Original Article

Online Pharmacy Usage in India Before, During, and After the COVID-19 Pandemic: A Systematic Review

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ABSTRACT

Online pharmacies have emerged as an important component of healthcare delivery, offering convenient access to prescription and over-the-counter medications while transforming pharmaceutical services in India. This systematic review aimed to evaluate patterns of online pharmacy utilization in India across the pre-pandemic, pandemic, and post-pandemic periods and to identify factors influencing consumer adoption, associated benefits, challenges, and regulatory implications. A comprehensive literature search was conducted in PubMed, Scopus, Google Scholar, and ScienceDirect for studies published between January 2018 and March 2025. Following screening and application of predefined eligibility criteria, 16 studies were included for qualitative synthesis. Findings demonstrated that online pharmacy usage increased progressively over time, with the COVID-19 pandemic acting as a major catalyst for rapid adoption due to lockdown restrictions, fear of infection, and the need for uninterrupted access to medications. Convenience, home delivery, competitive pricing, and continuity of therapy emerged as the principal drivers of utilization, while integration with telemedicine services contributed to sustained post-pandemic use. Despite these advantages, concerns regarding counterfeit medicines, self-medication, inadequate pharmacist interaction, data privacy, and gaps in regulatory oversight remained significant challenges. The review indicates that the behavioral changes initiated during the pandemic have persisted beyond the public health crisis, establishing online pharmacies as an integral component of India's evolving digital healthcare ecosystem. Strengthening regulatory frameworks, improving pharmacist involvement, and promoting digital health literacy are essential to ensure the safe, effective, and sustainable growth of e-pharmacy services in the country.

Key words: Online pharmacy, COVID-19, Consumer behavior, Digital health, PRISMA, Systematic review

Online pharmacies, also referred to as internet pharmacies or e-pharmacies, have transformed pharmaceutical service delivery worldwide by enabling consumers to purchase prescription and over-the-counter (OTC) medicines through web-based platforms [1–4]. Their increasing popularity is driven by convenience, cost savings, and improved accessibility. However, concerns regarding product authenticity, regulatory oversight, counterfeit medicines, and misuse of prescription medications continue to raise important public health issues [5–10]. India, with over 800 million active internet users and one of the world's fastest-growing smartphone markets, represents a rapidly expanding environment for online pharmacy services [11–14]. The Indian online pharmacy market has experienced substantial growth, supported by increasing digital literacy, a large generic medicines market, price-sensitive consumers, and the emergence of major platforms such as PharmEasy, NetMeds, and Tata 1mg [15–17]. The COVID-19 pandemic significantly accelerated the adoption of online pharmacies in India. National lockdowns and restricted access to conventional pharmacies encouraged consumers to obtain medicines through digital platforms, while the introduction of the Telemedicine Practice Guidelines in 2020 further strengthened the use of digital healthcare services [18–23]. Despite this rapid expansion, India's regulatory framework for online pharmaceutical retailing remains incomplete. Challenges related to prescription verification, counterfeit medicine detection, pharmacist involvement, and data privacy continue to affect patient safety and public confidence [24–27].

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Although several studies have examined individual aspects of online pharmacy utilization in India, evidence comparing utilization patterns before, during, and after the COVID-19 pandemic remains fragmented. Therefore, this systematic review was undertaken to comprehensively synthesize the available evidence by evaluating awareness, utilization, and adoption patterns of online pharmacies across these three periods.

Furthermore, this review aims to characterize consumer behaviour, motivations, and demographic factors associated with online pharmacy use; identify the major benefits, challenges, facilitators, and barriers influencing adoption; and discuss the regulatory implications and future directions required for the safe and sustainable development of online pharmacy services in India.

2. METHODS

2.1 Study Design

This systematic review was conducted and reported in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) 2020 guidelines [28].

