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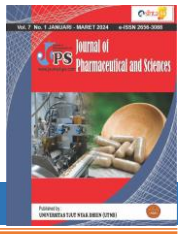

An Examination of Determinants Affecting Consumer Purchasing Behaviour for Pharmaceutical Products on e-commerce Platforms: a Systematic Review

Analisis Faktor-Faktor yang Mempengaruhi Perilaku Pembelian Konsumen terhadap Produk Farmasi pada Platform E-Commerce: Tinjauan Sistematis

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Abstract
As digital technology advances, consumers increasingly purchase pharmaceutical products through e-commerce due to easier access, competitive prices and product variety. However, studies examining the determinants of online purchases of prescription and over-the-counter (OTC) medicines remain limited. This study seeks to determine the elements that influence customers' decisions to purchase pharmaceuticals through e-commerce platforms. A systematic review was performed utilizing databases including PubMed, Scopus, ScienceDirect, Google Scholar, and Garuda. This study is limited to publications from 2012 to 2025. The data were analyzed using the TDF and COM-B frameworks. Results showed that eleven overarching themes influence consumers' decisions to purchase medicines through e-commerce platforms. These themes include price and cost savings, medicine and service quality, data security and privacy, risks and limitations, accessibility and convenience, product availability, logistics and delivery services, insurance policies and integration, user experience, customer service, and social or habitual factors. Preliminary evidence suggests that price may be a more influential factor in studies conducted in Asian developing countries, whereas quality, data security, and regulatory considerations were more frequently reported in the limited number of studies from developed countries.

***Keywords*: Consumer Behavior; E-Commerce; Medicine Purchase; Online Pharmacy**

Abstrak
Seiring dengan kemajuan teknologi digital, konsumen semakin membeli produk farmasi melalui platform e-commerce karena kemudahan akses dan harga yang kompetitif. Namun, penelitian mengenai faktor-faktor yang memengaruhi pembelian obat resep dan obat bebas (OTC) secara daring masih terbatas. Penelitian ini bertujuan untuk mengidentifikasi faktor-faktor yang memengaruhi keputusan konsumen dalam membeli produk farmasi melalui platform e-commerce. Systematic review dilakukan menggunakan basis data PubMed, Scopus, ScienceDirect, Google Scholar, dan Garuda, dengan publikasi yang dibatasi pada tahun 2012–2025. Data dianalisis menggunakan kerangka TDF dan COM-B. Hasil penelitian menunjukkan sebelas tema utama yang memengaruhi keputusan konsumen dalam membeli obat melalui e-commerce, meliputi harga dan penghematan biaya, kualitas obat dan layanan, keamanan data dan privasi, risiko dan keterbatasan, aksesibilitas dan kenyamanan, ketersediaan produk, layanan logistik dan pengiriman, kebijakan serta integrasi asuransi, pengalaman pengguna, layanan pelanggan, serta faktor sosial atau kebiasaan. Bukti awal menunjukkan bahwa harga mungkin merupakan faktor yang lebih berpengaruh pada studi yang dilakukan di negara-negara berkembang Asia, sedangkan kualitas, keamanan data, dan aspek regulasi lebih sering dilaporkan dalam jumlah studi yang masih terbatas dari negara-negara maju.

Kata Kunci: Perilaku Konsumen, E-Commerce, Pembelian Obat, Farmasi Daring.

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Introduction

Recent technological advances have precipitated substantial shifts in global consumer behavior, including a transition in the acquisition of pharmaceuticals from offline pharmacies to online pharmacies [4]. E-commerce platforms have emerged as the predominant distribution channel for various pharmaceutical products, including over-the-counter medicines, health supplements, and medical devices. These platforms offer several advantages, such as ease of access, competitive pricing, and a diverse product selection [33]. However, online transactions of pharmaceutical products also face complex challenges, including product authenticity, consumer data security, and the risk of misuse [2]. Conducting a systematic study of the factors that influence consumer purchasing behavior in this sector is imperative to comprehending the dynamics of this expanding market [43-44].

Consumer trust has been identified as a primary factor influencing the purchase of pharmaceutical products online [27]. It has been demonstrated that factors such as the seller's reputation, the authenticity of the products, and user reviews play a critical role in establishing Trust [23]. Furthermore, perceptions of transaction security and data privacy risk have been demonstrated to influence consumer shopping interest [17]. A plethora of prior studies have demonstrated that consumers generally exhibit heightened caution when procuring pharmaceutical products via online channels as opposed to other categories of products. This phenomenon can be attributed to the potential health implications associated with these products [13,30,43].

Government regulations and policies also influence consumer purchasing behavior on pharmaceutical e-commerce platforms. In certain nations, stringent restrictions on online sales of prescription medications have influenced consumer preferences towards over-the-counter products or health supplements. Conversely, the e-pharmacy market has grown faster in countries with more lenient regulations, albeit accompanied by increased concerns about counterfeit or unregistered products [29]. Consequently, a comprehensive understanding of the intricate interplay between regulatory frameworks and consumer behavior is imperative for the development of effective policies [37].

Several systematic reviews have previously described the prevalence of individuals purchasing prescription drugs online and the factors that motivate them to do so [16-17,30,43-44]. These reviews exclusively addressed online prescription purchases, neglecting to engage with the evidence and motivations underpinning OTC drug purchases. Furthermore, the scope of these studies was too extensive, encompassing all online platforms.

