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Medication safety in the context of self-medication and polypharmacy: A systematic review of prevalence, risk factors, and clinical implications

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ABSTRACT

Self-medication and polypharmacy are major global challenges, with significant impacts on the safety of drug therapy and the rational use of medicines. The increasing access to over-the-counter (OTC) medicines and the prevalence of chronic diseases contribute to the concomitant use of multiple therapies, often without adequate medical supervision. The study aims to systematically assess the prevalence, determinants, and clinical consequences of self-medication and polypharmacy, with a focus on their impact on medication safety. A systematic literature review was conducted using major international databases (PubMed, Scopus, Web of Science, ScienceDirect, Springer, and Wiley) for the period 2020-2025. Studies were selected based on pre-established inclusion criteria, with the analysis focusing on the prevalence, risk factors, and adverse effects associated with self-medication and polypharmacy. The results highlight a high global prevalence of self-medication, ranging from approximately 53% to 74%, with higher values in Asia and Europe. Polypharmacy is prevalent among the elderly population and patients with multiple comorbidities. Both phenomena are associated with an increased risk of adverse drug reactions, drug interactions, inappropriate treatment use, and decreased therapeutic efficacy. The main determining factors include limited access to health services, socioeconomic constraints, previous experiences with medicines, and the wide availability of OTC products. Self-medication and polypharmacy significantly affect the safety of drug therapy and represent major public health problems. Strengthening regulations, patient education, and interdisciplinary collaboration are essential to reduce risks and optimize the use of medicines.

Keywords: polypharmacy, self-medication, excessive drug dosage, interactions

INTRODUCTION

Minor ailments are common, self-limiting, and uncomplicated conditions that are often diagnosed and treated without physician intervention and remain the centerpiece of self-care practices worldwide [1, 2]. Minor ailments are and are likely continue to be a critical contributor to the clinical burden in both developed and developing settings. It was shown that in India, analgesics, antipyretics, antibiotics, and cough remedies were the most common self-prescribed medications [3]. Self-medication and polypharmacy are two interconnected phenomena with significant implications for public health and healthcare systems. Self-medication refers to the practice of individuals administering medications without prior consultation with a healthcare professional, often relying on their own knowledge or unproven recommendations. Self-medication is a form of self-care that has evolved considerably with the development of digital technology [4].

Polypharmacy, on the other hand, involves the concomitant use of a large number of medications, either prescribed or self-administered, which can lead to adverse drug interactions and therapeutic complications. However, self-medication is associated with risks such as misdiagnosis, excessive drug dosage, prolonged duration of use, drug interactions, and polypharmacy. The latter can be particularly problematic in the elderly [5]. The first definition of self-medication was proposed by experts from the World Health Organization (WHO) at the Alma-Ata Conference in 1978 and defines the administration of medicines by consumers to treat symptoms and minor health disorders recognized by themselves [6].

In 1985, in Nairobi at the Conference on the Rational Use of Medicines, the WHO specified:

> "The rational use of medicines requires the prescription of the most appropriate medicine, which is available at the time, at a price that the patient can afford, which is correctly dispensed and which will be administered in appropriate doses at appropriate intervals, for a period

> of time as long as necessary; the medicine must be effective, of acceptable quality and safety" [7].

In 1994, the European Association of Manufacturers of Non-Prescription Medicines replaced the term "self-medication" with "responsible self-medication," since one of the basic characteristics of self-medication is the patient's responsibility for their own health [8]. In Africa, several studies have shown the prevalence of self-medication. Among students living at the Kasapa Campus of the University of Lubumbashi, a prevalence of 99% was found [9]. In Ghana, a study that specifically analyzed self-medication with antibiotics found a prevalence of 70% [10].

In Senegal, Khadim (2020) thus showed a high prevalence (68.9%) of self-medication. A proportion of 46.3% of those who are self-medicated use Facebook or the Internet as a source of information to find the medicines to use. Advice received from these groups referred to hygiene and dietary measures (96.1%), consulting healthcare personnel (54.6%), consulting a traditional healer (50.4%) and administering medication (41.8%) [4]. The practice of self-medication exposes patients to dangers such as overdose, adverse drug reactions (ADRs), unwanted side effects, drug dependence, microbial resistance, and various other health problems, including the risk of masking progressive diseases and increased costs to the healthcare system [11].

Polypharmacy

Despite the increasing prevalence of polypharmacy, there is still no universally accepted definition of the term. A recent systematic review of the various definitions used in the literature found that the term is most commonly associated with the concomitant use of five or more medications. However, there is significant variation in the criteria included, such as duration of treatment and the inclusion or exclusion of over-the-counter (OTC) medications, traditional or complementary medicines. Given the overarching goal of reducing the risks associated with medication administration, it is essential to comprehensively screen all products used by a patient, including both prescribed and OTC medications, as well as alternative and complementary therapies. This holistic approach is fundamental to preventing drug interactions and optimizing patient safety in the context of polypharmacy.

> "Polypharmacy is the concomitant use of multiple medications. Although there is no standard definition, polypharmacy is often defined as the routine use of five or more medications. This includes OTC, prescription, and/or traditional and complementary medicines used by a patient" [12].

Polypharmacy is recognized as a major public health challenge, with a significant impact on both clinical outcomes and healthcare costs. The concomitant administration of multiple medications increases the likelihood of adverse reactions and drug interactions, affecting the safety and efficacy of treatment. Although the use of a numerical threshold to define polypharmacy may be useful in some contexts, it is not always relevant, as there are situations in which the simultaneous use of multiple medications is necessary and beneficial.