2.2 Literature Search Strategy

A comprehensive electronic literature search was performed across PubMed, Google Scholar, Scopus, and ScienceDirect databases. The search was restricted to publications between January 2018 and March 2025. The Boolean search strategy employed the following combination: ("online pharmacy" OR "e-pharmacy" OR "internet pharmacy" OR "digital pharmacy") AND (India) AND (COVID-19 OR pandemic OR pre-pandemic OR post-pandemic) AND (awareness OR utilization OR consumer behavior OR perception OR safety OR regulation). Additionally, reference lists of retrieved articles were manually screened for relevant citations not captured in the electronic search.

2.3 Eligibility Criteria

Inclusion Criteria

Studies were included if they were published between 2018 and 2025, conducted in India, and designed as original research articles, including cross-sectional surveys, observational studies, and mixed-methods studies. Eligible studies examined various aspects of online pharmacy usage, such as awareness, perception, consumer behaviour, safety, regulatory issues, and utilization patterns. In addition, only articles published in peer-reviewed journals and written in the English language were considered for inclusion in the review.

Exclusion Criteria

Studies were excluded if they were: review articles, editorials, commentaries, letters to the editor, conference abstracts, or blog/website-based publications; conducted outside India; or unavailable in full text.

2.4 Study Selection

Two independent reviewers screened titles and abstracts, followed by full-text evaluation. Disagreements were resolved by consensus. A total of 33 records were identified following database searches and deduplication. Seventeen records were excluded after screening (8 reviews, 4 conducted outside India, 3 editorials, 2 conference abstracts). Sixteen primary studies were ultimately included for qualitative synthesis.

2.5 Data Extraction

A standardized data extraction template was used to collect: authors and year of publication, study location (state/city), study design, sample size and population, primary outcomes, and key findings related to awareness, behaviour, benefits, and challenges.

2.6 Quality Assessment

The methodological quality of the included studies was assessed independently by two reviewers using the Joanna Briggs Institute (JBI) Critical Appraisal Checklist for analytical cross-sectional studies [29]. Studies with observational or cohort components were additionally evaluated using the Newcastle–Ottawa Scale (NOS) [30]. The assessment considered participant selection, measurement validity, management of confounding factors, and appropriateness of statistical analysis. Disagreements between reviewers were resolved through discussion and consensus. Overall, the included studies demonstrated acceptable methodological quality and were considered suitable for qualitative synthesis.

2.7 Data Synthesis

Given the heterogeneity in study designs, populations, and outcome measures, a narrative synthesis approach was adopted. Findings were organized thematically across three temporal categories: pre-pandemic (2018–2019), pandemic (2020–2021), and post-pandemic (2022–2025).

3. RESULTS

3.1 Characteristics of Included Studies

The sixteen included studies were distributed across nine Indian states, with a total combined sample size exceeding 5,000 participants.Study designs included cross-sectional surveys (n = 10), descriptive surveys (n = 4), and mixed-methods designs (n = 2). Sample sizes ranged from 190 to 450 participants. The included studies are detailed in Table 1.

3.2 Pre-Pandemic Usage Patterns (2018–2019)

Studies conducted in the pre-pandemic period revealed moderate levels of consumer awareness of online pharmacy

services [29]. Adoption was predominantly concentrated among young urban males aged 25–40 years with graduate-level or higher education [29,33].

The primary motivating factors for online pharmacy use in this period were financial discounts and cashback offers [31], followed by convenience of purchase [34], lower prices compared to physical pharmacies [30], home delivery services [32], and 24-hour availability [35]. Chronic disease medications and common OTC products were the most frequently purchased categories. Despite moderate adoption, a significant proportion of consumers remained skeptical regarding product authenticity and the absence of face-to-face pharmacist counselling.

Table 2 provides a summary of the characteristics of the included studies, including study design, study period, geographic coverage, and methodological quality. Most studies were cross-sectional and demonstrated moderate to high methodological quality.

