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Review Paper

Evidence of factors influencing self-medication with antibiotics in low and middle-income countries: a systematic scoping review

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ABSTRACT

Objectives: Self-medication with antibiotics (SMA) is a practice of global concern with a higher incidence within the low- and middle-income countries (LMICs). Despite worldwide efforts to control and promote the rational use of antibiotics, the continuing practice of SMA systematically exposes individuals and communities to the risk of antibiotic resistance and a host of other antibiotic side-effects. This systematic scoping review maps evidence on the factors influencing SMA in these settings.

Study design: Systematic scoping review.

Methods: The search strategy involved electronic databases including PubMed, Web of science, Science Direct, EBSCOhost, Google Scholar, BioMed Central, and the World Health Organization Library. PRISMA P guidelines and Arksey and O'Malley's framework were used. Thematic analysis was used to identify the factors that influence the practices of SMA in LMICs. The Mixed Method Appraisal Tool (MMAT), version 2011, was used to assess the quality of the included primary studies.

Results: Fifteen studies met the inclusion criteria. Studies included participants from the following LMICs: Guatemala, India, Indonesia, Kenya, Laos, Nepal, Nigeria, Pakistan, Sri Lanka, and Yemen. The findings of the review emphasized a considerable high prevalence of SMA, ranging from 8.1% to 93%, with an association with the level of education, monthly income, and gender of participants. Accessibility, affordability, and conditions of health facilities, as well as the health-seeking behavior, are factors that influence SMA in LMICs. Health conditions such as a sore throat, common cold, cough, headache, toothache, flu-like symptoms, pain relief, fever, runny nose, toothache, upper respiratory tract infections, and urinary tract infection were the major complaints that led to the practices of SMA.

Conclusions: There is a considerable level of research evidence predominantly in some LMICs from Asia, with less evidence from African LMICs. Sociocultural determinants of health associated with the structure and conditions of health system as well as the health-

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seeking behavior are the main factors influencing SMA. Contextual and comprehensive studies on the factors influencing the non-prescribed use of antibiotics are needed to enable evidence-based strategies to correctly address the utilization of antibiotics and contain the problem of antimicrobial resistance, especially within the LMICs.
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Background

Self-medication with antibiotics (SMA) has become a significant factor driving antibiotic resistance. Studies have consistently documented inappropriate and excessive use of antibiotics as the chief contributing factors causing the emergence and selection of resistant bacteria.[1–3] SMA also represents one of the most important worldwide issues for global public health and for patient safety.[2,4–6] The inappropriate use of antibiotics, such as for self-medication practices, may lead to the development of bacterial resistance, morbidity, rising costs of healthcare services, and the development of side-effects.[7]

Antibiotic resistance impairs the ability to treat common bacterial infections and is thus a major threat to public health, especially within low- and middle-income countries (LMICs).[3,8,9] The World Health Organization (WHO) alerts that in LMICs, about 80% of antibiotics are used in the community, of which about 20–50% are used inappropriately.[8] It has also been reported that more than two-thirds of antibiotics available in the pharmaceutical sector in LMICs are used for self-medication.[8] LMIC settings are facing huge challenges such as poor health systems, poor supervision and control of antibiotics, poor prescribing and dispensing practices by healthcare workers, and non-compliance with guidelines for antibiotics dispensing.[7] In consideration of the global threat and the consequences, as well as the implications of antimicrobial resistance (AMR), governments are concerned with the indiscriminate use of antibiotics and increasing practices of SMA.[3,4,8]

Over the past few decades, aroused by the alertness to a postantibiotic era, studies on the population's utilization of antibiotics have increasingly caught the attention of researchers. Several studies from LMICs have investigated the dynamic of SMA from the user's perspective by investigating factors, practices, and reasons behind SMA.[10–13] Although the WHO has declared antibiotics a prescription-only medicine (POM), literature demonstrates that sociocultural, behavioral, economic, and health system–related factors are influencing practices of SMA in LMICs. In this study, SMA is defined according to the WHO as 'the acquisition of antibiotics and self-administering them (or administering them to a child), with the aim of treating a perceived infection, and intermittent or continued use of the prescribed drug for chronic or recurrent diseases without the advice of a qualified health professional.'[8]