A clear example is the secondary prevention of myocardial infarction, which involves the administration of four distinct therapeutic classes: beta-blockers, statins, antiplatelet agents, and angiotensin-converting enzyme inhibitors. Studies show that self-medication is prevalent among all age groups but is particularly common among older people over 65. This population group is often affected by multiple chronic conditions, which leads them to use several medications simultaneously. In the absence of adequate medical supervision, this practice can lead to polypharmacy, with negative health consequences, including the occurrence of adverse reactions and adverse drug interactions.

Self-medication is a widespread phenomenon, characterized by a constantly increasing incidence and difficulty quantify, affecting all age groups, with a sharp prevalence among people over 65 years of age. It is estimated that between 5% and 10% of adolescents and young adults resort to self-medication, while this behavior is reported in an alarming proportion of 20-40% among young children, including infants and those under three years of age.

In this category, therapeutic decisions are predominantly influenced by the mother, who acts as the main "prescriber," a phenomenon amplified by a higher socio-economic status and accumulated parental experience, especially if the child in question is the second or third born in the family.

Another vulnerable group is pregnant women. If precautions are not followed, self-medication can result in adverse maternal and fetal outcomes. In Ethiopia, information on self-medication during pregnancy is scarce, with a prevalence of self-medication being 26.6%, according to [13]. Given the epidemiological scale and serious negative impact of self-medication of analgesics, self-medication is considered a major public health problem [14, 15].

In India, inadequate health services and easy access to a wide range of medicines have significantly increased self-medication rates [16]. Factors such as financial constraints, limited access to healthcare facilities, busy lifestyles, and a preference for convenience make individuals more prone to self-medication practices [17]. Non-steroidal anti-inflammatory drugs (NSAIDs) and anti-allergens are the most commonly used self-medication drugs used, followed by headache, cold, and cough medications [17].

UK government policy increasingly encourages self-management of minor illnesses, including self-medication. Analgesics account for a quarter of UK non-prescription drug sales, but concerns have been raised about their potential for misuse [18].

To address these issues, effective public education strategies on the risks of self-medication and the importance of consulting a healthcare professional before initiating any drug treatment are essential [19]. Clear clinical guidelines for the management of patients with multiple comorbidities are also needed to reduce polypharmacy and ensure effective and safe treatment.

Another factor contributing to self-medication and, implicitly, polypharmacy is uncontrolled access to unvalidated medical information, especially via the Internet. Patients may be tempted to self-diagnose their conditions and administer treatments based on information found online, without consulting a specialist. This practice can lead to therapeutic errors and worsening health conditions.

Due to the widespread availability of these drugs and the risks associated with their incorrect use, as well as the difficulty of contacting a doctor, the implementation and development of effective pharmaceutical care is necessary [20]. In the USA,

young people show a significantly higher intention to self-medicate [21]. This situation requires careful supervision and effective strategies to educate patients in the safe and responsible use of these pharmacological agents.

The greater the number of drugs used, the greater the risk of adverse reactions, including interactions and polypharmacy, being a consequence of the lack of a specialized medical consultation and the dispensing without the need for a medical prescription. Against the background of the increasing prevalence of chronic diseases and demographic aging, the incidence of polypharmacy is continuously increasing globally. In this context, it is imperative to implement effective strategies aimed at raising awareness of the risks associated with inappropriate polypharmacy and developing measures to optimize it.

Prevalence of Polypharmacy

Polypharmacy is a major and growing public health problem, occurring in all healthcare systems globally. The literature documents this phenomenon extensively in countries in North America, Europe, and the Western Pacific Region, and in recent years, increasing data have been collected from other regions of the world. However, comparing data across countries is often difficult due to differences in the structure of healthcare systems, data collection methods, and, most importantly, the lack of a universal definition of polypharmacy. The variability of the criteria used to designate this therapeutic practice makes comparative analysis and the identification of effective strategies difficult at the international level. Therefore, standardization of definitions and harmonization of data collection methodologies are necessary to better understand the impact of polypharmacy on public health and to develop effective interventions aimed at reducing inappropriate use of medicines

Medication Safety in Polypharmacy

Although polypharmacy is most commonly evaluated in relation to systemic medications, the concurrent use of multiple topical therapies represents an often-underestimated component of the overall medication burden. Several studies have demonstrated that topical agents, including corticosteroids, NSAIDs, and ophthalmic preparations, may lead to systemic absorption, particularly when used on large surface areas, damaged skin, or over prolonged periods. For instance, inappropriate use of topical corticosteroids has been associated with systemic adverse effects such as hypothalamic–pituitary–adrenal axis suppression, skin atrophy, and increased susceptibility to infections. Similarly, ophthalmic medications (e.g., beta-blockers used in glaucoma) may induce systemic cardiovascular and respiratory adverse reactions.

Recent studies have emphasized that the combined use of topical and systemic therapies may increase the risk of pharmacodynamic interactions and cumulative toxicity, especially in elderly patients with multimorbidity.

Therefore, topical medications should be systematically included in medication reviews when assessing polypharmacy and medication safety, as they may significantly contribute to ADRs and overall therapeutic risk.