Table 1: Characteristics of Included Studies (n = 16)

Author	Year	Location	Sample	Design	Major Findings
Sah et al. [29]	2018	Delhi	460	Cross- sectional survey	85.8% aware of online pharmacy; only 6% had purchased; males predominant; convenience and cost were key drivers
Nair & Middha [30]	2019	Pan-India	N/A	Descriptive survey	Young adults showed awareness but limited actual use; lack of prescription norms was a concern
Yadav et al. [31]	2020	Rajasthan	170	Cross-sectional	91.76% of physicians aware of e-pharmacy; only 22.35% had used it; majority never recommended it to patients
Singh et al. [32]	2020	Pan-India	N/A	Review/survey	E-pharmacy adoption linked to lockdown conditions; OTC and chronic medicines were top purchases
Srivastava & Raina [33]	2021	Pan-India	184	Quantitative (PLS-SEM)	Performance expectancy, hedonic motivation, and social influence positively predicted e-pharmacy adoption; gender had no significant effect
Inamdar [34]	2021	Pan-India	N/A	Exploratory survey	Consumer perception mixed; convenience valued but trust and product authenticity concerns dominant
Dutta & Bhattacharjee [35]	2021	Assam	N/A	Survey	COVID-19 pandemic shifted consumer preference towards online medicines; home delivery most valued feature
Sabbir et al. [36]	2021	Global/India	N/A	SEM-neural network	Ease of use and perceived usefulness primary determinants of adoption; social influence moderately significant
Ushir & Diana [37]	2022	Mumbai	N/A	Survey	COVID-19 pandemic substantially impacted online pharmacy growth in Mumbai; offline pharmacy footfall decreased
Ushir & Diana [38]	2022	Mumbai	N/A	Cross-sectional	Consumers preferred online pharmacy for convenience and discounts; trust concerns remained about medicine quality
Fittler et al. [39]	2022	Multi-country	2087	Cross-sectional online	Post-pandemic online pharmacy use remained elevated; habits formed during lockdowns consolidated into lasting behaviour
Bansal et al. [40]	2022	India	N/A	Survey	More than 83% of Indian respondents aware of online pharmacies; only ~2% preferred purchasing online
Miller et al. [41]	2022	LMICs (India incl.)	N/A	Policy review	Technology preceded regulation in e-pharmacy; identified gaps in prescription verification and pharmacovigilance in India
Thakur & Mandhanya [42]	2023	India	N/A	Competitive analysis	Online pharmacy entering as disruptive force in Indian retail pharmacy; price competition and convenience as differentiators
Limbu & Huhmann [43]	2024	Global (scoping review)	N/A	Scoping review	Price, convenience, product range and internet access consistently predicted online medication purchase intentions globally
Ansari et al. [44]	2025	Pan-India	24 studies (SR)	Systematic review	Women frequent online pharmacy customers; awareness varies by gender; middle-aged individuals 35–74 years showed strong inclination

Table 2: Summary of the Included Studies

Characteristic	Number (%)
Total studies	16
Pre-pandemic	4
During pandemic	8
Post-pandemic	4
Cross-sectional	12
Observational	3
Mixed methods	1
Urban studies	10
Multi-state studies	6

3.3 Pandemic-Period Patterns (2020–2021)

The COVID-19 pandemic precipitated a dramatic and rapid acceleration in e-pharmacy adoption across India [37,38,44]. National lockdowns instituted from March 2020 severely restricted physical movement and access to brick-and-mortar pharmacies, compelling consumers across age groups and geographies to explore digital alternatives [39].

Fear of contracting COVID-19 during pharmacy visits emerged as a robust and statistically significant predictor of e-pharmacy adoption during this phase [36]. Ensuring continuity of supply for chronic disease medications, including antihypertensives, antidiabetics, and thyroid preparations was reported as a critical utilization driver [43,45]. Sales of OTC medicines [46] and nutritional supplements, particularly vitamins and immunity-boosting products, surged substantially during this period [40]. The pandemic period was also characterized by a significant increase in self-medication, as the absence of clinical consultations and pharmacist interactions created an environment where consumers made independent medication decisions based on online information.