Bilal et al.[11] and Shah et al.[14] agree that SMA practices are worryingly common in LMICs and are often influenced by a variety of factors. Several authors identified three main factors undermining the correct utilization of antibiotics: (a) sociocultural factors such as past successful use, the idea of self-care, good knowledge of antibiotics, advice or influence of a relative or friend, and health-seeking behavior; (b) health system–related factors such as long delays at clinics/hospitals, lack of trust in health facilities and workers, non-compliance with prescribing and dispensing regulation, and easy access of antibiotics; and (c) economic factors such as individual and family income as well as time and money saving.[7,15–19] To better address the problem of SMA, concerted efforts are being made by health authorities in LMICs to consolidate the pharmaceutical sector by strengthening regulation and inspection of drugs and conducting health education programs to raise public awareness.[3]

Considering the challenges SMA poses to accessibility, affordability, and availability of antibiotics, the existing literature indicates the need to understand the phenomena of SMA.[7,16,20–22] This can be done by considering the diverse factors facilitating the access to antibiotics for self-medication and the different sources of antibiotics. This has the potential to enable development of evidence-based approaches on antibiotic stewardship and management in LMICs.

The research question that guides this study is what is known from existing literature on factors influencing SMA in LMICs? Therefore, this scoping review aims at mapping evidence on the factors influencing SMA in LMICs.

Objective

To map evidence of factors influencing the practice of SMA in LMICs and identify research gaps.

Methods

Search strategy and selection criteria

Authors undertook a systematic scoping review of the factors influencing SMA in LMICs as part of a large study aimed at investigating the factors influencing the practices of SMA in the general population in Maputo, Mozambique. In this review, LMICs are defined according to the World Bank (WB) classification. As stated by the WB, for the current 2019 fiscal year, low-income countries are defined as those economies with a gross national income (GNI) per capita of $995 or less in 2017, whereas lower middle-income countries are those economies with a GNI per capita between $996 and $3895. The term country refers to any territory for which authorities report separate social or economic statistics.[23]

The scoping review protocol[24] was developed, registered, and published in the international prospective register of systematic reviews (PROSPERO), *a priori* and is accessible via the following link:[52]

A systematic scoping review is a type of evidence synthesis method aimed at mapping the range of literature that exists around a specific topic of interest and focuses the research questions by charting the existing research findings and identifying research gaps. Scoping methodology is also considered a useful approach for determining the need and value of a future primary (in-depth study) or a full systematic review.[25] The study was guided by a scoping review framework and conforms to the Preferred Reporting Items for Systematic reviews and Meta-Analysis (PRISMA) guidelines by Arksey and O'Malley.[25] The population, intervention, comparison, and outcome (PICO) framework for determining the eligibility of the studies for the primary research question is presented in Table 1.

Literature search

We conducted a systematic literature search from the following databases: PubMed, EBSCOhost, Web of Science, Science Direct, Google Scholar, and World Health Organization Library. The database search occurred from July to December 2017 using the following keywords: 'self-medication', 'antibiotics', 'factors', 'reasons', and 'Self-Medication with Antibiotic'. Boolean terms (AND and OR) were used to separate the keywords. Medical Subject Headings (MeSH) terms were also included.

Study selection occurred in three stages. In the first stage, one reviewer screened the titles from the databases with guidance from the eligibility criteria. After title screening, one independent reviewer and the main author (N.G. and N.F.T.) screened the abstracts. There were no discrepancies in reviewers' responses at this stage. Finally, for a full-article screening, another independent reviewer joined the main author (B.C. and N.F.T.), and discrepancies were resolved by including a third reviewer (N.G.). The remaining articles were then assessed for eligibility for data extraction. A PRISMA flow diagram (Fig. 1: literature search and selection of studies) shows the process involved in obtaining eligible studies.

Table 1 – Framework for determining the eligibility of research questions (PICO).

Criteria	Determinants
Population	Adults
Intervention	Self-medication with antibiotics
Comparison	Not applicable
Outcomes	Primary outcomes: Prevalence, factors, and reasons for SMA and related health conditions Secondary outcomes: Source of antibiotics and commonly used antibiotics,
Setting	Low and middle-income countries

PICO, population, intervention, comparison, and outcome; SMA, self-medication with antibiotics.