First, the global population is undergoing a major demographic shift, is characterized by an increase in the proportion of older people. Studies estimate that the proportion of the population aged 65 years and over will increase from 8% in 2010 to 16% in 2050, while the percentage of people aged 80 years and over in OECD countries is expected to more than double by 2050.

Second, epidemiological data show that multimorbidity increases significantly with age. A study conducted in Scotland indicated that 81.5% of people aged 85 years and over had multimorbidity, with an average of 3.62 chronic conditions per patient. Ornstein et al. also reported that the most common chronic conditions in primary care are hypertension (33.5%), hyperlipidemia (33.0%), and depression (18.7%). The presence of multiple chronic conditions is often associated with multiple symptomatologic manifestations, functional impairments, and disabilities, which leads to frequent use of multiple concomitant medications.

According to [15], 84.5% of the respondents agreed that self-medication could be harmful and is associated with adverse effects, while 52.6% stated that they would not advise others to indulge in self-medication.

In this context, it is essential to differentiate between appropriate and inappropriate polypharmacy. Appropriate polypharmacy is defined as the concomitant use of multiple medications under the conditions that

(a) all medications are prescribed to achieve clearly defined and agreed therapeutic goals with the patient,

(b) these therapeutic goals are either already met or there is a reasonable probability that they will be met in the future,

(c) drug therapy has been optimized to minimize the risk of ADRs, and

(d) the patient is motivated and able to administer all medications according to therapeutic indications [12].

In contrast, inappropriate polypharmacy is present when one or more drugs are prescribed when they are no longer needed, either because

(a) there is no evidence-based indication, the indication has expired, or the dose administered is unreasonably high,

(b) one or more drugs do not meet the proposed therapeutic goals,

(c) a drug or combination of drugs causes adverse reactions or exposes the patient to an increased risk of such reactions, or

(d) the patients are unwilling or unable to administer one or more drugs according to therapeutic recommendations [12].

The management of polypharmacy requires a multidisciplinary approach, involving close collaboration between physicians, pharmacists, nurses, and other health professionals, as well as the active integration of the patient in the therapeutic decision making process.

Optimizing this process involves implementing mechanisms for periodic treatment review, carried out systematically and collaboratively, thus ensuring the individualization and adjustment of therapeutic regimens according to the patient's needs. In this regard, effective communication between the actors involved and the rigorous exchange of information are essential elements, thus facilitating the use of modern tools, such as electronic medication registries held by the patient.

Over 50% of people over 65 years of age resort to self-medication, a practice associated with risks similar to those encountered in the younger population, but with a significantly higher frequency and severity. This increased vulnerability is due to the presence of multiple comorbidities, frequent poly-medication, and the biological fragility characteristic of the elderly.

The safety of pharmacotherapy in geriatric patients is a fundamental issue in the context of demographic changes, given the continuous growth of this population category. Among the elderly population, factors that favor the excessive use of these drugs include the high prevalence of musculoskeletal disorders, respiratory infections, inflammatory processes, and various types of pain. Thus, polypharmacy is a frequent consequence of the use of these drugs.

Polytherapy often escalates into poly-pragmatic, that is, the medically unjustified, irrational consumption of several drugs. In terms of gender distribution, it has been found that women resort to self-medication approximately twice as frequently as men. Although they generally have a higher level of health education, their adherence to prescribed treatments is often lower. Regarding education, studies show a direct correlation between education level and self-medication, with people with higher education resorting to this practice three times more frequently than other socio-educational categories.

The main groups prone to self-medication include the elderly, women, and people with a high level of education. The motivations for self-medication vary from superficial reasoning, such as associating one's own symptomatology with the diagnosis and treatment of a known person, to more worrying cases, in which the patient overestimates his medical skills and mistakenly assumes the ability to self-treat.

The extent of the phenomenon is worrying. In our country, it seems that 75% of the population admits to taking medication without consulting a specialist.

Causes of the Development of Self-Medication

Over the past decade, the number of OTC drugs has doubled, contributing to a misconception among patients that these products are no longer part of pharmaceutical science, but are simply commercial goods, freely available on the market. This shift in perception reduces awareness of the risks associated with uncontrolled use of these drugs and encourages self-medication.

Another factor that exacerbates this problem is the intense exposure to aggressive advertising in the media. Although the promotion of pharmaceutical products can be beneficial informing consumers, it often leads patients to choose a drug based on a well-known brand name, rather than a correct assessment of the symptoms by a specialist. Thus, the patient relies more on marketing strategies than on an informed medical recommendation.

In addition, uncontrolled access to online platforms containing unfiltered medical information unsupported by scientific evidence is another major source of irrational self-medication. Lack of discernment in selecting information sources can lead to the administration of inappropriate drug combinations, resulting in dangerous interactions and severe adverse effects. In extreme cases, the patient ends up using real "drug cocktails," with potentially fatal consequences.

Self-medication is linked to incorrect dosing, improper administration, prolonged use, addiction, and abuse of substances, including the Internet and friends, encouraging self-management of health and increasing the risk of uninformed choices about medications [22].

Family, friends, neighbors, pharmacist, previously prescribed medication, or suggestions from an advertisement in newspapers or popular magazines are common sources of self-medication [23].

The strategic framework of the WHO's third global initiative on patient safety–"medication without harm"–provides a solid basis for developing integrated policies aimed at improving the safety of medicines and mitigating the risks associated with polypharmacy [12].