This review provides a comprehensive synthesis of the factors influencing consumers' decisions to purchase medicines through e-commerce platforms. By integrating evidence from previous studies, it offers regulators, businesses, and consumers a broader understanding of the evolving digital pharmaceutical marketplace. The findings may inform data-driven policy recommendations and business strategies while supporting consumer protection and compliance with applicable healthcare standards.

This review specifically aims to identify and map the determinants of online medicine purchasing behaviour onto the Theoretical Domains Framework (TDF) and the Capability, Opportunity, Motivation–Behaviour (COM-B) model. By integrating these behavioural frameworks, the review seeks to provide a deeper understanding of how cognitive, social, environmental, and motivational factors interact to influence consumers' decisions to purchase medicines through e-commerce platforms.

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Methods

Study design

This systematic review was performed per the 2020 Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) standards [31]. The primary objective of employing PRISMA is to enhance transparency, accuracy, and comprehensiveness in the reporting process of review articles [31]. The utilization of PRISMA facilitated the systematic mapping of the study selection process, which was represented in the form of a flow diagram. This approach enabled the visualization of the article sources and the screening process, which excluded articles that did not align with the established criteria. Consequently, the final results obtained met the requisite standards. Subsequently, an extraction process was implemented to identify points supporting the research objective of describing the factors that encourage consumers to purchase medicines on e-commerce platforms.

This systematic review employs a descriptive synthesis approach to comprehensively analyze the determining factors that influence the habit of purchasing medicines through e-commerce platforms. The Descriptive Synthesis approach was selected because it can synthesize the results from qualitative, quantitative, and mixed-method research within a narrative structure, while preserving the unique context of each study reviewed [15]. This approach is considered the most suitable given the multifaceted factors influencing online medicine purchasing, including psychological, social, and technical aspects. Descriptive synthesis allows researchers to identify consumer behavior patterns without requiring statistical meta-analysis, making this method ideal for fields of study that are still evolving, such as e-pharmacy.

Eligibility criteria

This systematic review includes studies that discuss the purchase of medicines through e-commerce. These studies can be qualitative, quantitative, or mixed methods and must be published in accredited journals or reputable conference proceedings. The data used are limited to the latest publications from 2012 to 2025. Drug purchases through e-commerce that do not focus on drugs, offline drug purchases, and online drug purchases that do not discuss e-commerce are excluded from the data analyzed.

Search strategy

We searched five major databases (PubMed, Scopus, ScienceDirect, Google Scholar, and Garuda) to obtain comprehensive reference sources. We used the exact specific keywords for all sources: ("e-commerce" OR "e-marketplace" OR "online pharmacy" OR "digital health market") AND ("medicine purchase" OR "drug buying behavior" OR "online drug purchase") AND ("consumer behavior" OR "purchase intention" OR "trust" OR "perceived risk" OR "price" OR "regulation"). This search strategy was designed based on the PICO framework, which focuses on 1) Population: online drug buyers, 2) Intervention/Exposure: e-commerce platforms, and 3) Outcome: factors determining buying drugs [9]. This method helps find literature that is genuinely relevant to the research objectives.

Screening and Selection Process

The articles were searched using keywords and manually screened for articles relevant to the research objectives. The articles obtained were managed using Zotero reference management software. The article screening process was executed in three stages:

1. The Zotero application is utilized to eliminate duplicate articles.
2. The titles and abstracts of articles were reviewed to identify and exclude those clearly irrelevant.
3. The subsequent step involves screening the entire text to identify articles that meet the established inclusion criteria.

The author (RA) carried out the article screening process independently through the three aforementioned stages. The screening results that the author (RA) deemed to meet the inclusion criteria were subsequently discussed with AW and SP, who have expertise in pharmaceutical research and consumer behaviour research. To minimize selection bias, any disagreements regarding study eligibility during the full-text screening stage were resolved through consensus discussion between RA and the other reviewers (AW and SP). A kappa statistic was not calculated given the small number of included studies; however, all disagreements were documented and reconciled through discussion, with additional adjudication when necessary.

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Quality Assessment

A quality assessment was conducted to evaluate the validity, reliability, and risk of bias of the studies included in the review. This approach enabled us to ascertain how the study's findings could substantiate the review's conclusions. According to the type of article reviewed, the quality assessment was conducted using three types of critical appraisal.

Quantitative research was evaluated utilizing the Assessment Tool for Cross-Sectional research (AXIS) [50]. The instrument consists of a 20-item checklist requiring a response of yes, no, or uncertain. A "yes" response is designated a value of 1, whilst a "no" response is assigned a value of 0. The same applies to the "don't know" response. The subsequent guidelines were implemented: Scores denoting good quality span from 15 to 20, moderate quality from 8 to 14, and low quality from 1 to 7 [45].

Qualitative studies were assessed utilizing the Critical Appraisal Skills Programme (CASP) qualitative study checklist. The instrument consists of a 10-point checklist, to which respondents must provide a "yes," "no," or "don't know" answer. The subsequent guidelines were established: each item was assigned a score of one for a "yes" rating and zero for a "no" or "don't know" rating. Scores denoting high quality (≥8), moderate quality (5-7), and low quality (≤4) [46].

The Mixed-Methods Assessment Tool (MMAT) was utilized to assess the quality of mixed-methods research investigations [51]. Seventeen points were assigned, prompting respondents to answer categorically with "yes," "no," or "don't know." In the event of a "yes" response, a value of 1 was assigned, whereas "no" and "don't know" were awarded a value of 0. The subsequent guidelines were implemented: Scores reflecting excellent quality (90%-100%), moderate quality (60%-89%), moderate-low quality (40%-59%), and low quality (≤39%) were employed to evaluate the quality of the scores [47].