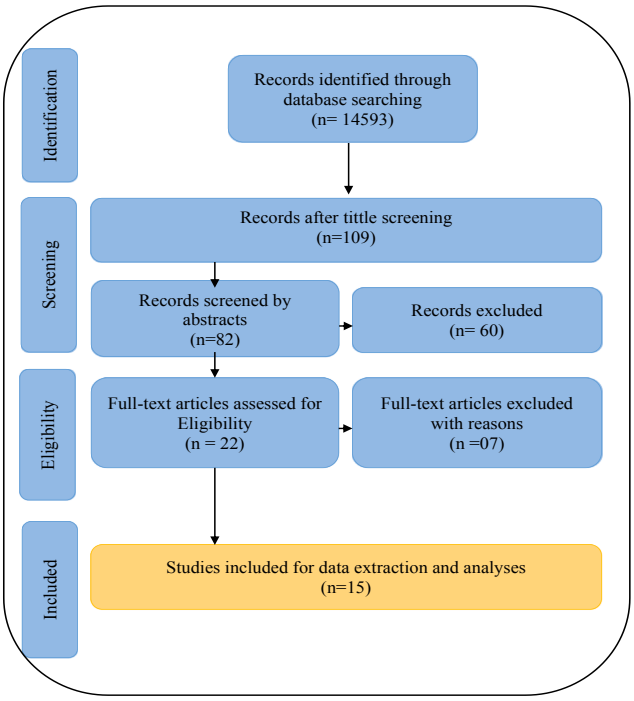

Fig. 1 – PRISMA flow diagram of study selection. PRISMA, Preferred Reporting Items for Systematic reviews and Meta-Analysis.

Inclusion criteria

- Evidence of prevalence of SMA in adults;
- Evidence of factors and practices of SMA;
- Evidence of reasons for SMA;
- Evidence of commonly used antibiotics;
- Evidence of common symptoms leading to SMA;
- Evidence of source of antibiotics.

Exclusion criteria

- Studies that do not report on the primary outcomes of the study;
- Studies that were published before 2007;
- Studies evidencing intervention on the utilization of prescribed antibiotics;
- Studies that included people younger than 18 years.

Study selection

We followed the outlined stages of study selection guided by the aforementioned eligibility criteria. First, we conducted a title screening, whereby one reviewer screened the titles from the databases. Eligible titles, ready for abstract and full-article screening, were then exported to the EndNote Library. Second, after title screening, two independent reviewers (N.F.T. and N.G.) applied the eligibility criteria for abstract screening of articles. Third, after abstract screening, two independent reviewers (N.F.T. and B.C.) conducted full screening of articles. Discrepancies between reviewer's responses at the full-article-screening stage were resolved by involving a third reviewer (N.G.).

Quality assessment

All included studies underwent a quality assessment by the use of a Mixed Methods Appraisal Tool (MMAT), version 2011.[26] Two reviewers (N.F.T. and B.C.) assessed the quality of evidence of the included studies, and results were communicated. The studies were assessed in the following domains: clarity of the research questions, relevant resources to address the objective, relevant process of data analysis, the relation between the finding and the context, and relevance of the findings. An overall quality percentage score for each of the included studies was calculated, and scores were interpreted as low quality (≤50%), average quality (51–75%), and high quality (76–100%). The total quality scores in this study ranged from average- to high-quality studies.

Data extraction

Data were extracted from included studies after they were thoroughly read to enable us to characterize studies included in this review. Relevant information related to the research questions was extracted using a standardized data extraction sheet. We extracted data from the following domains: author and year, study setting, population, gender, intervention, the aim of the study, study design, diseases or conditions leading to SMA outcomes, and key findings.

Collating and summarizing the findings

Thematic analysis was performed to identify evidence of the factors influencing SMA from the included studies. In extracting themes from the included studies, NVivo, version 11, was used. The thematic content analysis was then performed to answer the research questions of the study. The following themes emerged:

- Prevalence of SMA;
- Factors influencing SMA;
- Reasons for SMA;
- Health conditions related to SMA.

Results

Screening

A total of 14,593 articles were retained from our initial search through databases. Applying our exclusion criteria, the number of articles was reduced to 82 in which abstract screening was undertaken (Fig. 1). A total of 60 studies were excluded as they did not meet the study's inclusion criteria. Therefore, a total of 22 studies were included for full-article screening, which resulted in the inclusion of 15 studies for data extraction. After full-article screening, the degree of agreement between screeners was 72.73% agreement vs 74.79% expected by chance, which constitutes a high agreement (Kappa statistic = 0, *P*-value> 0.05). McNemar's chi-square statistic suggests that there is no statistically significant difference in the proportions of yes/no answers from the reviewer. Results of the article screening are presented in Fig. 1. After full-article screening, seven studies were found to have no valuable data for analysis in this study for the following reasons: one study was not within the specified time frame,[27] four studies were from upper-middle- or high-income countries,[28–30] one study had no outcomes of factors influencing SMA,[19] and another one was a dissertation.[18]