Individual Responsibility and Cost Optimization in Self-Medication

In the current context of health systems, reducing the financial burden on the state in terms of reimbursement of medicines is an essential objective. Increasing the degree of responsibility of citizens in maintaining their own health is a strategic direction aimed at optimizing the use of medical resources and improving the sustainability of the pharmaceutical system.

Self-medication, when practiced in an informed and responsible manner, can be a complementary element to medical care, without substituting it. However, patients must refrain from self-medication in situations where they do not have sufficient knowledge about the symptomatology and etiology of the condition, since the improper administration of medications on their own responsibility can worsen the health condition and lead to severe complications.

The fundamental principle of self-medication consists of assuming individual responsibility for one's own health. In this regard, patients must be able to objectively assess their medical condition, recognize the limits of self-administered treatment, and seek specialized medical advice when the situation requires it. If the symptomatology does not improve within 2-3 days or if signs of worsening of the condition appear, medical intervention becomes imperative.

Thus, self-medication must be guided by a balance between patient autonomy and access to adequate medical care, with the ultimate goal of optimizing health status and preventing the risks associated with uncontrolled drug use.

The Role and Objectives of Self-Medication in Optimizing the Health System

In the context of current challenges related to financing and human resources in the health sector, self-medication is a strategy that can contribute to improving access to medical care and reducing pressure on the health system.

The main objectives of self-medication include:

- Rapid and efficient management of the symptoms of minor conditions that do not require the direct intervention of a specialist, thus allowing patients to maintain their well-being without overloading medical services.
- Patient autonomy in treating mild clinical manifestations, thus reducing the number of avoidable medical consultations and, implicitly, reducing pressure on the health system infrastructure.

- Expanding access to treatment, especially for the rural population, where medical resources are often limited, thus facilitating a more effective approach to routine health problems.

Self-medication can be defined as the process by which the patient initiates a drug treatment on their own initiative, using OTC medicines consciously and responsibly. This is not limited to treating the symptoms of minor ailments, but can also include the use of food supplements, vitamins, or other products intended to maintain general health.

In a regulated and controlled framework, self-medication constitutes an essential component of the primary health care system, supporting the efficiency of resources and promoting health education of the population. However, the inappropriate use of non-prescription medicines imposes significant risks, which is why it is essential to correctly inform patients and involve health professionals in guiding this process.

Advantages and Benefits of Self-Medication in the Health System

Self-medication, when carried out responsibly and based on scientifically validated information, can significantly contribute to the optimization of health resources, providing benefits to both patients and medical and pharmaceutical professionals. This practice allows patients to assume an active role in managing their own health, increasing their autonomy and responsibility. At the same time, it facilitates the reduction of time and financial resources required to access medical services by avoiding consultations for minor conditions. Self-medication can also reduce the impact of psycho-emotional factors associated with diagnostic uncertainty, allowing patients to quickly initiate appropriate symptomatic treatment.

From the perspective of physicians, this practice helps optimize time and resources, allowing them to pay more attention to patients who require specialized care, advanced diagnosis, and complex treatments. Reducing consultations for minor conditions gives healthcare professionals the opportunity to focus on high-impact activities in prevention, diagnosis, and treatment. At the same time, healthcare institutions benefit from reduced overcrowding in primary care units and emergency departments, thus contributing to a better allocation of resources and reducing expenses associated with the treatment of minor conditions.

Responsible self-medication helps to reduce treatment costs, personal time, and physician time, i.e., consultation time [18]. Self-medication can be beneficial when practiced responsibly, reducing healthcare burdens and promoting patient autonomy and access to treatment, especially in regions with limited healthcare infrastructure [17].

Although polypharmacy is most commonly evaluated in relation to systemic medications, the concurrent use of multiple topical therapies represents an often overlooked component of the overall medication burden. In routine clinical practice, particularly in dermatology and ophthalmology, patients frequently use several topical agents simultaneously, including corticosteroids, NSAIDs, antiseptics, and emollients. Despite their local route of administration, these products may undergo significant systemic absorption, especially when applied over large body surfaces, on compromised skin barriers, or for prolonged periods, potentially leading to systemic adverse effects. Furthermore, when combined with systemic therapies, topical medications may contribute to additive or synergistic pharmacodynamic interactions, thereby increasing the risk of ADRs.

Consequently, a comprehensive assessment of medication safety in the context of polypharmacy should also incorporate topical treatments as integral contributors to potential drug interactions and overall therapeutic risk.

Pharmacists, in turn, have the opportunity to leverage their expertise by advising patients on the responsible use of OTC medicines, thus strengthening their essential role within the healthcare system. The implementation of the concept of pharmaceutical care is facilitated by providing patients with personalized recommendations and monitoring the correct use of self-medication treatments. At the same time, interdisciplinary collaboration between pharmacists and healthcare professionals is strengthened, contributing to more efficient management of drug therapy and improving the quality of patient care.

MATERIAL AND METHOD

This section presents the sources of information used, the electronic search strategy, the study selection process, methodologies to minimize bias, data extraction methods and additional analyses performed [24]. By presenting this information in detail, the transparency and reproducibility of the study are ensured, providing readers with a clear understanding of the methodology applied, the rigorous criteria used to select relevant studies, and the measures implemented to mitigate any sources of bias. At the same time, this section emphasizes the methodological rigor and scientific integrity of the investigative approach, highlighting the systematic and comprehensive approach adopted in the process of collecting, processing, and analyzing data. Therefore, the detailed description of the methodology is a fundamental element in strengthening the credibility and validity of the results obtained, facilitating both the critical evaluation of the study and its reproduction in similar research contexts.