Data Extraction

After excluding data that did not align with the established criteria using PRISMA, 15 articles were obtained for further analysis. The data were extracted manually using Excel, with important points identified according to the research needs, including:

1. The analysis considered the following variables: author and year, country, types of e-commerce, participants and settings, sample size, study design, and data collection.
2. The results of this study pertain to the determinants that influence the purchasing behavior of pharmaceutical products through e-commerce platforms.

Synthesis Approach

A framework synthesis approach was employed using the Theoretical Domains Framework (TDF) as a predefined analytical framework. Following data extraction, the identified determinants were grouped into conceptually similar categories and mapped to the relevant TDF domains by the primary author (RA). The classification and interpretation of the determinants were subsequently reviewed and discussed with AW and SP throughout the review process to ensure consistency and methodological rigour. Any differences in interpretation were resolved through consensus discussion. The identified TDF domains were then deductively mapped onto the Capability, Opportunity, Motivation–Behaviour (COM-B) model according to the validated relationships proposed by Michie et al. (2011). This approach enabled a structured synthesis of the evidence and facilitated the interpretation of behavioural determinants influencing online medicine purchasing behaviour.

Data Analysis

The study findings will be grouped according to themes in the Theoretical Domains Framework (TDF) and components of the COM-B model (Capability, Opportunity, Motivation-Behavior) [48]. This grouping aims to comprehend the various factors influencing the behavior or practices under study. In addition, the data will undergo a descriptive analysis to identify patterns, identify gaps, and ascertain key findings in the extant literature. This analysis is conducted to present a comprehensive synthesis of the factors that inhibit and encourage behavior based on the TDF and COM-B approaches, so that it can serve as a basis for targeted intervention or policy recommendations.

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Results and Discussion

Search Results

The articles were collected from five reliable sources, namely Scopus (n=4), PubMed (n=13), Science Direct (n=206), Google Scholar (n=202), and Garuda (n=6), resulting in a total of 431 articles. Utilizing the Zotero application facilitated the identification of duplicates among the articles. The application yielded a total of 103 duplicate articles. A manual screening encompassed titles and abstracts, identifying 23 articles that did not align with the established criteria. This process yielded a final total of 305 articles. Subsequently, the articles were meticulously reviewed by thoroughly examining their full texts. This process identified 13 articles that satisfied the study's inclusion criteria. Conversely, a manual search was conducted for articles pertinent to the research, identifying two articles that met the established criteria. This adjustment increased the number of articles subjected to analysis, bringing it to 15.

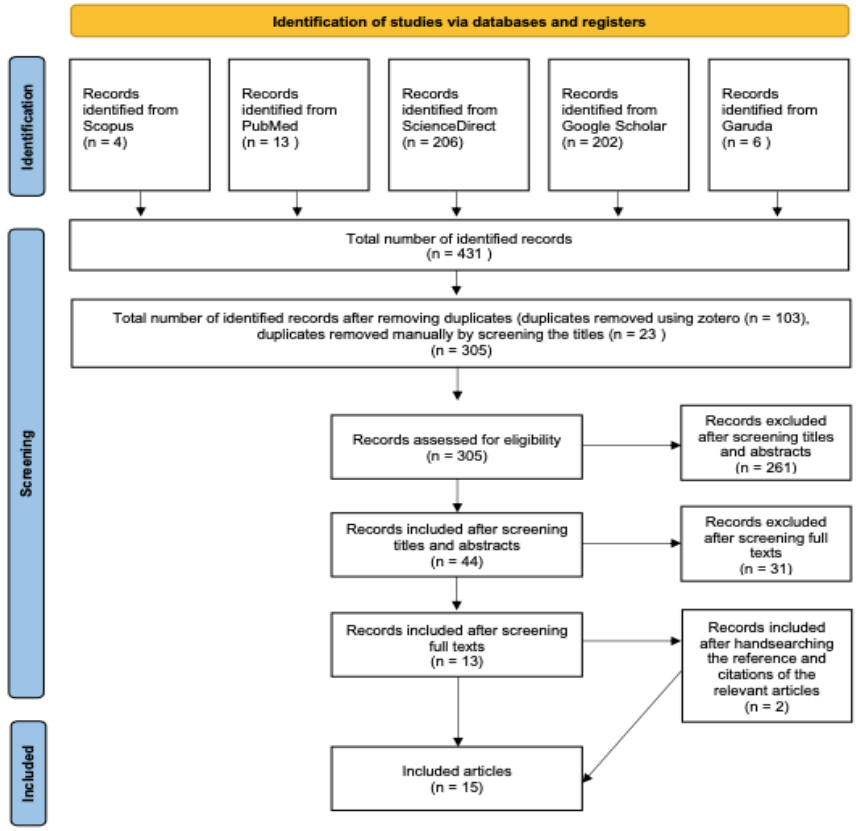

Figure 1: PRISMA flow diagram for study selection

Methodological Quality

According to the present study's findings, which were based on assessments using tailored critical appraisal tools (AXIS for quantitative studies, CASP for qualitative studies, and MMAT for mixed-methods studies), most articles included in this review demonstrated high methodological quality, while only a small number were rated as moderate quality. Studies employing advanced analytical techniques, such as factor analysis and multimethod approaches with physiological validation, generally received high-quality ratings. Although cross-sectional studies predominated the included literature, most demonstrated satisfactory methodological rigor, including clearly defined objectives, appropriate study designs, validated measurement instruments, and adequate statistical analyses. The studies rated as moderate quality were primarily limited by convenience sampling procedures, insufficient response rate reporting, and potential respondent bias. Overall, this assessment supports the methodological robustness of the evidence synthesized in this review.