Characteristics of included studies

Fifteen out of the 22 reviewed articles were eligible for data extraction. All included studies were carried out in LMICs and published between 2007 and 2017. More than half of the included studies were from the Asian continent, namely India, Indonesia, Laos, Nepal, Pakistan, Sri Lanka, and Yemen,[11,14,31–37] four of the included studies were from the African continent, Kenya and Nigeria,[10,12,13,38] and two from Latin America, Guatemala.[39,40] Regarding the settings of the studies, seven of the included studies were conducted in urban settings,[12,14,31,34,37,38,40] five were carried out in rural settings,[10,11,13,33,35] and three were conducted in both rural and urban settings.[32,36,39] The study settings included universities,[12,14,31,34] hospitals,[11] primary healthcare centers,[10,33] pharmacies,[32,39,40] and households.[13,35,36] Data collection was executed through self-administered questionnaires[10–12,14,31,34,38,40] and interviews.[13,31,33,35–37]

The total sample size of all 15 included studies was 7676 participants, ranging from 150 to 1827; the participants were all adults, with age ranging from 18 to 69 years.[10–14,31–40] Participants were predominantly female in seven of the included studies[12,31,33,36,37,39] and males in three of the included studies.[10,11,32] The study designs for all the included studies were descriptive cross sectional.[10–14,31–40] Of the 15 studies included, 14 (93.3%) investigated the factors and practices of SMA[10–12,14,31–40] and one (6.7%) investigated the factors and practices of self-medication with antibacterial and antimalarial drugs.[13] In terms of percentage, 68.75% of the studies were aimed at estimating, evaluating, determining, and investigating the prevalence of SMA to identify factors that influence the practices.[10–13,32,34–38] In addition, three of the included studies (18.75%) were also aimed at comparing the magnitude of SMA between different pharmacies,[39] between different years of study of dental students,[31] and between different cities in the country.[40] One study (6.25%) aimed at determining the public knowledge of antibiotics and determinants of SMA,[36] and another (6.25%) aimed at describing antimicrobial self-medication for reproductive respiratory tract to explore the understanding and use of health information.[33]

Methodological quality of the included studies

All the 15 primary studies underwent a methodological quality assessment using the MMAT, version 2011.[26] Of the 15 included studies, 10 studies were scored as high quality.[10,11,13,32–34,37–40] The remaining five studies had an average score.[12,14,31,35,36] None of the included studies for quality assessment were scored as low quality (≤50%). The overall evidence was considered to have a minimal risk of bias.

Prevalence of SMA

All included studies assessed the prevalence of SMA. It was demonstrated that all the participants (100%) in the studies had self-medicated themselves with antibiotics in the past three months to one year before the studies. It is also important to mention that one study reported a prevalence of 8.1%.[37] The considerable difference is due to the period of analysis. Other studies analyzed the SMA practices in the last 3–12 months, whereas the last study analyzed SMA practices in the the past 4 weeks. The overall prevalence of SMA ranged from 8.1% to 93%. According to two of the studies, there are significant differences in the prevalence of SMA between the rural and urban areas.[33,36] Studies conducted in rural areas reported a lower prevalence of SMA, especially among participants with high levels of education, ranging from 48% to 58%,[13,33,36] whereas studies from urban settings reported the high prevalence of SMA, ranging from 77% to 93%, independent to the level of education.[11,14,31,32,38,39] A total of six included studies evidenced that female participants had more intent to self-medicate and have the highest prevalence of SMA than their male counterparts.[12,31,33,36–38]

Although dental students are more knowledgeable about pharmacology, a study aimed at comparing features of the practice of SMA among senior dental students in North India reported high prevalence as well as the irrational and inappropriate use of non-prescribed antibiotics.[31] Similar results were reported in a study aimed at estimating the prevalence of SMA among nursing students in Nepal.[34] Authors also reported that 50.7% of the nursing students had a positive history of self-medication with antibiotics over the past one year before the study.[34] While health science students are expected to use antibiotics appropriately as they have more knowledge, Sah and Shah[34] and Aditya[31] reported that these students are more likely to use non-prescription antibiotics, showing a high prevalence of SMA. Shah et al.[14] in a study aimed at analyzing the prevalence of self-medication with antibiotics also reported a high prevalence of SMA among other university students.

Studies aimed at determining the prevalence of SMA among the general/civil population reported significantly high prevalence rates (98.6%); this was especially among the employed and more educated participants from both rural and urban settings.[10,38] Nevertheless, Kurniawan et al.,[33] in their study aimed at determining the knowledge of antibiotics, reported that more than half (55.6%) of the participants attributed the lack of knowledge of the indications of antibiotics for their proneness to SMA. Moreover, a study aimed at comparing the prevalence of SMA in two pharmacies serving disparate socio-economic community pharmacies in Guatemala City reported a high prevalence of SMA in both groups (77% and 79%) despite the differences in the monthly income and educational level of the participants.[39] Studies reported no association between marital status and prevalence of SMA. However, according to the studies, the prevalence of SMA practices is associated with sociodemographic characteristics.