In this study, a comprehensive search was carried out to identify relevant sources of information. This work was conducted as a systematic review of the literature, in accordance with the recommendations of the preferred reporting items for systematic reviews and meta-analyses (PRISMA) guideline.

Data Sources and Search Strategy

A systematic search was performed in the following electronic databases: PubMed, Scopus, Web of Science, ScienceDirect, Springer, and Wiley. The period analyzed included articles published between January 2010 and December 2024.

The search strategy used combinations of keywords and Boolean operators, such as “self-medication” OR “automedication,” “polypharmacy” OR “polymedication,” “adverse drug reactions” OR “drug safety.” The search was limited to articles published in English.

Studies that met the following criteria were included in the analysis:

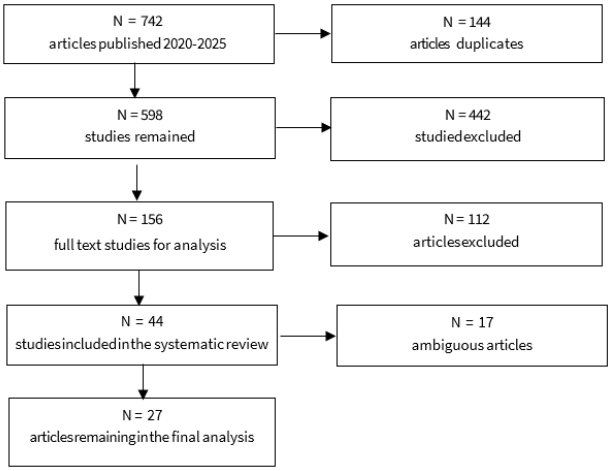

Figure 1. PRISMA 2020 flow diagram illustrating the study selection process (adapted from Page et al. [25], 2021)

- relevant observational, clinical, or meta-analyses studies
- studies investigating self-medication and/or polypharmacy
- studies reporting data on medication safety (adverse reactions, drug interactions, inappropriate use)
- articles published in internationally indexed journals

The following were excluded:

- articles without full text available,
- duplicate studies,
- works without direct relevance to the objectives of the study,
- non-scientific articles (editorials and opinions)

The selection of studies was carried out in three stages:

1. **Identification:** all relevant articles were identified by searching the databases.
2. **Screening:** titles and abstracts were assessed for relevance.
3. **Eligibility:** The remaining articles were fully reviewed for inclusion.

The selection process was carried out independently by three reviewers, and any discrepancies were resolved by consensus.

The systematic search of databases identified a total of 742 articles published between 2020 and 2025. After removing duplicates, 598 studies remained for the screening stage.

After full-text analysis, 112 articles were excluded due to failure to meet inclusion criteria, lack of relevant data, or low methodological quality. Finally, 44 studies were included in the systematic review, but after eliminating ambiguous studies, only 27 were the subject of the analysis in the present study. The study selection process is presented in the PRISMA diagram (**Figure 1**).

Relevant data were extracted using a standardized form, including author and year of publication, country and type of study, and sample size, prevalence of self-medication/polypharmacy, and main outcomes regarding medication safety.

The methodological quality of the included studies was assessed using validated instruments, adapted to the type of study (ex. Newcastle-Ottawa scale for observational studies). Studies were classified according to risk of bias (low, moderate, high). The data were analyzed descriptively by synthesizing the results regarding the prevalence, determinants, and clinical consequences of self-medication and polypharmacy. Given the heterogeneity of the studies included, a quantitative meta-analysis was not performed.

RESULTS AND DISCUSSION

The increase in the number of studies after 2020 reflects the increased interest in self-medication in the context of the COVID-19 pandemic. The analysis of the 27 included studies highlights a high prevalence of self-medication globally, ranging from 53% to over 70%, depending on the region and population studied (**Table 1**). The included studies indicate that self-medication is more common in countries with limited access to health services, and among people with higher levels of education, who tend to have greater confidence in their own medical knowledge.

The included studies also highlight several clinically relevant examples of ADRs associated with polypharmacy and self-medication. Commonly reported reactions include gastrointestinal bleeding related to NSAIDs, hepatotoxicity associated with excessive paracetamol use, and increased risk of antimicrobial resistance due to inappropriate antibiotic use.

In elderly patients, polypharmacy has been linked to falls, cognitive impairment, and hospitalizations due to drug-drug interactions. Additionally, the concomitant use of sedatives and antihypertensive agents may lead to hypotension and increased fall risk.

These findings emphasize the importance of careful medication review and monitoring, particularly in vulnerable populations. Polypharmacy is prevalent among the elderly population and patients with multimorbidities, being significantly associated with an increased risk of ADRs and pharmacological interactions. The analyzed cohort studies highlight a correlation between the concomitant use of several medications and increased mortality. The determinants of self-medication include the increased accessibility of non-prescription drugs, the high costs of medical services, previous experiences, and the influence of the social environment. In the context of the COVID-19 pandemic, a significant increase in self-medication was observed, driven by limitations in access to health systems.

The results of this systematic review highlight that self-medication and polypharmacy are major public health problems, with a high prevalence globally and significant implications for the safety of drug therapy. The prevalence range of self-medication (approximately 53%-70%) identified in the reviewed studies is consistent with recent literature and reflects an upward trend, accentuated in the context of the COVID-19 pandemic.

