A REVIEW OF CYBERSECURITY AWARENESS IN RURAL INDIA

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Abstract :

The fast digitization of rural India has happen due to government conducted programs in recent years, which not only allows villagers can access digital services but also they are exposed to cyber threats .This comprehensive review examines cybersecurity awareness in rural India using only research, statistics, and policy data recent years. The paper analyzes digital adoption patterns, cyber threat landscape, awareness gaps, educational initiatives, and policy responses, providing evidence-based recommendations for strengthening rural cybersecurity resilience.

Keywords: Cybersecurity awareness, rural India, digital literacy, cyber threats, PMGDISHA, digital divide, cybercrime

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Introduction :

India's digital transformation has reached rural communities through ambitious government programs such as Digital India, BharatNet, and the Pradhan Mantri Gramin Digital Saksharta Abhiyan (PMGDISHA). By 2022, rural internet users constituted approximately 399 million out of 759 million active users nationwide. However, this unprecedented digital inclusion has created new vulnerabilities, as rural populations often lack adequate cybersecurity awareness and digital literacy skills necessary to navigate online threats safely.[1]

The quick spread of internet and digital services in rural India, thanks to government programs, has been a double-edged sword. While it has brought many new opportunities, it has also created new dangers.

On one hand, people in villages can now easily use digital services like online banking and government applications. This has made life more convenient and connected.

On the other hand, many of these new internet users aren't familiar with the risks that come with being online. This makes them easy targets for cybercriminals. Scammers often try to steal money or personal information through fake phone calls, text messages, or websites. Since many people don't know how to spot these tricks, they are more likely to fall for them.

To fix this, there's a growing need for better education on staying safe online. Teaching people how to recognize scams and protect their information is just as important as giving them internet access in the first place. This way, everyone can enjoy the benefits of the digital world

without being at a higher risk.

The convergence of expanding digital access with limited cybersecurity knowledge has created a critical policy challenge. Rural users, traditionally less exposed to technology, face sophisticated cyber threats including phishing, identity theft, financial fraud, and malware attacks without adequate protective knowledge or institutional support systems.

Evolution of Digital Access in Rural India :

1. Government Digital Initiatives :

The Digital India Program, launched in 2015, aimed to transform India into a digitally empowered society. Key rural-focused components included:

- **BharatNet Project :** This ambitious project aimed to connect every Gram Panchayat in India with high-speed internet using fiber-optic networks. By 2022, it had successfully extended connectivity to more than 2.13 lakh Gram Panchayats out of the targeted 2.5 lakh[2]

- **Common Service Centers (CSCs) :** To ensure availability of government and digital services closer to citizens, more than 400,000 CSCs were set up across rural areas. These centers became access points for services such as e-governance, digital payments, banking, telemedicine, and even online education[3]

- **PMGDISHA :** Government has Launched PMGDISHA on February 2017 for training 6 crore rural households in minimum basic digital skills. It enabled individuals who had never used digital devices before to learn fundamental skills such as operating computers, using mobile phones, and accessing online services.[4][5]

    Together, these initiatives significantly expanded digital access in rural India before July 2023, laying the groundwork for greater inclusion in digital governance, education, finance, and communication.

2. Digital Adoption Patterns :

Between 2018 and 2022, rural India witnessed a remarkable surge in digital adoption, reflecting broader access to technology and changing user behavior we observed:

Increased Smartphone penetration in rural area : The proportion of rural households with smartphones nearly doubled, rising from just 25% to 54%. This rapid growth was a key driver of digital access, making the internet and mobile applications available to millions of first-time users.[6]

Increased Mobile internet usage : Rural India became a significant contributor to the country's digital ecosystem, with mobile internet users increasing from 251 million to 399 million. Affordable data plans, wider 4G coverage, and government initiatives encouraged this rise[2]

Digital payments raise : Perhaps the most dramatic shift was in financial behavior. Rural regions recorded a 340% increase in digital payment adoption, aided by platforms like UPI,

mobile wallets, and bank-led initiatives that simplified transactions for both individuals and small businesses.