Factors influencing SMA

LMICs are faced with challenges in providing quality healthcare services for their population. Those challenges include lack of or poor health facilities, poor service delivery, lack of healthcare workers, limited training of healthcare workers, poor or ineffective health education, and promotion strategies.[10–14,31–40]

Sociodemographic and socio-economic factors

In all selected studies, sociocultural, economic, and demographic factors were reported to have an influence on the practices of SMA within limited-resource settings. The influences of the aforementioned factors were reported as either low or high depending on the context and the investigated participants. For example, one study reported an association between employed participants and high prevalence of SMA, considering the monthly income and purchasing power,[39] whereas two other studies reported high association of SMA practices among the unemployed participants due to difficulties in affording to visit a medical doctor.[11,32]

A study by Ramay et al.[40] found that gender was related to self-medication because women were more involved in these practices than men. Although similar results were found by some other included studies,[10,31–33,38] a study by Abdulraheem et al.[10] reported that in rural setting, male participants were more prone to engage in SMA practices than female ones.

Bilal et al., in a study aimed at evaluating the prevalence and practice of SMA among people dwelling in the rural areas of Sindh province in Pakistan, have reported that factors such as education level, socio-economic status, and health insurance were all related to self-medication.[11] The study discovered how self-medicating participants had a low level of education, with almost half of them being uneducated and mostly belonging to the low socio-economic class.[11]

Health-seeking behavior and health system–related factors

Three of the included studies (26.7%) assessed factors and reasons for SMA related to the health services, facilities, and workers. These included long distance traveled to health facilities, long waiting queues to seek medical help, poor quality of the provided care, dissatisfaction with hospital workers' attitudes, and poor control of antibiotic dispensation, as well as easy access to antibiotics.[10,33,38] Eleven of the included studies (73.3%) assessed factors related to the user's knowledge, practices, and health-seeking behavior. In these studies, the participants mentioned that previous use of antibiotics, previous knowledge of health condition, consider minor illness, the use of leftover antibiotics, the easily purchasable from pharmacies, the relatively low cost of purchasing than that of seek for medical doctor, the recommendation from a relative or friend, the self-decision on taking antibiotic, and the idea of self-care.[10,11,14,31,32,34–37,39]

In studies carried out by Aditya[31] and Sah et al.[34] with dental and nursing students, respectively, the easy access to over-the-counter (OTC) antibiotics was reported, and economic constraints, previous experience with the same illness, and a good knowledge of antibiotics were noted as the principal factors influencing their practices of self-medication.

Abdularheem et al.,[10] in a study aimed at estimating the prevalence of SMA in a rural area in Nigeria, reported affordability, accessibility, hospital and clinic delays, health workers

attitudes, difficulties in accessing health facility, and previous knowledge of antibiotics as the main factors influencing antibiotic self-medication practices. In addition, other studies carried out in Nigeria and Indonesia by Albawani et al.,[32] Kurniwan et al.,[33] Israel et al.,[38] and Widayati et al.[37] similarly evidenced that the main reasons for the indulgence in practices of SMA are the high cost of physician consultation, the inability to pay for health services, and the lack of money to go to the hospital or clinic. Four of the included studies reported the affordability (low cost of purchasing), purchasing convenience, and accessibility (easily purchased from pharmacies and drugstores) of antibiotics in Nigeria, Pakistan, and Guatemala.[10,11,39,40]

Participants' views of health system and services were also assessed in the included studies. One study reported the high cost of a physician and frustration with hospital protocols,[38] another study, the difficulties in accessing health facilities,[10] and two others, the lack of trust in healthcare professionals and lack of time.[11,38] Thus, the studies have shown that the chief factors and reasons influencing SMA practices are those related to the user's knowledge and practices and those related to the conditions and environment of the health system and health services.[10–14,31–40]

Health conditions related to SMA

The use of antibiotics for self-diagnosed health conditions and symptoms is reported as a common and concerning practice in LMICs. The practice of self-diagnosing health conditions is particularly appalling because most of the time, it is not based on standardized parameters and on the professional work. The prominent disease conditions that predisposed respondents to antibiotic self-medication practices were revealed in all the included studies; the most reported conditions included a sore throat, common cold, cough with mucus, headache, toothache, flu-like symptom, pain, fever, runny nose, toothache, upper respiratory tract infections, and urinary tract infection.[10–14,31–40] Some other studies reported that sexually transmitted infections, reproductive tract infection, stomach ache, and diarrhea,[10,13,32,36] and, although less frequently mentioned by participants, wounds or skin diseases,[33,35] vaginal discharge,[10] and eye diseases[13] were also health conditions leading to SMA. Thus, common cold, flu-like symptoms, and sore throat were the predominant indications for taking antibiotics as reported in all included studies.[10–14,31–40] Common health problems related to SMA according to included studies are shown in Fig. 2.