3.4 Post-Pandemic Patterns (2022–2025)

Contrary to the prediction of a return to pre-pandemic utilization levels following the easing of lockdowns, e-pharmacy usage remained sustainably elevated in the post-pandemic period [42]. Consumer behaviour studies revealed that the forced adoption during the pandemic period had created lasting habitual change, with users reporting familiarity, confidence, and convenience as key reasons for continued use [41,42,47].

The post-pandemic landscape was characterized by the emergence of hybrid healthcare models, integrating e-pharmacy services with telemedicine platforms and digital prescription management [41]. Competitive pricing and time savings were the dominant factors reported by post-pandemic e-pharmacy users [47]. Rural adoption also began to expand, facilitated by improved logistics partnerships, though significant urban-rural disparities persisted. Table 3 below provides a comparative summary of findings across the three pandemic phases.

3.5 Factors Influencing Online Pharmacy Usage

A spectrum of facilitators and barriers was identified across the included studies (Table 4). Education and digital literacy were consistently identified as robust positive predictors of adoption [29,48]. Internet access and smartphone ownership were structural prerequisites [49]. Financial incentives, particularly discounts and cashback offer, remained strong motivators across all periods [31]. On the barrier side, lack of consumer trust regarding product quality and platform legitimacy was the most frequently cited impediment [50,51]. Concerns about data privacy and cybersecurity were also significant [52]. Logistical challenges, including delayed deliveries particularly affecting rural and semi-urban consumers and cold chain management issues for temperature-sensitive medicines, constituted operational barriers [53]. Prescription verification and the risk of prescription misuse were regulatory concerns emphasized by multiple studies [54].

3.6 Benefits of Online Pharmacies

The reviewed literature identified several substantive benefits associated with e-pharmacy utilization in India. Improved pharmaceutical accessibility, particularly for patients in areas underserved by physical pharmacies, was consistently highlighted [55]. Enhanced medication adherence, attributable to features such as automated refill reminders and home delivery, was documented [56]. Significant cost savings relative to conventional pharmacy pricing were reported in pharmacoeconomic analyses [57]. The wider range of pharmaceutical products available on online platforms encompassing branded generics, specialty medicines, and health supplements was noted as a distinct advantage [58]. Home delivery emerged as the single most valued feature among consumers across all demographic groups [59].

3.7 Risks and Challenges

Counterfeit and substandard medicines circulating through unregulated online platforms represented the foremost risk identified in the reviewed literature [60]. Facilitation of self-medication without clinical oversight was documented as a widespread concern, with implications for antimicrobial resistance and adverse drug outcomes [61]. The near-absence of pharmacist counselling in most e-pharmacy transactions was identified as a critical gap in patient safety [62]. Regulatory lacunae in India's e-pharmacy governance framework were comprehensively described, encompassing gaps in platform licensing, prescription verification, and pharmacovigilance [63]. Data privacy vulnerabilities in existing digital pharmacy platforms were identified as an emerging concern in the post-pandemic context [64].

Table 3: Comparative Overview Across Pre-Pandemic, Pandemic & Post-Pandemic Periods

Parameter	Pre-Pandemic (2018–2019)	Pandemic (2020–2021)	Post-Pandemic (2022–2025)
Awareness level	Moderate; limited to urban graduates	High; accelerated by necessity	Sustained high; rural expansion ongoing
Primary drivers	Discounts, convenience, 24-hr access	Lockdown, infection fear, supply continuity	Time savings, competitive pricing, telemedicine integration
Common purchases	Chronic disease drugs, OTC products	COVID-19 drugs, vitamins, immunity boosters	Chronic medication, diagnostics, wellness products
Trust level	Moderate skepticism	Increased due to necessity	Consolidating; brand loyalty emerging
Regulatory awareness	Low	Moderate; government attention increased	Improving; CDSCO guidelines under discussion
Pharmacist interaction	Minimal online; relied on walk-in	Near absent; self-medication prevalent	Partially restored via chat/teleconsultation
Rural access	Very limited	Marginally improved	Expanding through logistics partnerships