3. Cybersecurity Threat Landscape in Rural India

1. Rising Cybercrime Statistics :

As per *National Crime Records Bureau (NCRB)*

The increasing use of digital services in rural India has also given rise to serious cybersecurity concerns. Data from the National Crime Records Bureau (NCRB) highlights a sharp and worrying upward trend in cybercrime cases over recent years:

Year	Total Cybercrime Cases	Annual Growth
2018	27,248	-
2019	44,735	64.20%
2020	50,035	11.80%
2021	52,974	5.90%
2022	65,893	24.40%
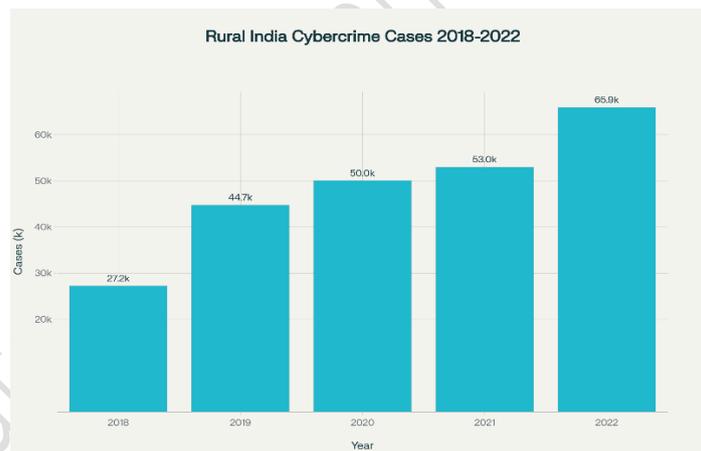
Source: National Crime Records Bureau (NCRB) [7][8]

The figures clearly show that cybercrime incidents have been surging year after year, with particularly high spikes in 2019 and again in 2022. This escalation signals that as rural populations increasingly adopt smartphones, mobile internet, and digital payments, they are also becoming more vulnerable to online fraud, phishing attempts, identity theft, and other forms of cyber exploitation.

2. Prevalent Threats Targeting Rural Users :

Research conducted between 2020-2022 identified key threats affecting rural populations:

- **Phishing and Social Engineering :** Around 68% of cyber fraud cases in rural areas involved fraudsters impersonating bank officials through fake phone calls or messages. These deceptive tactics trick rural users into revealing sensitive banking information or OTPs[9]

- **SIM Swapping :** Cybercriminals took control of mobile phone numbers by tricking telecom operators or stealing SIM cards. This allowed them to intercept One-Time Passwords (OTPs) and gain unauthorized access to financial accounts[10]

- **Fake App Downloads :** Many rural users inadvertently downloaded malicious apps disguised as official mobile banking or government service apps. These fake apps could steal data or perform unauthorized transactions[11]

- **Digital Payment Fraud :** Unauthorized transactions using UPI and other mobile payment methods rose sharply by 230% in rural areas during this period, highlighting growing vulnerabilities as digital payments became widespread[12]

- **Job and Loan App Scams** : Many people in villages are eager for quick income or easy loans. Fraudsters lure victims with high-salary part-time jobs or instant personal loans; once the target shares an advance payment or personal info, the scamster vanishes, A study and news reports mention over 700 loan apps operating in India by early 2022, many using aggressive and fraudulent recovery tactics, including threats and blackmail[30]

- **Identity Theft and Malware** : Downloading unknown apps or opening suspicious attachments can infect a phone, leading to stolen contacts, passwords, and even Aadhaar or PAN details. In 2022, identity theft cases in India accounted for approximately 3,041 reported incidents out of a total 65,893 registered cybercrime cases that year. [29]

4. Cybersecurity Awareness: Current State and Gaps :

1. Baseline Awareness Levels :

A comprehensive study by Kumbhakar and Kumar (2022) assessed cybersecurity awareness among rural higher education students in India. The findings revealed significant gaps in knowledge and preparedness:

- Only 4.05% of the students demonstrated a high level of cybersecurity awareness, indicating they understood key concepts and safe online practices well[13]

- A majority, about 85.13%, showed moderate awareness but still had important knowledge gaps that could put them at risk in certain situations[13]

- Around 10.81% had critically low awareness, lacking even basic understanding of cybersecurity threats[13]

- Additionally, 39.19% scored below the average on basic cybersecurity concepts, indicating a widespread lack of familiarity with common online risks such as phishing and malware[13]

This study highlights the urgent need for targeted educational programs and awareness campaigns, especially for rural students, to bridge these gaps and empower them to navigate the digital world safely.