Discussion

This study sought to map evidence on the factors influencing the practices of SMA in LMICs and identify research gaps. The use of antibiotics without a prescription occurs globally despite the prescription-only legal status for the mentioned drugs in most countries.[46] The findings of this study have helped to better underscore the existing evidence on the factors influencing SMA in LMICs. This review has provided evidence on the prevalence of SMA, factors and reasons for SMA, as well as on the common symptoms and health problems related to SMA in LMICs.

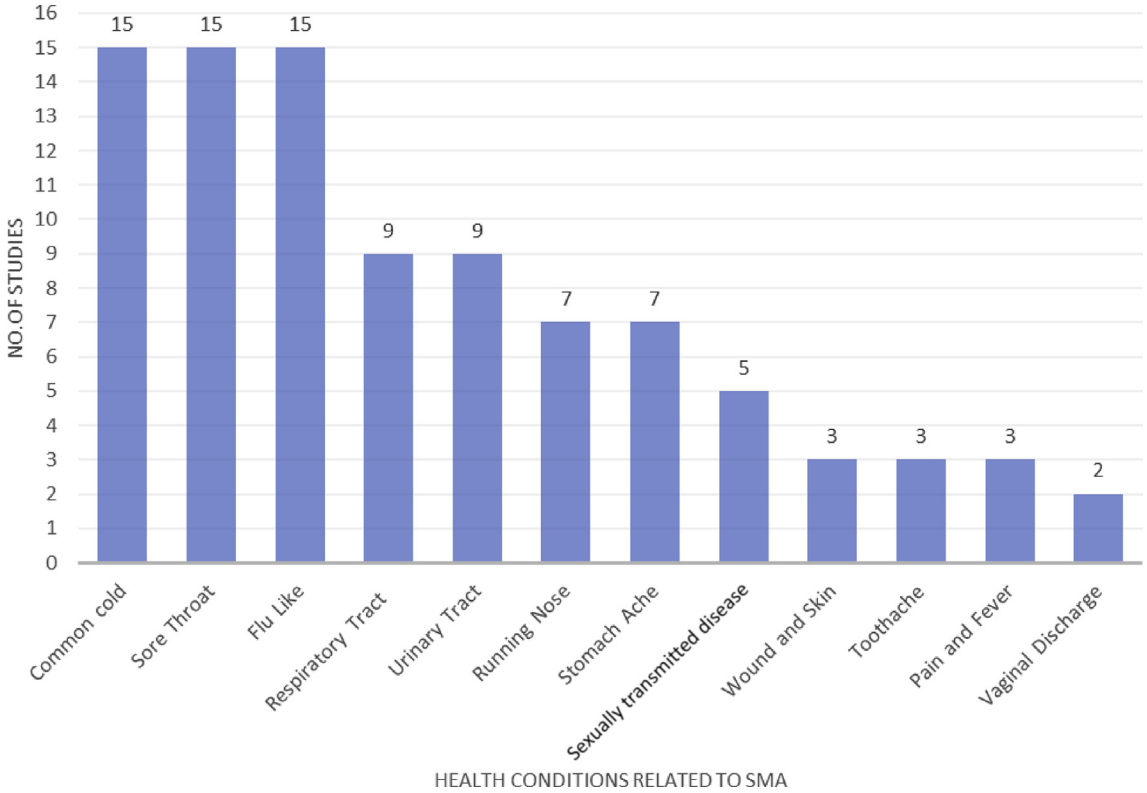

Fig. 2 – Health conditions related to the practice of SMA.

Regarding the global concern on antibiotic use in health, agriculture, and animal production, the WHO emphasizes the need for research and evidence-based information to support education programs and strategies to improve the correct utilization of antibiotics, especially in resource-constrained countries where the problem is alarming and proliferating.[4,8] To the best of our knowledge, the present study is the first systematic review of the factors influencing SMA in these settings.