An important aspect highlighted by the studies is the influence of socioeconomic factors and access to health services on self-medication behavior. In regions with limited access to health care or high costs of consultations, patients tend to resort to self-medication more frequently. At the same time, a high level of education is not always a protective factor, with some studies indicating a correlation between medical knowledge and the tendency to self-administer treatments.

Table 1. Characteristics of studies included in the systematic review

No	Author	Year	Country	Study type	Magazine	Main results
1	Quincho-Lopez et al.	2021	Peru	Transverse	Therapeutic Advances in Drug Safety	Self-medication > 60% during pandemic
2	Auta et al.	2020	Global	Systematic review	Journal of Antimicrobial Chemotherapy	Self-medication with antibiotics is high
3	Pazan Farhad et al.	2021	Global	Systematic review	Springer	Polypharmacy, multimorbidity, older adults, health outcomes, inappropriate prescribing
4	Midão et al.	2023	Europa	Systematic review	Age and Ageing	High prevalence in the elderly
5	Khezrianet al.	2020	UK	Systematic review	Drugs & Aging	Frequent interactions
6	Alhomoud et al.	2024	Saudi Arabia	Transverse	Journal of Clinical Pharmacy	Dominant social factors
7	Alrasheedy et al.	2021	Saudi Arabia	Transverse	Saudi Pharmaceutical Journal	Self-medication > 70%
8	Guillot et al.	2020	France	Systematic review	Theraphyes	A general overview of definitions, descriptions and determinants
9	Drusch et al.	2021	France	Transverse	BMC Geriatrics	Trends in decreasing potentially inappropriate medication in older people
10	Bhagavathula et al.	2021	USA	Systematic review	Frontiers in Pharmacology	Prevalence of polypharmacy and hyperpolypharmacy
11	Shehnaz et al.	2021	India	Transverse	Pharmacy Practice	High student self-medication
12	De la Cruz and Fredy	2021	Peru	Transverse	BMC Public Health	Associated with limited access
13	Fadare et al.	2021	Nigeria	Observation	Journal of Pharmaceutical Policy and Practice	Increased ADRs
14	Kassie et al.	2021	Etiopia	Transverse	BMC Public Health	Frequent self- medication
15	Hyea Bin Im et al.	2024	Korea	Meta-analysis	BMCJ Global Health	Self-medication during pregnancy, herbal medicine
16	Bare et al.	2022	Spain	Observation	BMC Geriatrics	Drug interactions
17	Albusalih et al.	2022	Jordan	Transverse	Risk Management and Healthcare Policy	Socioeconomic factors
18	Yllescas et al.	2021	Peru	Descriptive study	Universitatea Națională din San Luis Gonzaga	High urban self-medication
19	Onchonga et al.	2020	Kenya	Transverse	Pan African Medical Journal	COVID self-medication
20	Sefah et al.	2025	Ghana	Observation	Antibiotics	Using antibiotics without a prescription
21	Elayeh et al.	2020	Jordan	Transverse	PLoS ONE	Self-medication during a pandemic
22	Wegbom et al.	2021	Nigeria	Transverse	Pan African Medical Journal	High prevalence
23	Ruiz	2021	Argentina	Systematic review	Research in Social and Administrative Pharmacy	Global impact of self-medication
24	Belo et al.	2021	Portugal	Transverse	International Journal of Environmental Research and Public Health	Educational factors
25	Tan et al.	2022	Malaysia	Transverse	Healthcare	Frequent self- medication
26	Ahmed et al.	2020	Bangladesh	Transverse	PLoS ONE	COVID self-medication
27	Shrestha et al.	2021	Nepal	Transverse	BMC Public Health	Limited access, self- medication

Regarding polypharmacy, it is prevalent among the elderly population and patients with multiple chronic diseases. The included studies consistently show an association between polypharmacy and increased risk of ADRs, drug interactions, and even mortality. These results emphasize the need for careful monitoring of drug therapy and an individualized approach to treatment. The analysis also highlights the significant role of self-medication in the inappropriate use of antibiotics, contributing to the increase in antimicrobial resistance, a major global health problem. The wide availability of non-prescription drugs and the influence of the social environment (family, pharmacies, mass media) are important determinants in this context. Compared to other synthesis studies, the results obtained confirm global trends and strengthen the evidence on the negative impact of self-medication and polypharmacy on patient safety. At the same time, the present work brings an updated perspective, focused on the post-2020 period, highlighting the behavioral changes generated by the pandemic context. The most frequently used therapeutic classes in self-medication are analgesics, antipyretics, antibiotics, and antihistamines. Their inappropriate use is associated with significant risks, including the development of antimicrobial resistance and the occurrence of adverse reactions. Overall, the results highlight the fact that self-medication and polypharmacy represent major risk factors for the safety of drug therapy, with important implications for public health. Self-medication is a major public health challenge globally, with significant implications for patient safety and the rational use of medicines. In this context, India stands out with a prevalence rate of 64.4%, which is considerably higher than the 54% previously reported in a meta-analysis by Rashid et al. These data highlight the geographical and contextual variability of the phenomenon, underscoring the need for tailored intervention strategies to appropriately manage self-medication and its associated risks [17]. This rate closely aligns with the global prevalence of 67% [22]. Globally, the prevalence of self-medication varies significantly, influenced by cultural, economic, and regulatory factors.