2. Gender Disparities :

The research shows clear differences in cybersecurity awareness between female and male students in rural areas:

- Female students consistently scored lower than their male peers when tested on cybersecurity knowledge and safe online practices.[13]

- Women living in rural areas are about 40% more likely to fall victim to social engineering attacks such as phishing or fake calls[9]

- Only 23% of women surveyed were able to correctly identify phishing attempts, highlighting a significant vulnerability compared to men[10]

Improving cybersecurity education and awareness among rural women is crucial to closing the gender gap and protecting them from growing digital threat

3. Knowledge Gaps in Critical Areas :

Many rural users are missing important cybersecurity knowledge in key areas :

- **Multi-factor Authentication :** Only 12% of rural users understand the importance of multi-factor authentication to protect their accounts

- **Phishing Recognition:** About 67% cannot recognize phishing emails or suspicious links, making them vulnerable to scams.[10]

- **Password Security:** Around 78% use weak or repeated passwords, which increases the risk of unauthorized access[9]

- **Software Updates:** Nearly 45% never update their mobile apps or operating systems, leaving their devices exposed to malware and security flaws.[11]

These gaps highlight the need for focused training on simple but effective security practices to better protect rural users.

5. Educational Initiatives and Interventions :

1. Government Programs :

PMGDISHA (2017-2023) :

The Pradhan Mantri Gramin Digital Saksharta Abhiyan (PMGDISHA) made a significant impact in promoting digital literacy in rural India between 2017 and 2023:

- **Enrollment :** A total of 7.35 crore individuals enrolled in the program[4]

- **Training Completion :** Out of them, 6.39 crore successfully completed training on basic digital skills[4]

- **Certification :** Approximately 4.78 crore participants earned official certification after assessment.[4]

- **Cybersecurity Component :** The training curriculum included 20 hours of instruction, covering essential topics such as digital device operation, internet use, online communication, using digital payment tools, and importantly, basic cybersecurity and cyber hygiene practices[14][5]

This large-scale initiative helped bridge the digital divide by empowering rural citizens to engage confidently with digital technology and government e-services

Information Security Education and Awareness (ISEA) :

The Ministry of Electronics and Information Technology (MeitY) launched the Information Security Education and Awareness (ISEA) program to strengthen cybersecurity skills and awareness across India. Key achievements by pre-2023 include:

- **Formal Training :** Over 4,192 candidates received structured cybersecurity training courses[15]

- **Awareness Workshops :** More than 3,583 workshops were conducted nationwide to promote cyber hygiene and best security practices[15]

- **Rural Outreach :** Special programs targeted rural schools and community centers to raise cybersecurity awareness where it is most needed[3]

ISEA aims to build a skilled cybersecurity workforce and create a cyber-aware society by combining formal education with widespread public awareness campaigns.

2. Private Sector Initiatives :

Cyber Rakshak Program (2023) :

Kyndryl partnered with Common Service Centres (CSC), under the Ministry of Electronics & IT, to launch Cyber Rakshak, a cybersecurity training program aimed specifically at women in rural and remote areas.:

The key features of the program include

- **Target :** Training 100,000 women across 500 districts in India over three years[3]

- **Coverage :** 500 districts across India[3]

- **Certification :** Providing joint certification from Kyndryl and the National Institute of Electronics and Information Technology (NIELIT) after successful completion[3]

- **Focus :** Preparing women to become "Cybersecurity Ambassadors" who will help educate and guide their communities on digital safety and cybersecurity challenges[3]

CyberShikshaa Initiative :

Microsoft and DSCI collaboration targeting(**Microsoft & DSCI)**

1. Targets women engineering graduates from tier-II, tier-III cities, and rural areas with limited cybersecurity skills.

2. Provides a 4-month interactive cybersecurity training program including theory, hands-on projects, mentoring, and soft skills.

3. Training is delivered by reputed partners like C-DAC and NIELIT.

4. Offers placement assistance to connect trained women with job opportunities.

5. Supported by MeitY's ISEA initiative, aiming to bridge the cybersecurity gender gap and boost workforce diversity.[16]

6. Impact Assessment of Awareness Programs :

1. Measured Improvements :

Studies conducted between 2021-2023 showed positive impacts where programs were implemented:

- **Password Practices :** There was a 45% improvement in the adoption of strong password practices among participants[17]

- **Suspicious Link Avoidance :** Safe browsing behavior improved, with a 38% increase in avoiding suspicious links and websites.[11]

- **Incident Reporting :** Reporting of cybercrime incidents to authorities rose by 67%, showing greater trust and awareness about seeking help.[10].