The prevalence of SMA is common over the world, but it is much higher in the LMICs where governments are struggling to find resources to provide better quality and effective health facilities and programs. In a study by Shubha et al.[19] of Indian dental students, the prevalence of self-medication was 78.18%. In Nigeria, Osemane and Lamikanra[12] reported a prevalence of 91.4% among university students, and 91% was reported in Laos.[36]

The results of this study are different from those of the studies from some upper-middle or high-resource regions and countries, where the overall prevalence of self-medication reported was not as high, for example, in Lithuania, 19.1%, Turkey, 22%,[17] South America, 44.1%, and the Middle East, 34.1%.[22] This shows that the prevalence of SMA varies according to countries and regions. The variety could be due to the differences on the effectiveness of the health services and facilities, to the health education strategies, as well as to the compliance with regulations on antibiotic prescribing and dispensing.[22]

The level of education (both high and low) was reported to influence the practice of SMA in LMICS.[10,33,37] On the one hand, in addition to difficulties affording the cost of health care, illiteracy can facilitate the practice of SMA as individuals and entire communities are less aware of the health risks. On the other hand, a high level of education is also a potential factor facilitating SMA. It was shown that university students and health science senior students were more likely to self-medicate despite knowing the pharmacology of antibiotics, which led to a false sense of confidence in self-diagnosis.[11,39] These results are similar to those of other studies carried out with university students in Ethiopia where people with a high level of education and high level of income, including senior university students, were reported to have the highest prevalence of SMA and were more likely to intent SMA practices.[21] In this case, promoting literacy and health education programs showing the disadvantages of SMA among communities would be important to target both groups of users (with the low and high level of education), and, at the same time, improve and increase the compliance with protocols at health workers level.

It can be inferred from the study that family members and friends play an important role in individuals' SMA practices and that sharing and/or advising antibiotics are common practices between family members and friends mainly when the symptoms are similar. This represents a potential risk factor for a patient as inappropriate antibiotic use may lead to the worsening of disease conditions; to the development of side-effects, recurrent infections, and AMR;[8,47,48] as well as to the increased number of bedridden sick people, the costs for purchasing stronger antibiotics, the costs for treatment of resistant infections, and the mortality rates.[4,5,7,47,49]

Studies have evidenced that in sickness events, antibiotics are used without prescription to treat symptoms that are originally viral and not bacterial infections, which do not require antibiotics. It was shown in this review that most of the reported symptoms/health conditions leading to SMA practices such us a sore throat, common cold, headache, toothache, flu-like symptoms, diarrhea, pain relief, fever, and runny nose do not necessarily need antibiotic treatment. This represents another opportunity to deliver health education programs that address the public.

In the context of practices of SMA, it is important to consider that health disease models and health care are derived from social history, are inherited culturally, and cannot be reduced to individual experience, but involving the community, its values, and customs, so that when an individual gets sick, the whole family gets involved.[50,51] The sickness events are not only personal but also constitute a family problem as often one must take care of the sick family member. In many cultures, women are influential people as they are socially regarded as responsible for providing care and/or provisioning education, nutrition, and health to other members especially children and the elderly. The influence of community, family members (especially women), could thus be used by health promoters as a bridge to promote good practices in the use of antibiotics. Therefore, special programs could be developed to target influential people among families and communities, as well as women in markets, schools, and other public places. This would have a positive impact on the future generations and on the promotion of the good use of antibiotics at family and community level.

The use of old prescriptions and leftover antibiotics by participants in the included studies revealed the poor practices of prescribing and dispensing and the lack of effective health education and promotion strategies. At the same time, the use of leftover antibiotics could be attributed to the poor adherence to treatments by participants. If the physicians could strictly prescribe the necessary antibiotics and the pharmacists could discourage dispensing antibiotics from old prescriptions, people would slowly understand the disadvantages and become educated on their correct use. Action is therefore required in LMICs' health systems to strengthen the regulations on dispensing practices, and physicians should also be encouraged to, during their consultations, take all the opportunities they have with patients toward promoting the appropriate use of prescribed antibiotics.

Moreover, the study results evidenced the variations on the prevalence of SMA based on sociodemographic (gender and marital status) and socio-economic (income and education) factors. As part of the social determinants of health, these factors are contextual, and they play a role in molding the knowledge and on guiding the practices of individual and communities. Evidence of factors influencing SMA is not well documented in most LMICs from Sub-Saharan Africa given the limited number of articles that we found.

The most reported factors that influence SMA practices, according to the included studies, are related to the following:

1. **The user's health-seeking behavior,** namely, knowledge, practices, and expectations, as well as the easy access of the drugs from pharmacies, the low cost of purchasing, the recommendation of a relative or friend, the self-decision on taking antibiotic, and the idea of self-care;

2. **The health system structure and conditions,** namely, lack of facilities, long distances, long waiting queues, poor quality of service delivery, poor supervision and control regarding prescribing and dispensing practices, and non-compliance with dispensing protocols.