According to reported data, self-medication rates are 71% in Asia, 74% in Europe, 60% in South America, and 56% in Africa [22]. In contrast, Iran and Ghana have lower rates of 53% [26, 27] and 54%, respectively [28]. These disparities can be attributed to differences in cultural norms, socioeconomic status, accessibility and quality of healthcare infrastructure, and the degree of regulation and availability of OTC medicines. These variables highlight the need for differentiated and tailored policies in each national context to effectively manage self-medication and its associated risks [29, 30].

For example, the absence of prescription requirements in some African countries allows for unrestricted purchase of medicines, promoting self-medication [31, 32]. Furthermore, high medical consultation fees and limited health insurance coverage further encourage self-treatment behaviors [33]. Addressing these issues requires comprehensive interventions to promote responsible use of medicines and improve access to quality health services.

Subgroup analyses revealed several important aspects regarding the prevalence of self-medication. In the contexts of most developing countries, including Ethiopia, it is difficult to elucidate the prevalence of medication use during pregnancy and its relative contributions to birth defects [31]. The Northern Region of India had the highest rate of self-medication, while the Eastern Region reported the lowest prevalence. However, the absence of significant differences in subgroup analysis suggests that the determinants of self-medication extend beyond geographical variations, including socioeconomic, cultural, and educational aspects [34]. Numerous studies have shown that students, especially those in the medical sciences, exhibit a heightened tendency towards self-medication due to exposure to medical information, a phenomenon consistently observed in various research settings [34-37].

The majority of medical students, 65.87%, are self-medicated due to their pharmacology knowledge, in contrast to 62.1% of pharmacy students [35]. Time trend analysis reveals a higher prevalence of self-medication before 2016, followed by a progressive decrease in the following years, suggesting possible improvements in public awareness, access to health services, or the effectiveness of regulatory measures implemented during this period. Furthermore, the discrepancies observed between studies with small samples, which reported higher rates, and those with large samples, where prevalence was lower, underline the importance of considering sample size when interpreting epidemiological results on self-medication.

The lower prevalence reported in studies with large sample sizes may be attributable to a more heterogeneous population, including individuals with improved access to health services and higher levels of health literacy. In contrast, studies with smaller sample sizes may overestimate the prevalence of self-medication, reflecting specific characteristics of the investigated groups, such as economic vulnerability, limited access to health care, or greater reliance on community pharmacies.

The widespread practice of self-medication in India is driven by a complex interplay of cultural, economic and systemic factors in the health infrastructure. Cultural traditions play a significant role in shaping perceptions of health and illness, often leading individuals to view certain conditions as minor and self-limiting. Social norms often discourage seeking medical care for perceived minor problems and favor the use of traditional remedies, passed down from generation to generation. Previous positive experiences associated with managing similar conditions without specialized medical intervention reinforce this behavior, contributing to the perpetuation of self-medication at the population level.

A significant number of individuals choose to self-medicate rather than seek professional medical care, perceiving this practice as an acceptable and effective alternative [35, 38]. This preference is supported by the belief that many common conditions can be managed independently, without the intervention of a health professional. Moreover, time constraints and the need for rapid improvement frequently lead to the resort to self-medication, which is perceived as a convenient and affordable solution. Factors such as busy schedules, long waiting times for medical consultations, and the difficulty of accessing health services in certain regions contribute to reinforcing this trend.

In addition, economic barriers are a major determinant of self-medication, especially among low-income populations. The costs associated with medical consultations, specialist investigations, and prescribed treatments can be a significant barrier, leading individuals to resort to direct purchase of medicines, especially those available without a prescription [35, 38]. Thus, financial constraints amplify the tendency to self-medicate, contributing to the frequent use of this practice in a global context.

Self-medication has emerged as a perceived more accessible and cost-effective alternative for the management of various conditions, especially in the context of overburdened health systems and existing financial barriers [37, 39].

In addition, the rapid expansion of social networks and digital platforms has facilitated access to medical information, transforming the Internet into a primary source of consultation for a growing number of individuals. This trend has led to a significant change in patient behavior, with many of them preferring to seek answers online rather than seeking guidance from a healthcare professional [17, 30]. As a result, the phenomenon of self-diagnosis and self-treatment has seen an alarming increase, as individuals rely excessively on information available on the Internet to make therapeutic decisions. However, this practice is associated with an increased risk of inappropriate use of medications, favoring uncontrolled self-medication, and lacking the supervision of an authorized medical professional.

Individual decisions regarding self-medication are often influenced by past experiences and subjective perceptions of the efficacy of previously used treatments. Confidence in the knowledge gained through repeated exposure to certain medications leads many individuals to resort to this practice without seeking specialist medical advice [35, 40].

A key factor facilitating self-medication is the widespread availability of OTC medications and permissive regulations in many jurisdictions. Thus, many pharmacies dispense prescription medications without requiring a valid medical document, treating them de facto as OTC products. This practice expands unauthorized access to pharmaceutical treatments, favoring self-medication and increasing the risks associated with inappropriate medication use [16].

In addition, limited access to health services, especially in rural areas, is another determinant of self-medication. Geographical barriers, poor infrastructure, and the limited availability of medical personnel make it difficult for the

population to access appropriate consultations and treatments, leading to the resort to self-administered solutions. In contrast, in urban areas, the more developed medical infrastructure and the proximity of health facilities reduce the need for self-medication, although the phenomenon persists among certain categories of the population, especially for economic reasons or lack of time.