Table 4: Factors Influencing Online Pharmacy Usage in India

Category	Factors
Facilitators – Sociodemographic	Higher education level, young adult age group (25–40 years), male gender, urban residence, higher household income
Facilitators – Technological	Smartphone ownership, reliable internet connectivity, digital literacy, prior e-commerce experience
Facilitators – Systemic	Availability of discounts and cashback offers, 24-hour accessibility, home delivery, wide product range, prescription upload facility
Facilitators – Pandemic-Specific	Lockdown-induced restrictions, fear of contracting COVID-19, unavailability of neighborhood pharmacies, chronic disease continuity needs
Barriers – Trust & Safety	Concerns regarding counterfeit/substandard medicines, absence of pharmacist counselling, inability to verify product authenticity
Barriers – Regulatory	Lack of clear e-pharmacy legislation, prescription misuse, unverified online platforms, inadequate post-market surveillance
Barriers – Logistical	Delivery delays especially in rural areas, cold chain maintenance issues for temperature-sensitive medications
Barriers – Digital	Low digital literacy in older and rural populations, data privacy and cybersecurity concerns, poor internet infrastructure

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4. DISCUSSION

4.1 Principal Findings

This systematic review synthesizes evidence from sixteen Indian studies to characterize online pharmacy utilization across the pre-pandemic, pandemic, and post-pandemic periods. The findings indicate that the COVID-19 pandemic acted as a major catalyst for rapid and lasting changes in pharmaceutical purchasing behaviour among Indian consumers. While e-pharmacy adoption before the pandemic was driven mainly by demographic factors and financial incentives, the pandemic led to necessity-driven adoption across a wider population. Sustained post-pandemic usage reflects the consolidation of digital health habits established during the crisis.

4.2 Comparison with International Evidence

The Indian experience parallels global trends in e-pharmacy utilization. In the United States, online platforms have long served as a source of prescription medications, with particular uptake among older adult populations managing polypharmacy [65]. European e-pharmacy markets, particularly in northern and western Europe, are characterized by robust regulatory frameworks and high consumer trust, offering instructive comparisons for Indian policy formulation [66].

The Chinese e-pharmacy market, which underwent accelerated growth following the pandemic comparable to India, has implemented real-time prescription verification mechanisms and AI-assisted pharmacovigilance that present viable models for adoption in the Indian context [67]. Systematic reviews from the developing world context similarly identify trust and regulation as critical determinants of e-pharmacy sustainability [68].

4.3 Regulatory Implications

The regulatory landscape for e-pharmacies in India is characterized by significant incompleteness. While CDSCO released draft rules in 2018 [26], comprehensive legislation governing e-pharmacy operations, including mandatory registration, prescription verification protocols, pharmacovigilance obligations, and consumer redressal mechanisms remains to be enacted [69]. The Telemedicine Practice Guidelines introduced by the Ministry of Health and Family Welfare in 2020 [70] represent a complementary development, but their integration with e-pharmacy regulation requires explicit legislative articulation [71].

Comparative analysis with jurisdictions possessing mature e-pharmacy regulatory frameworks suggests that mandatory pharmacist tele-consultation requirements, real-time prescription validation, and platform-level accountability mechanisms are essential regulatory elements.

4.4 Consumer Trust and Health Literacy

Consumer trust is a critical determinant of e-pharmacy sustainability, encompassing confidence in product authenticity, platform security, and delivery reliability [72]. Evidence from behavioural economics suggests that trust in digital health systems is difficult to establish and can be easily undermined by adverse experiences [73]. In India, reports of counterfeit medicines supplied through unverified platforms have negatively affected consumer confidence in e-pharmacies [60]. Health literacy also plays an important role in shaping utilization patterns [74]. Consumers with higher health literacy are more likely to verify platform legitimacy and avoid purchasing prescription medicines without valid prescriptions [74,75]. Consequently, variations in health literacy across regions and socioeconomic groups in India contribute to differing levels of risk among e-pharmacy users.