These improvements show that awareness programs can effectively enhance cybersecurity habits and promote safer online behavior

2. Persistent Challenges :

Despite the progress from cybersecurity awareness programs, several challenges remain in rural areas:

- **Limited Reach :** Only 15% of rural households have access to formal cybersecurity training programs, limiting widespread impact[3]

- **Retention Issues :** Around 60% of participants forget the key cybersecurity concepts they learned within six months, showing difficulties in retention[17]

- **Language Barriers :** Most educational materials (about 78%) are available only in Hindi or English, creating language barriers for many rural users who speak regional languages[18]

- **Infrastructure Constraints :** About 40% of the target rural areas lack stable internet

connectivity, posing infrastructure challenges for delivering effective online training.[19]

To make cybersecurity education more effective in rural India, we need easy-to-understand content, better internet access, and ongoing support

7. Barriers to Effective Cybersecurity Education :

1. Infrastructural Limitations :

Rural cybersecurity education faces serious technical challenges:

- **Connectivity Issues :** About 30% of rural households do not have reliable internet access, making it hard to participate in online training[19]

- **Device Limitations :** Over 30% of rural households lack functional digital devices like smartphones or computers needed for learning[11]

- **Power Supply :** Nearly 45% of the training centers experience irregular electricity supply, which disrupts classes and training sessions[20]

These problems create major hurdles for delivering effective cybersecurity education in rural India

2. Educational and Cultural Challenges :

- **Low Base Literacy :** The adult illiteracy rate in rural areas is still high at around 22.3%, which makes learning digital skills difficult.[3]

- **Linguistic Diversity :** About 75% of cybersecurity training materials are not available in regional languages, limiting access for many rural users who speak different local languages[18]

- **Cultural Resistance :** Around 35% of elderly people in rural areas are hesitant or unwilling to adopt new digital technologies due to cultural resistance[21]

- **Gender Constraints :** Social norms and gender roles prevent women from participating fully in digital education programs in 40% of rural regions.[22]

These educational and cultural barriers create significant obstacles to improving cybersecurity awareness in rural India

3. Resource and Capacity Constraints :

- **Trained Instructors :** There is a shortage of qualified cybersecurity instructors available to teach in rural areas[23]

- **Funding Limitations :** Many training programs suffer from insufficient funding, making it hard to sustain long-term education[15]

- **Follow-up Support :** Continuous mentorship and follow-up support after the initial

training are lacking, which limits lasting impact.[3]

8. Policy Framework and Regulatory Response :

1. National Cyber Security Policy (2013) :

Though predating the rural digital boom, the policy established foundational principles:

- Vision of secure and resilient cyberspace for all citizensContinuous mentorship and follow-up support after the initial training are lacking, which limits lasting impact.[24]

- It emphasized the need to spread cybersecurity awareness among the general public[25]

- Mandated measures to protect critical information infrastructure across sectors[24]

2. Institutional Framework :

Key institutions supporting rural cybersecurity before July 2023 :

- **CERT-In :** (Indian Computer Emergency Response Team): Provided cybersecurity guidance tailored to different sectors to help prevent and respond to threats. [15]

- **Indian Cybercrime Coordination Centre (I4C) :** focused on investigating cybercrimes and raising public awareness on cyber safety.[26]

- **Cyber Swachhta Kendra :** Offered free tools to detect and remove malware from computers and mobile devices, helping users stay protected[27]

- **National Cyber Coordination Centre :** Monitored cyber threats in real time to quickly respond and coordinate actions against emerging attacks.[15].

These institutions form the backbone of India's cybersecurity efforts, especially supporting rural areas through guidance, investigation, and resource provision

3. State-Level Initiatives :

Several states have launched targeted programs to improve cybersecurity awareness and skills in rural areas:

- **Kerala :** Included cybersecurity lessons as part of the curriculum in rural schools to teach students about safe online practices.[18]

- **Karnataka :** Conducted door-to-door awareness campaigns across 500 villages to educate rural residents about cybersecurity risks and protection[1]

- **Tamil Nadu :** Provided cybersecurity training specifically to women's self-help groups to empower women with digital safety knowledge[22]

- **Odisha :** Established digital literacy centers that include cybersecurity training components to help rural populations use technology safely[15]

- **Maharashtra :** Launched the Maharashtra Cyber Security Project, which includes a

Cyber Command Centre, district-level cybercrime cells, cyber forensic labs, and extensive awareness programs to equip police and citizens with cybersecurity skills and combat online threats effectively. The state also supports cooperative banks with a cybersecurity operations center and ongoing training to prevent cyber fraud.

