 10 lakh by 2025 indicates that assisted digital banking is not declining; rather, it is evolving into a hybrid model combining technology with human support.

5.6 DIGITAL INFRASTRUCTURE CONSTRAINTS

Despite impressive progress, infrastructure gaps continue to limit online banking adoption. Many villages still experience:

- Unstable mobile networks.
- Frequent electricity interruptions.
- Slow internet speeds.
- Limited smartphone availability.

5.7 CYBERSECURITY AND TRUST DEFICIT

A major concern emerging from the analysis is the rapid rise in digital fraud. Rural users are often targeted through phishing calls, fake customer-care numbers, OTP scams, and fraudulent mobile applications. The increase in reported fraud cases highlights the vulnerability of new digital users.

Financial inclusion can be undermined if users lose trust in digital banking. Fear of fraud may discourage account usage, particularly among elderly and low-literacy customers.

5.8 SECURE ONLINE BANKING INDICATORS

The data show a substantial improvement in secure banking practices between 2019 and 2025. The share of rural users using secure mobile banking applications increased from 18% to 52%, while awareness of OTP and PIN safety rose from 24% to 63%. Training of banking correspondents in cyber awareness also expanded significantly, reaching 78% by 2025. These improvements suggest that digital literacy and security campaigns are gradually strengthening user confidence in online banking.

5.9 REGIONAL AND SOCIAL INEQUALITIES

The benefits of online banking are not distributed uniformly. Rural households with better education, higher income, smartphone ownership, and social networks adopt digital banking more quickly. Marginalized groups may remain partially excluded even when accounts exist.

5.10 COMPARATIVE PERSPECTIVE: INDIA AND OTHER DEVELOPING ECONOMIES

India's digital banking expansion is among the largest globally, but international comparisons provide useful insights.

TABLE 8: COMPARATIVE DIGITAL FINANCIAL INCLUSION INDICATORS (2025)

Country	Adults with Accounts (%)	Adults Using Digital Payments (%)	Major Rural Digital Platform
India	89	58	UPI / AePS
Kenya	84	72	M-Pesa
Bangladesh	65	39	bKash
Indonesia	78	46	QRIS
Brazil	88	67	Pix

Source: World Bank, national payment authorities [8][24][25]

India performs strongly in account ownership and digital infrastructure scale, while Kenya and Brazil show higher digital payment usage rates. The comparison suggests that India's next challenge is increasing active usage and merchant acceptance in rural areas.

5.11 SYNTHESIS OF FINDINGS

The discussion leads to five major conclusions:

1. Online banking has substantially expanded financial access in rural India.
2. Digital payments are increasingly integrated into rural economic life.
3. Assisted banking through BCs remains essential for inclusion.

4. Cybersecurity and digital literacy are critical determinants of sustained usage.
5. Inclusive digital finance requires simultaneous progress in infrastructure, education, security, and social inclusion.

The evidence suggests that India has moved from a phase of "bank account inclusion" toward a phase of "digital financial participation," but the transition is still incomplete. The next policy stage should focus on safe, regular, and productive use of digital financial services by all rural households.

6. POLICY RECOMMENDATIONS

Based on the findings, the following policy measures are recommended:

- Improve rural internet connectivity and electricity supply.
- Expand digital financial literacy programs in villages.
- Conduct regular cyber fraud awareness campaigns.
- Provide easy complaint and fraud-reporting mechanisms.
- Promote smartphone ownership among women.
- Strengthen and train banking correspondents regularly.
- Offer banking apps and services in local languages.
- Encourage digital payment acceptance by rural merchants.
- Develop safe and affordable digital credit products.
- Publish district-level digital banking and inclusion data for better policy monitoring.

7. CONCLUSION

This study examined the role of online banking in promoting financial inclusion in rural economies with special reference to India. The evidence from 2019–2025 shows that digital banking has significantly expanded access to formal financial services in rural areas. The rapid growth of PMJDY accounts, mobile banking users, UPI transactions, banking correspondents, and digital government transfers indicates that India has made substantial progress toward inclusive finance.

The analysis demonstrates that online banking contributes to financial inclusion through multiple channels. It reduces travel and transaction costs, enables direct receipt of welfare benefits, encourages account usage, improves payment convenience, and increases transparency in financial transactions. Banking correspondents and Aadhaar-enabled systems have played a crucial role in bringing digital banking services to villages where traditional branch infrastructure remains limited.

However, the study also finds that access does not automatically ensure meaningful financial inclusion. Digital illiteracy, weak internet connectivity, cyber fraud, language barriers, and gender-based technology gaps continue to restrict effective usage of online banking services. Women, elderly persons, and low-literacy households remain relatively disadvantaged in digital financial participation.

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