Study Characteristics

This article employs many approaches in its studies, namely quantitative (n=13), qualitative (n=1), and mixed methods (n=1). These studies are geographically dispersed across multiple Asian, European, and

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American countries. In Asia, the following countries are represented: Indonesia (n=4), India (n=3), China (n=2), Bangladesh (n=1), Pakistan (n=1), and Jordan (n=1). In Europe, Hungary and Germany are represented by one case each, while in America, the United States is the sole country with one case.

Table I: Quality Assessment of Included Studies

Study	Study Design	Appraisal Tool	Score	Quality Rating
Cokro et al. (2023) [8]	Cross-sectional study	AXIS	18/20	High
Bandivadekar (2023) [5]	Exploratory and descriptive study	AXIS	15/20	High
Wang, S. et al. (2022) [38]	Cross-sectional study	AXIS	16/20	High
Sumi, S. F., et al. (2021) [36]	Cross-sectional study	AXIS	17/20	High
Erawati et al. (2023) [10]	Cross-sectional study	AXIS	13/20	Moderate
Ferawati et al. (2024) [12]	Cross-sectional study	AXIS	18/20	High
Baid et al. (2021) [6]	Cross-sectional study	AXIS	17/20	High
Singh et al. (2025) [35]	Phenomenological study	CASP	09/10	High
Purnomo et al. (2021) [32]	Cross-sectional study	AXIS	17/20	High
Lakho et al. (2024) [21]	Cross-sectional study	AXIS	14/20	Moderate
Gharaibeh et al. (2023) [14]	Cross-sectional study	AXIS	18/20	High
Moureaud et al. (2021) [26]	Cross-sectional survey	AXIS	18/20	High
Fittler et al. (2018) [13]	Cross-sectional study	AXIS	19/20	High
Liu J et al. (2020) [24]	Cross-sectional study	AXIS	17/20	High
Ersoz et al. (2023) [11]	Experimental Study	MMAT	95%	High

Table II: Characteristics of Included Studies

Author and Year	Country	Types of e-commerce	Participants and Settings	Sample Size	Study Design	Data Collection
Cokro *et al.* (2023) - [8]	Indonesia	e-marketplaces (Shopee, Tokopedia, Blibli).	Students. Faculty of Medicine and Health Science in Jakarta, Indonesia	n = 95	Cross-sectional study	Online Questionnaire
Bandivadekar (2023) - [5]	India	e-marketplaces (Flipkart, Amazon), Proprietary D2C Pharmacy Platform and Website	Employed, unemployed, self-employed, retired, student. Tier 1 Cities, Tier 2 Cities, Tier 3 Cities in India	n = 529	Exploratory and descriptive study	Online Questionnaire
Wang, S. *et al.* (2022) - [38]	China	e-marketplaces (JD Pharmacy, Dada Nexus, Alibaba Health), and the O2O Pharmacy Platform (Meitun Pharmacy).	Graduate students, undergraduates, junior college graduates, senior high school students, or below. School and University	n = 200	Cross-sectional study	Online Questionnaire
Sumi, S. F., *et al.* (2021) - [36]	Bangladesh	D2C Website	Online pharmacy consumers in Bangladesh	n = 160	Cross-sectional study	Online Questionnaire
Erawati *et al.* (2023) - [10]	Indonesia	e-marketplaces (Shopee, Tokopedia, Blibli).	Lecturers in Semarang	n = 77	Cross-sectional study	Online Questionnaire
Ferawati *et al.* (2024) - [12]	Indonesia	e-marketplaces (Shopee, Tokopedia, Blibli).	Social media users. Metropolitan cities in Indonesia	n = 200	Cross-sectional study	Online Questionnaire
Baid *et al.* (2021) - [6]	India	e-marketplaces (Flipkart,Amazon, Proprietary D2C Pharmacy Platform, and Website	Online pharmacy consumers. in various Indian cities	n = 400	Cross-sectional study	Online Questionnaire
Singh *et al.* (2025) - [35]	India	e-marketplaces (Flipkart,Amazon, Proprietary D2C Pharmacy Platform, and Website	Online pharmacy consumers. in various Indian cities (Delhi, Noida, Gurgaon, Indirapuram, Dwarka, and New Delhi)	n = 12	Phenomenological study	Interview
Purnomo *et al.* (2021) - [32]	Indonesia	e-marketplaces (Shopee, Tokopedia, Blibli).	Consumers who purchased over-the-counter medication online in the last 6 months.	n = 174	Cross-sectional study	Online Questionnaire

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			Jakarta, Bogor, Depok, Tangerang, and Bekasi.			
Lakho *et al.* (2024) - [21]	Pakistan	e-marketplaces (Daraz.pk, Shopistan), Website and Proprietary D2C Pharmacy Platform	Employed. Department of medicine in Karachi-Pakistan	n = 217	Cross-sectional study	Online Questionnaire
Gharaibeh *et al.* (2023) - [14]	Jordan	e-marketplaces (OpenSooq Jordan, Jumia Jordan), Website and Proprietary D2C Pharmacy Platform	Residents of the Hashemite Kingdom of Jordan who are 18 years or older.	n = 425	Cross-sectional study	Online Questionnaire
Moureaud *et al.* (2021) - [26]	United State	e-marketplaces (Amazon, Alibaba, and eBay), D2C Website.	Employed. MTurk (Mechanical Turk)- US	n = 730	Cross-sectional survey	Online Questionnaire
Fittler *et al.* (2018) - [13]	Hungary	D2C Website and e-marketplaces (eMAG.hu)	Outpatients. Southern Transdanubian region of Hungary	n = 1055	Cross-sectional study	Questionnaire
Liu J *et al.* (2020) - [24]	China	D2C Website (J1.Com) and e-marketplace (JD Pharmacy)	Consumer. B2C Online Pharmacy (J1.Com and JD Pharmacy)	n = 107.198	Cross-sectional study	Content Analysis
Ersoz *et al.* (2023) - [11]	Germany	D2C Website (Apotal and DocMorris)	Students. University in Germany	n = 37	Experimental Study	Video Analysis and Questionnaire