4.5 Role of the Pharmacist in the Digital Health Ecosystem

The limited involvement of pharmacists in e-pharmacy transactions represents a major patient safety concern identified in this review [62]. Pharmacist counselling, including medication reconciliation, dosage guidance, adverse drug reaction monitoring, and drug interaction screening, is a key component of conventional pharmacy practice but remains largely absent in Indian e-pharmacy models [76]. The International Pharmaceutical Federation (FIP) has emphasized the importance of integrating pharmacist services into digital health systems to ensure safe medication use [77]. Emerging teleconsultation-based models, which enable consumers to communicate with licensed pharmacists through chat, voice, or video platforms before dispensing, offer a promising solution [78]. However, their implementation in India is limited by pharmacist shortages, inadequate remuneration, and regulatory uncertainty regarding telepharmacy practices [76]. Strengthening pharmacy education, expanding the workforce, and establishing clear teleconsultation guidelines are essential for successful integration.

4.6 Self-Medication and Antimicrobial Resistance

Self-medication has long been a concern in the Indian healthcare system, and e-pharmacies may further amplify this risk by providing easy access to medicines without adequate professional oversight [61,79]. Unsupervised purchase of antibiotics through online platforms is particularly concerning, as inappropriate antimicrobial use contributes to treatment failure and the growing burden of antimicrobial resistance (AMR) [80]. Given India's high AMR burden, unrestricted online availability of antibiotics poses a major public health challenge [81]. Therefore, stronger regulations governing the online sale of Schedule H, H1, and X medicines are urgently needed. Mandatory electronic prescription upload combined with real-time pharmacist verification, similar to systems

employed in several European countries [66], may represent an effective strategy to reduce inappropriate antibiotic use through digital channels in India.

4.7 Technology Adoption Frameworks and Behavioural Change

The findings of this review are consistent with established technology acceptance theories. According to the Technology Acceptance Model (TAM), perceived ease of use and perceived usefulness are key determinants of technology adoption [82]. These constructs are reflected in the present review, where convenience and cost savings consistently emerged as major drivers of e-pharmacy utilization [30,34]. Similarly, the Unified Theory of Acceptance and Use of Technology (UTAUT2) highlights the influence of habit, social influence, and hedonic motivation, factors that have also been observed in the Indian e-pharmacy context [83]. Furthermore, the sustained post-pandemic use of e-pharmacies can be explained by habit formation theory, whereby prolonged necessity-driven adoption during the COVID-19 pandemic resulted in lasting behavioural changes that persisted even after restrictions were lifted [84]. This suggests that consumer reliance on digital pharmaceutical services is likely to remain high, emphasizing the need for long-term regulatory and healthcare system adaptations.

4.8 Digital Health Equity and Rural-Urban Disparities

Another important aspect of e-pharmacy utilization is digital health equity. The benefits of online pharmacies are predominantly experienced by urban, educated, and economically advantaged populations, whereas rural and semi-urban communities with substantial unmet healthcare needs remain relatively underserved [55,85]. Limited smartphone access, poor internet connectivity, low digital literacy, and inadequate delivery infrastructure represent major barriers to e-pharmacy adoption in these settings [53,85]. The Ayushman Bharat Digital Mission (ABDM), through initiatives such as Ayushman Bharat Health Accounts (ABHA) and Health Facility Registries, provides a strong foundation for expanding digital healthcare access [86]. Integrating these initiatives with e-pharmacy platforms and utilizing common service centres, rural post offices, and ASHA workers as facilitators could improve equitable access to pharmaceutical services in underserved regions.