These initiatives show state governments actively promoting cybersecurity education and protection at the grassroots level, tailored to their regional needs.[15]

9. International Comparisons and Best Practices :

1. Successful Models :

Research comparing rural cybersecurity initiatives globally identified effective approaches:

- **South Korea :** Made cybersecurity education mandatory in rural community centers, ensuring everyone had the basics of digital safety.[10]

- **Estonia :** Made cybersecurity education mandatory in rural community centers, ensuring everyone had the basics of digital safety.[11]

- **Singapore :** Developed public-private partnerships to deliver cybersecurity training in rural areas, leveraging both government and industry resources for greater impact[17]

These models show how combining education, public involvement, and collaboration can successfully boost cybersecurity awareness in rural populations.

2 Lessons for India :

Key insights applicable to Indian context:

- **Continuous Learning :** One-time training is not enough. People need ongoing refreshers to keep their cybersecurity knowledge up to date[3]

- **Local Language Materials :** Offering training resources in multiple local languages greatly improves understanding and retention[18]

- **Community Leaders :** Involving respected local figures increases the trust and acceptance of cybersecurity programs [1]

- **Practical Applications :** Training that focuses on real-life scenarios is much more effective than purely theoretical lessons[10]

These lessons show the importance of making cybersecurity education ongoing, relatable, and accessible to diverse rural communities across India.

10. Evidence-Based Recommendations :

1. Educational System Integration :

- **Mandatory Curriculum :** Cybersecurity lessons should be included in the school

curriculum from an early age, with age-appropriate topics taught starting in primary school.[28]

- **Teacher Training :** Rural educators should receive comprehensive training so they can effectively teach cybersecurity concepts to their students[22]

- **Adult Education :** Cybersecurity education should be added to ongoing adult literacy programs to reach adults who missed formal schooling[3]

Integrating cybersecurity into both formal and adult education ensures broader and more lasting awareness in rural communities.

2. Community-Based Approaches :

- **Peer Learning :** Train local champions as cybersecurity ambassadors, Select and train trusted local people to act as *cybersecurity ambassadors* who can guide others in their community. [3]

- **Panchayat Integration :** Make cybersecurity a regular part of gram sabha (village council) discussions to spread awareness at the grassroots level.[1]

- **Women's Groups :** Use self-help groups and women's collectives as strong networks to share information and build awareness within families and communities[22]

3. Technology Solutions :

- **Offline Training Materials :** Create easy-to-use, mobile-friendly resources like videos, guides, and booklets that villagers can access without internet. This helps people in low-connectivity areas learn about cybersecurity at their own pace[19]

- **Gamification :** Use interactive games and simulations to make learning about cyber threats fun and engaging. This approach especially helps young people remember important safety tips better.[11]

- **SMS/Voice Alerts :** Send regular cybersecurity tips through simple text messages or voice calls. These alerts reach even basic phone users, keeping the whole community informed about scams, password safety, and secure online habits.[26]

4. Policy Interventions :

- **Mandatory Disclosures :** Financial institutions should be required to report cybercrime cases from rural areas. This helps track issues and improve responses to cyber threats in these communities.[25]

- **Regulatory Compliance :** All digital service providers must undergo cybersecurity training to ensure they follow safety standards and better protect rural users[24]

- **Budget Allocation :** Governments should set aside dedicated funds specifically for cybersecurity programs in rural regions, ensuring consistent support and resources for awareness and protection efforts.[15]

11. Future Research Directions :

1. Critical Knowledge Gaps :

More research is needed on:

- How well rural people remember cybersecurity training over time.

- Which training methods cost the least but work best.

- How local culture affects using cybersecurity practices.

- How peer learning compares to formal teaching for effectiveness.

These will help improve cybersecurity education in rural areas.

2. Methodological Improvements :

- Develop standardized tools to measure cybersecurity awareness specifically for rural communities.

- Conduct long-term studies that track changes in behavior over time after training.

- Compare cybersecurity awareness and practices across different socioeconomic groups to understand varied needs.

- Combine both qualitative (interviews, focus groups) and quantitative (surveys, tests) research methods for a fuller picture.

Conclusion :

Rural India's digital transformation created both unprecedented opportunities and significant cybersecurity challenges. While government initiatives like PMGDISHA successfully expanded digital literacy, cybersecurity awareness remained inadequate, leaving millions vulnerable to cyber threats. The evidence reveals persistent gaps in knowledge, significant gender disparities, and substantial barriers to effective education delivery.

Successful interventions demonstrated the importance of culturally appropriate, linguistically accessible, and community-based approaches. However, the scale of the challenge requires sustained, coordinated efforts involving government, private sector, and civil society stakeholders.

Moving forward, India must prioritize comprehensive cybersecurity education that goes beyond basic digital literacy, ensuring that rural populations can safely participate in the digital economy while protecting themselves from evolving cyber threats.

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Page 133