The findings of the present study were then analyzed using the COM-B model in conjunction with the Theoretical Domain Framework (TDF) (Figure 2) as a framework for data analysis.

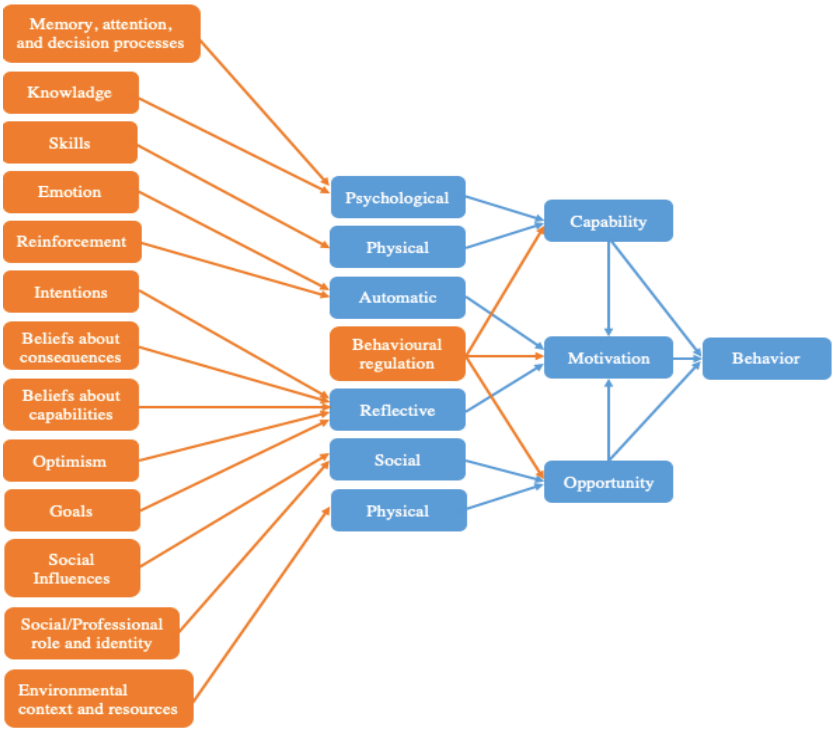

Figure 2: Integration of the TDF and COM-B Model frameworks

This model, created by Michie et al. (2011), highlights three key elements that shape consumer behavior.49 Firstly, "capability" refers to an individual's competence in accessing and utilizing digital platforms. This includes understanding the authenticity of medicinal products and proficiency in navigating e-marketplace features. Secondly, external factors such as drug availability, price promotions, and the level of Trust in online transaction systems can facilitate or hinder purchases. Finally, Motivation is defined as the internal drives consumers experience, categorized as positive (e.g., convenience or competitive prices) or negative (concerns about counterfeit drugs or data leaks). The interplay among these three components determines an individual's propensity to engage in transactions on an e-pharmacy platform.

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This study employs an integrated approach by applying the Theoretical Domains Framework (TDF) to obtain a more in-depth analysis [48]. This analytical framework encompasses 14 interconnected domains, including cognitive, emotional, social, and environmental factors influencing behavior. The integration of TDF facilitates the identification and mapping of various determining factors in a more structured manner, including those that may be less visible in a typical COM-B analysis. This approach expands the study's scope and enhances the analysis of the relationship between factors, particularly for less clear elements in conventional methods. Consequently, TDF offers a distinct advantage in examining the multifaceted elements contributing to behavioral phenomena.

The Theoretical Domains Framework (TDF) combines the COM-B Model to offer a more comprehensive understanding of consumer behavior. By integrating these two models, researchers can ascertain the determinants of behavior via the COM-B model while gaining a more profound comprehension of psychological and contextual dimensions through the TDF. The TDF provides a comprehensive overview of the elements influencing consumer behavior through its 14 analytical domains. Simultaneously, COM-B offers a straightforward foundation comprising three fundamental elements: The triangle of capability, opportunity, and Motivation is essential in analyzing human behavior. Integrating these two methodologies enhances understanding of the interaction between internal and external elements in consumer decision-making [48-49].

Concurrently, extant research has integrated the TDF framework with the COM-B model to meticulously analyze the factors that motivate the online purchase of prescription drugs [46]. This study utilized the model illustrated in Figure 2 to examine the results of prior research that satisfied the inclusion criteria.