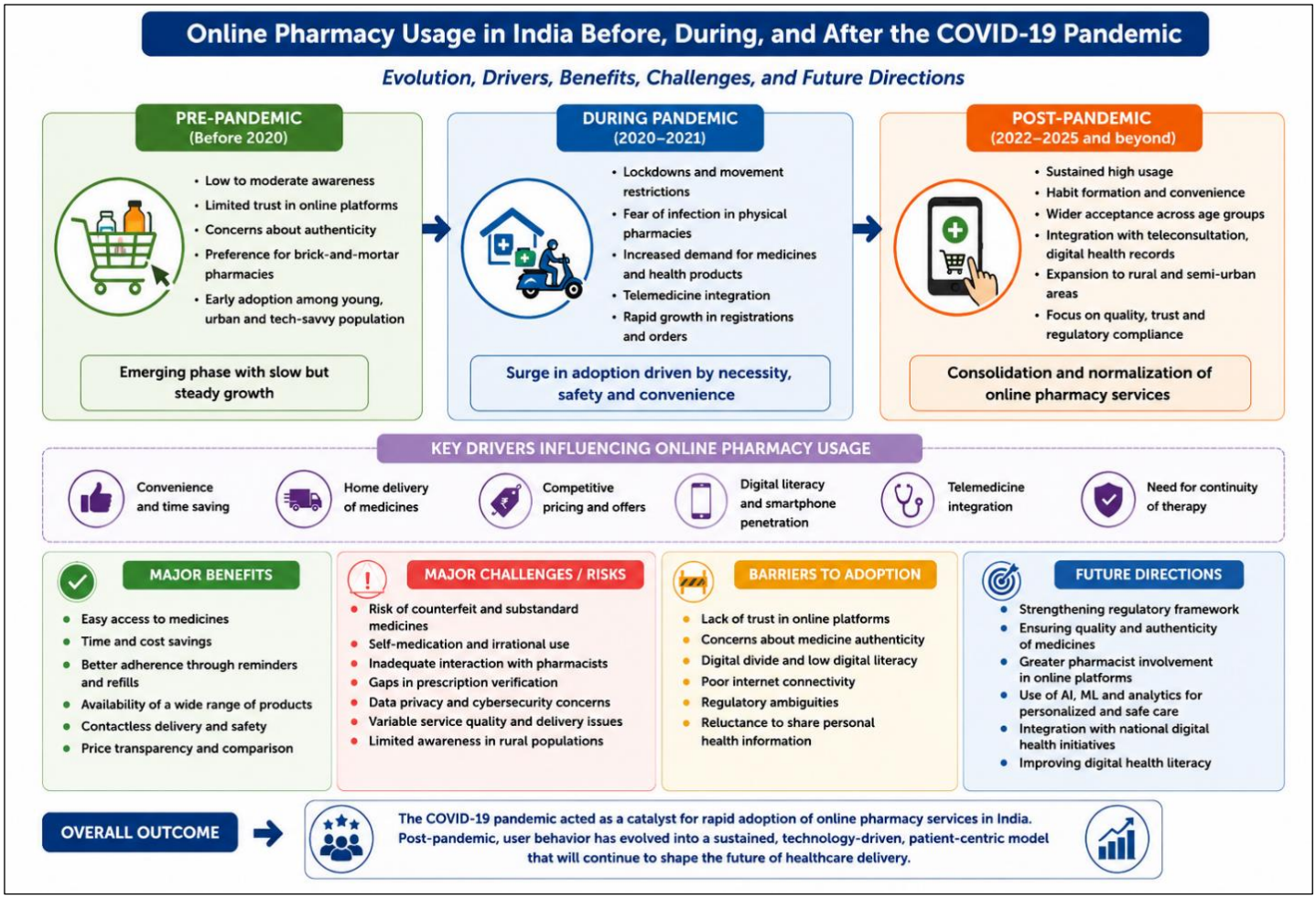


Figure 1: Graphical summary illustrating the evolution of online pharmacy usage in India before, during, and after the COVID-19 pandemic, including the major drivers, benefits, challenges, barriers to adoption, and future directions.