Decisions regarding self-medication are often influenced by advice received from friends, relatives, or family members, who base their recommendations on personal experiences [41, 42] or subjective beliefs. In addition, previous medical prescriptions are frequently used as reference points for the management of recurrent episodes of certain conditions, which contributes to the perpetuation of self-medication without adequate medical supervision [43].

Furthermore, individuals tend to base their therapeutic choices on empirical knowledge gained through previous experiences with various drugs or on their general level of awareness regarding their use. However, this reliance on non-professional sources raises significant concerns regarding the accuracy, validity, and safety of the information used [43, 44]. The lack of critical evaluation of information sources and the absence of medical expertise can lead to incorrect drug administration, potentially dangerous drug interactions, and worsening of patients' health.

Our analysis shows that analgesics, antipyretics, antibiotics, and antitussives are the most commonly used therapeutic classes in self-medication globally, which is supported by numerous studies [17, 45].

Analgesics, such as paracetamol and ibuprofen, are commonly administered to relieve pain and discomfort associated with common conditions, including headache, myalgia, and dysmenorrhea [46, 47]. Similarly, antibiotics are widely used to treat perceived minor infections, although self-medication with these substances carries considerable risks, such as the development of antimicrobial resistance and the occurrence of adverse effects associated with inappropriate use [44, 35].

Antipyretics, including aspirin and paracetamol, are also commonly used to reduce fever, a common symptom of various infectious diseases [48]. Antihistamines are frequently administered to manage symptoms of colds and coughs, contributing to the high prevalence of self-medication among the population [49, 50]. The easy availability of these drugs as OTC products, coupled with poor regulation of their sale in many regions, is a factor that encourages and perpetuates this practice [38].

To mitigate the risks associated with self-medication, it is imperative to implement strategic and multidimensional measures. Strengthening the regulation of the use and distribution of medicines, especially antibiotics, is a key priority to ensure their rational and responsible use [51]. This involves strengthening controls on the marketing of antibiotics and OTC medicines, so that uncontrolled access to these products is limited, thereby reducing the risk of misuse [30, 52].

Expanding and strengthening public education campaigns also play a key role in promoting the appropriate use of medicines and discouraging self-medication [52]. These campaigns should be integrated into national public health strategies and tailored to specifically target vulnerable groups, including rural populations and disadvantaged socio-economic groups. Building existing initiatives within the National Health Policy and expanding them through a community-based approach can significantly contribute to raising awareness and changing behaviors related to self-medication. In addition, improving access to quality health services, especially in rural and remote areas, is imperative to provide viable alternatives to self-medication [52]. This involves not only expanding health infrastructure but also implementing measures to facilitate the population's access to medical consultations, including through telemedicine and digital health initiatives. Thus, an integrated approach, based on regulation, education, and improved access to health services, can limit the phenomenon of self-medication and reduce the associated risks.

These findings are consistent with previous studies highlighting the risks associated with topical and systemic polypharmacy [53, 54].

Polypharmacy is increasingly recognized as a complex clinical challenge that extends beyond systemic therapies, encompassing also the concomitant use of topical medications, which may contribute to cumulative drug exposure and interaction risk. Evidence suggests that topical treatments, particularly corticosteroids and ophthalmic agents, can induce both local and systemic adverse effects and may interact with systemic therapies, thereby amplifying the overall risk of ADRs in patients with multimorbidity [54, 55].

Overall, the results highlight the need to implement integrated strategies that include patient education, stricter regulation of access to medicines, and the active involvement of healthcare professionals in monitoring their use.

CONCLUSIONS

Optimizing the management of polypharmacy requires a thorough review of care paradigms and a restructuring of medical services, so that the therapeutic burden of health professionals is distributed efficiently, while ensuring patient safety. In an increasingly dynamic medical context marked by multiple challenges, a holistic assessment of the clinical, safety, and economic consequences of polypharmacy is imperative. In this regard, the application of innovative strategies based on the principles of change management can contribute to the optimal use of therapeutic resources and to reducing the negative impact of polypharmacy on public health.

Self-medication, when regulated and integrated into an adequate supervisory framework, can constitute an auxiliary element in the health system, facilitating access to treatments for minor conditions and contributing to the decongestion of medical services. However, inappropriate use of medicines, especially in the absence of medical advice, poses significant risks, including adverse reactions, drug interactions, and the development of antimicrobial resistance. Therefore, it is essential to develop and implement coherent health education policies and regulations to access medicines available without a prescription.

Although it is difficult to eliminate self-medication, effective measures can be taken to discourage this practice. Promoting open dialogue and effective collaboration between patients and healthcare professionals can facilitate access to personalized medical advice, thereby reducing the tendency towards self-medication. This strategy not only optimizes the

use of medicines but also contributes to strengthening patients' trust in the healthcare system, facilitating access to appropriate and safe care.

Adopting an integrated strategy, combining strict regulations on the distribution of medicines, extensive health education programs, and measures to improve access to medical services, can have a significant impact on reducing the phenomenon of self-medication. In addition, the active involvement of health professionals in counseling patients and promoting responsible behavior in the use of medicines is an essential aspect to minimize the risks associated with the inappropriate consumption of pharmaceutical products.

By implementing such complementary measures, the incidence of inappropriate self-medication can be significantly reduced, contributing to improving clinical outcomes and protecting the long-term health of the population.

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