Table III: Determinants of Consumer Behavior in E-Commerce Medicine Purchases

Theme	Determinants of Behavior	Study
Accessibility and Convenience	Online access is more convenient	[8]
	Convenient and fast online medicine purchases	[38]
	People who cannot go to a pharmacy can still buy products	[13]
	I can buy medicine outside of pharmacy operating hours	[13]
	I can access products that are not available locally	[13]
	Products can be compared more quickly and easier than at a pharmacy	[13]
	Ease of obtaining medicine	[10]
	Speed and Convenience	[6]
	Buying medication from online sources is easier and faster	[14]
	Perceived ease of use	[36],[12]
	Expectations of effort	[35]
	Ease of online/digital payment	[4]
	Time savings	[4]
Price and Cost-Saving	Medicine price	[38], [10], [35],[21]
	More economical, discounts available on the marketplace	[8]
	Easier to compare medicine prices on the marketplace	[8]
	Cheaper prices or cost advantages	[4]
	Affordable	[24]
	Expensive	[24]
	Medicine purchased online is cheaper.	[14]
	Get the best price (low price)	[26]
Product Availability and Completeness	Medicines are not available at pharmacies	[8]
	Availability of various types of medicines	[8]
	Availability of a wide range of products and ease of comparison	[4]
	Type of medicine	[38]
	Completeness of medicines	[10]
	Availability of branded generic medicines	[26]
	Availability of original branded medicines	[26]
	Can be purchased in large quantities	[26]
Quality of Medicines and Services	Medical information on the marketplace It is more detailed than that from pharmacists	[8]
	Service at pharmacies is unsatisfactory.	[8]
	Quality of after-sales service	[38]
	Level of medicine information provided	[38]
	I get more complete information than at pharmacies	[13]
	I can get better quality products than at pharmacies	[13]

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	Satisfactory effects of medicines	[24]
	Reliable quality of medicines	[24],[10]
	Information about medicines	[10]
	Medicines purchased online have better quality.	[14]
	Obtaining legal/authentic medicines	[26]
User Experience and Platform Design	Informative Platform	[6]
	Website Page Design	[38],[36]
	Website Stability	[38]
	Perceived Usability	[21],[36],[12]
	Performance Expectations	[35]
	Purchase Intent	[36]
Security and Privacy	Privacy and confidentiality of identity	[4]
	Online payment security	[38]
	Concerns about website security	[38]
	Privacy protection	[38]
	Security	[36]
	Trust	[32],[11],[21],[12]
	Can purchase from a trusted source	[26]
	Online pharmacy brand	[38]
Logistics and Shipping Services	Convenient home delivery	[4]
	Accurate logistics distribution	[38]
	Professional Logistics Packaging	[24]
	Complete Logistics Packaging	[24]
	Slow Delivery Speed	[24]
	Slow Transportation Speed	[24]
	Satisfactory Logistics Speed	[24]
	Easy Shipping	[14]
Customer Services and Support	Quick Customer Service Response	[24]
	Customer Services Does Not Resolve Issues	[24]
	Satisfactory Promotions	[24]
	Additional services at affordable prices	[6]
	Responsiveness (emotional response)	[11]
Social Factors and Habits	Social influence	[35]
	Facilitating conditions	[35]
	Habits	[35]
	Buying from sources recommended by people known	[26]
Policies and Insurance	Availability of health insurance reimbursement	[38]
	Availability of policy support for online medication purchases	[38]
Risks and Limitations	Can be purchased without a doctor's prescription	[26]
	Can be purchased without FDA approval	[26]
	Perceived risk	[11],[21]

Determinants of Consumer Behavior in E-Commerce Medicine Purchases

Price and Cost-Saving

In various countries, especially emerging markets, price has been identified as a significant factor influencing online drug purchases. In India and Indonesia, e-commerce platforms such as PharmEasy and Tokopedia Health offer substantial discounts on generic medications, appealing to consumers seeking to reduce their healthcare expenditures [4,12]. Concurrently, within the United States, where prescription drug costs are exorbitant, enterprises such as Mark Cuban's Cost Plus Drug Company are experiencing increased patronage due to their commitment to transparent pricing and modest profit margins.

In middle-income countries such as Bangladesh and Pakistan, significant price discrepancies between online and traditional pharmacies are prompting consumers to transition to digital platforms [21,36]. Nevertheless, unduly low prices can raise concerns regarding product quality, encouraging consumers to become more discerning in their selection of trusted platforms. In addition, several countries have observed a trend of procuring pharmaceuticals from foreign markets as a cost-saving measure. However, this practice is frequently constrained by the stringent import regulations that are in place in many nations [37].

Quality of Medicines and Services

The quality and authenticity of medicines are critical considerations for consumers worldwide. In Germany and Hungary, the European Union's stringent GDP standards ensure that medications sold online meet rigorous safety and efficacy requirements [37]. In contrast, in India and Bangladesh, the prevalence of

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counterfeit or substandard medicines has led consumers to prefer platforms that work with leading pharmaceutical manufacturers and have official certification [16-17].

In Indonesia, the BPOM has implemented a QR code verification system to ensure the authenticity of medicines [53]. Concurrently, platforms such as JD Health and Alibaba Health in China provide a combination of modern and traditional treatments, subject to the stringent oversight of the National Medical Products Administration (NMPA). However, in certain countries, such as Pakistan, illicit pharmaceuticals are prevalent on online platforms, underscoring the necessity for more stringent government oversight.

Security and Privacy

Data security and patient confidentiality are significant concerns in online pharmaceutical transactions. In the United States, e-pharmacy platforms are required to comply with the Health Insurance Portability and Accountability Act (HIPAA) standards to safeguard the confidentiality of customer health information. Simultaneously, under the jurisdiction of the European Union, the General Data Protection Regulation (GDPR) mandates that enterprises must enforce data encryption and transparency protocols for using personal information [17,27-28].