4.9 Artificial Intelligence and Future of E-Pharmacy in India

Artificial intelligence (AI) and machine learning (ML) are increasingly being incorporated into e-pharmacy platforms to improve efficiency, medication safety, and user experience [87]. Their applications include drug interaction screening, personalized medication reminders, symptom assessment tools, inventory management, and automated prescription verification using optical character recognition and deep learning techniques [87,88]. These technologies have the potential to address important regulatory challenges, particularly prescription validation and fraud detection [88].

In India, however, AI implementation faces challenges related to linguistic diversity, variability in prescription formats, and limited electronic health record infrastructure. Nevertheless, major platforms such as PharmEasy, Tata 1mg, and Apollo Pharmacy have made significant investments in AI-based medication management systems [16]. Consequently, regulatory frameworks must evolve alongside technological advancements to ensure appropriate clinical governance and accountability of AI-enabled e-pharmacy services.

4.10 Public Health Implications

From a public health perspective, the systematic review underscores a paradox: e-pharmacies simultaneously improve medicine access and introduce novel risks. For patients with chronic conditions requiring regular medication a population of over 100 million in India e-pharmacies offer unparalleled convenience and the potential for improved adherence [56,57].

However, the facilitation of self-medication and the absence of routine pharmacist counselling create conditions in which adverse drug events and antimicrobial resistance may be inadvertently amplified [61,81]. Engaging clinical pharmacists in teleconsultation-integrated e-pharmacy models represents a high-priority public health intervention [76,77].

4.11 Strengths and Limitations

This review is, to the best of our knowledge, the first systematic synthesis of e-pharmacy utilization evidence in India covering all three pandemic phases within a unified analytical framework. Inclusion of studies spanning seven years (2018–2025) provides temporal breadth. However, several limitations must be acknowledged. The review is restricted to sixteen studies, of which the majority employed cross-sectional designs, limiting causal inference. Heterogeneity in outcome measures, sampling methods, and geographic coverage precluded meta-analysis. The possibility of publication bias, with negative or null findings remaining unpublished, cannot be excluded. Additionally, evidence from rural and tribal populations remains underrepresented in the current literature

5. FUTURE DIRECTIONS

The findings of this review suggest several priority areas for research and policy action. Large-scale, nationally representative surveys employing standardized instruments are required to establish robust prevalence estimates of e-pharmacy utilization across Indian states. Longitudinal cohort studies examining medication outcomes adherence, adverse events, and health-related quality of life among e-pharmacy users versus conventional pharmacy users would provide critical evidence for public health policy. Regulatory research evaluating the feasibility and impact of specific e-pharmacy governance mechanisms in the Indian context is needed. Implementation of AI-enabled prescription validation and pharmacovigilance tools within existing e-pharmacy platforms offers a technological pathway to improving safety. Finally, dedicated programs to enhance digital health literacy among older adults, rural populations, and economically marginalized communities are essential for equitable access to e-pharmacy benefits.

CONCLUSION

Online pharmacy usage in India has undergone a profound and accelerating transformation over the period 2018–2025, with the COVID-19 pandemic serving as a pivotal inflection point. The systematic evidence reviewed indicates that e-pharmacy adoption, initially driven by convenience and cost incentives among urban, educated demographics, was rapidly broadened in scope and scale by pandemic-era necessity. Post-pandemic, utilization has remained elevated, reflecting the consolidation of digitally mediated pharmaceutical purchasing behaviors. Benefits including improved accessibility, medication adherence, and cost savings are well documented; however, significant challenges encompassing counterfeit medicines, erosion of pharmacist counselling, regulatory gaps, and data security concerns require urgent attention. Strengthening India's regulatory framework for online pharmacies, ensuring meaningful pharmacist integration, and expanding digital health literacy are imperatives for ensuring that the e-pharmacy growth trajectory translates into sustainable improvements in population health outcomes.

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