In countries such as Indonesia and Bangladesh, the development of data security awareness remains in its nascent stages [8,36]. A significant proportion of transactions are still conducted through cash on delivery (COD), a practice that poses a risk to buyer security. Furthermore, the absence of robust regulatory frameworks in certain nations renders consumers susceptible to fraudulent activities and data breaches. Platforms offering secure digital payments and transparent privacy policies garner greater consumer trust.

Risks and Limitations

It is important to note that online pharmaceutical purchases are not without risk. These risks include the potential for acquiring counterfeit medications, medications that have surpassed their expiration date, or medicines that do not correspond to the patient's prescription. In India and Pakistan, reports indicate that a significant proportion of drugs sold online are unregistered or do not meet quality standards [16]. In China, stringent restrictions on pharmaceutical imports impede consumer autonomy, while in nations such as Jordan, the acquisition of antibiotics without a prescription has given rise to concerns regarding antimicrobial resistance [14]. Additionally, discrepancies in regulatory frameworks among nations frequently impede cross-border drug procurement [40-41]. To illustrate, substances permissible in one jurisdiction may be prohibited or necessitate specific authorization in another. Consumers must exercise heightened vigilance and ensure that their transactions are conducted through legitimate platforms, in accordance with local legal frameworks.

Accessibility and Convenience

The primary rationale behind the increasing prevalence of online medicine purchases is the enhanced accessibility it offers. In Indonesia and India, services such as Halodoc and 1mg have emerged as innovative solutions, facilitating access to healthcare for consumers residing in rural areas by eliminating the need for extensive travel [4,12]. In the United States, Amazon Pharmacy offers expedited delivery through subscription services, while in Hungary, platforms such as TesztGYOR facilitate same-day delivery [20,13]. However, in countries with underdeveloped infrastructure, such as Pakistan and Bangladesh, medicine supply remains difficult, especially in distant areas [17,36]. Furthermore, the dependence on internet access is a considerable challenge for specific consumers, especially older people, who may possess limited familiarity with digital technologies.

Product Availability and Completeness

Global e-pharmacy platforms have emerged as prominent entities in the contemporary healthcare landscape, exemplified by well-known names such as Amazon Pharmacy and JD Health. These platforms offer many healthcare products, including medications not readily available in physical pharmacies, particularly those classified as "rare medicines." In India, PharmEasy and Netmeds have extensive distribution networks, ensuring the availability of medicines in various regions [52]. However, in countries with stringent regulations, such as China, the availability of imported medicines is significantly constrained.

The supply chain also influences product availability. During the pandemic, numerous countries encountered drug shortages resulting from logistical disruptions. In e-commerce, platforms that demonstrate proficiency in inventory management and collaboration with multiple suppliers exhibit superior capabilities in meeting consumer demands.

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Logistics and Shipping Services

The speed and reliability of delivery have been shown to impact the consumer experience significantly [17]. In China, JD Health offers same-day delivery in major metropolitan areas, while in the US and Europe, services such as Amazon Prime and Zur Rose guarantee delivery within 1-2 days. However, in countries with less developed transportation infrastructure, such as Bangladesh, the delivery of medications often requires a greater investment of time. Furthermore, drug delivery necessitates refrigeration, including vaccines and insulin, which require additional packaging and handling protocols. Platforms that allocate resources to refrigerated logistics and secure packaging garner greater consumer trust.

Policies and Insurance

Integration with health insurance emerges as a pivotal element in the context of online drug purchases [54]. In Germany, most online pharmaceutical purchases are covered by national health insurance. Conversely, in the United States, only a limited number of platforms are integrated with Medicare. In India, specific platforms provide discounted rates for private insurance holders; however, the scope of coverage remains constrained. The clarity of return policies has been demonstrated to influence purchasing decisions. Platforms that facilitate the return of damaged or unsuitable medications are more popular. However, in many countries, return policies for health products remain quite limited due to safety concerns.

It is important to note that only one included study (Wang et al., 2022) empirically examined the role of insurance policies in influencing online medicine purchasing behaviour. The broader discussion on regulatory frameworks, including regulations related to online medicine sales, data protection, and consumer safety, is derived from background literature and supporting references rather than from the systematic synthesis of the included studies. Therefore, the available evidence remains limited regarding the direct influence of specific regulatory frameworks on consumers' purchasing decisions. Future primary research should specifically investigate how different regulatory environments affect online medicine purchasing behaviour across countries and healthcare systems, as this remains an important gap in the current literature.

User Experience and Platform Design

Utilizing user-friendly interfaces and intuitive features has been demonstrated to enhance consumer satisfaction [20,23]. In Indonesia, applications like Alodokter are highly regarded for their user-friendly design. The 1mg platform in India employs artificial intelligence (AI) to provide medication recommendations informed by purchase history. However, overly complex platforms can present significant consumer challenges in countries with limited digital literacy, such as Pakistan and Bangladesh. Consequently, service providers must ensure that their designs are simple and accessible.

Customer Services and Support

In the context of the e-pharmacy industry, responsive customer support has been identified as a critical element. In the United States and Europe, round-the-clock chat, phone, or email service is the norm. The Altibbi platform offers Arabic Support to help local consumers in countries like Jordan. However, in many developing countries, customer service is still limited to certain working hours. Furthermore, a substandard or delayed response can diminish consumer confidence in the platform [2,7,23].

Social Factors and Habits

How individuals procure medicine online is influenced by prevailing social norms and customs. In Muslim countries such as Jordan, sensitive medications, including contraceptives and erectile dysfunction treatments, are frequently procured online, driven by the desire for privacy [14]. In China, Alibaba Health employs livestreaming as a health education tool. In India, reviews and recommendations from online communities play a significant role in consumer decision-making [4]. However, in some countries, such as Hungary, older adults exhibit reluctance to adopt online medicine purchases, likely due to a strong preference for visiting physical pharmacies [13]. It is imperative to educate and socialize the public about the advantages of e-pharmacies to enhance their adoption among this demographic.

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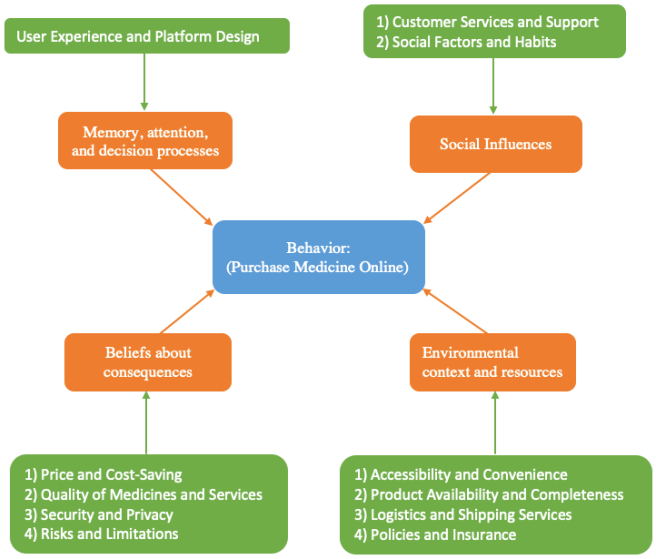

Figure 3: Consumer behavior analysis using the TDF Framework

Based on the Theoretical Domains Framework (TDF), multidimensional interactions between individual, social, and environmental factors influence online medicine purchasing behavior. From a cognitive perspective, consumers' memory, attention, and decision-making processes are shaped by user experience and platform design. Beliefs about consequences also play an essential role, including price, service quality, security, privacy, and potential risks and limitations. In addition, social influences through customer service support, community habits, and social norms also shape consumer preferences in choosing e-pharmacy services. Meanwhile, environmental factors and resource availability, including accessibility, product completeness, logistics services, and regulations and insurance, are additional determinants that facilitate or hinder this behavior. Thus, the decision to purchase medicine online results from a complex interaction structured according to the TDF domain, making a comprehensive understanding of these factors crucial in developing digital pharmacy service strategies.

Beyond identifying the relevant TDF domains, the COM-B model further explains the behavioural mechanisms through which these determinants influence consumers' purchasing decisions. For instance, the theme "Accessibility and Convenience" was primarily mapped onto the TDF domain "Environmental Context and Resources" and the COM-B component "Opportunity," particularly Physical Opportunity. This suggests that consumers are more likely to purchase medicines online when physical barriers, such as travel time, transportation difficulties, and limited pharmacy operating hours, are reduced. In contrast, "Price and Cost-Saving" was mapped onto the TDF domain "Beliefs about Consequences" and the COM-B component "Motivation," specifically Reflective Motivation. This indicates that consumers consciously evaluate the perceived benefits and financial consequences of purchasing medicines online before making a decision. Similarly, themes related to medicine quality, security, and privacy were linked to domains associated with beliefs, trust, and perceived risk, reflecting motivational processes that shape purchasing intentions. These findings suggest that different determinants operate through distinct behavioural mechanisms and therefore may require different intervention approaches. For example, interventions aimed at improving convenience may focus on enhancing delivery services and platform accessibility, whereas interventions targeting price-related determinants may involve subsidy schemes, promotional strategies, or pricing policies.

Study Limitations

It should be noted that most included studies did not differentiate between prescription-only and over-the-counter (OTC) medicines when examining online purchasing behaviour. As a result, many determinants identified in this review were analysed collectively across medicine types. This represents an important limitation because factors such as perceived risk, regulatory requirements, and the need for a physician's prescription may differ substantially between prescription and OTC medicines. Only a small number of included studies explicitly focused on a specific medicine category, such as prescription medicines or OTC products. Therefore, future research should distinguish between these product types to better understand whether the determinants of online medicine purchasing behaviour vary across regulatory and therapeutic contexts.

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Conclusions and Future Directions

The present study demonstrates that many interacting factors, including economic considerations, quality and safety concerns, regulatory frameworks, and social norms, influence consumers' decisions to purchase medicines through e-commerce. A comprehensive understanding of these determinants is imperative for formulating targeted consumer protection policies and digital pharmacy business strategies, ensuring safe, affordable, and standard-compliant access to medicines in various national contexts. Future research is recommended to explore consumer purchasing behavior across different demographic groups and countries, as well as to evaluate the long-term impact of digital health regulations and technological developments on online medicine purchasing practices.

Preliminary evidence suggests that price may be a more dominant factor in Asian developing countries, particularly Indonesia and India, whereas quality, data security, and regulatory considerations were more frequently emphasized in the limited number of studies conducted in developed countries, such as Germany and the United States. However, due to the relatively small number of studies from developed countries and the geographical imbalance of the available evidence, these findings should be interpreted as indicative rather than conclusive. Further comparative research across different regions is needed to better understand potential variations in online medicine purchasing behaviour.

Conflict of Interest

This systematic review did not receive any specific financial support from public, commercial, or non-profit funding agencies. The study was conducted as part of the academic requirements of the Master of Pharmaceutical Management program, Faculty of Pharmacy, Universitas Gadjah Mada. The co-authors provided academic guidance and supervision throughout the research process, including the development of the methodology, data analysis, and interpretation of findings.

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