These factors are comparable with results reported by Napolitano et al.[7] when mentioned that in high-income countries from Europe, the law enforcement, the awareness campaigns, and the effective supervision contribute to decrease the prevalence of SMA. Thus, strong regulation enforcement, effective training of health workers (especially pharmacists), and community awareness campaigns are required to limit the inappropriate use of antibiotics.

The decision to use non-prescribed antibiotics in LMICs, according to the included studies, is a result of a complex interaction among the aforementioned factors. Consequently, interventions toward mitigating the antibiotic self-medication and improving the appropriated use of antibiotics in LMICs need to focus on these and other emerging factors.

Strengths and limitations of the study

To our knowledge, this is the first systematic scoping review to map evidence on the factors influencing SMA and identify evidence-based recommendations to reduce the irrational use of antibiotics in the LMICs. An extensive search strategy, which helped in the identification of a considerate number of studies, was used in this study. The manual identification of references in the texts of articles also allowed additional articles to be found. The study followed clear screening processes using keywords, which was guided by study PICO nomenclature. A thorough data search using Boolean terms and MeSH terms was conducted during the literature search to increase the chances of finding eligible studies for inclusion in this review.

The review also included a methodological quality assessment of the included primary studies using the recommended MMAT tool to assess the risk of bias from the included studies. Despite the aforementioned strengths, this review has some limitations that should not be overlooked. There was a potential for bias in the studies included due to the method of analysis, recall period, selection, and social desirability. This has an effect on the findings of the primary studies. For example, SMA was mainly assessed in most of the studies using self-report and self-administered questionnaires, a method that runs the risk of recall bias and obtains socially desirable responses.

Implications for practice

Evidence shows that there is wide use of antibiotics for self-treatment as part of the routine management of self-diagnosed symptoms or health problems. Bearing in mind the increase of pharmacies, drugstores, and the poor health-care access faced by patients in LMICs, there is a need to improve on the use of antibiotics in these resource-constrained settings. At the same time, action is needed to empower patients with knowledge regarding the use of medicines in general and antibiotics. Evidence shows that the accessibility and availability of antibiotics, the economic interests of pharmacies, and the role of pharmacists linked to the health-seeking behavior of individuals and communities continuously pose a challenge for controlled and appropriate use of antibiotics. This study recommends that tackling the problem of SMA will require the involvement of all key stakeholders to ensure user-centered outcomes and sustainability of the health promotion and education strategy programs.

Implications for research

Considering the need to improve the utilization of antibiotics in LMICs by promoting good prescribing and dispensing practices as well as improving public awareness, the findings of this study will guide future contextual and deep understanding researches. Moreover, pilot project and studies on the factors that influence the practice of SMA, the sources of non-prescribed antibiotics and the role of pharmacists need to be considered for different population and contexts.

Recommendations

There is a need to develop more studies (qualitative, quantitative, and observational studies, longitudinal prospective, or retrospective studies) on the factors influencing SMA to correctly address the public health problem in LMICs. There are several studies conducted regarding the practices of SMA, but most of them are cross-sectional studies; few studies focus on knowledge, attitudes, and practices (KAP), which this study recommends. More qualitative, comprehensive and comparative studies would have the advantage of raising a deep understanding of the SMA phenomenon.

This scoping review shows a gap in high-quality literature, focusing on factors influencing SMA in most of the LMICs. Therefore, it is recommended that randomized control trial (RCT) studies are needed to explore the impact of SMA in groups of population to guide future practices. It is important to assess the impact of SMA on AMR using RCTs to produce evidence to guide the development of more effective health promotion strategies and enforcement law, protocols, and policies on prescribing and dispensing of antibiotics, as a considerable step to contain the AMR.

Conclusion

Although unevenly distributed among LMICs, the studies revealed considerable research evidence of various factors influencing SMA in some of these settings. Many of the studies reporting factors influencing SMA in LMICs were carried out on the Asian continent, with very few studies from the African continent in general, especially from Sub-Saharan Africa.

Antibiotic self-medication is a very common practice, highly prevalent in resource-constrained countries. SMA practices are influenced by sociocultural determinants of health and frequently associated with factors such as poor dispensing and prescribing practices and unappropriated health-seeking behavior. The practice of SMA is one of the most important factors contributing to the emergence of AMR which is no longer a threat but an appalling reality. Thus, it is important to understand the link between the different but

concurrent factors leading to SMA practices to better address the appropriated use of antibiotics and contain the AMR.

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Ethical approval

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Competing interests

The authors declare that they have no competing interests.

Consent for publication

Not applicable.

Availability of data and material

Some of the information generated and analyzed during this study are included in this published article [and its supplementary information files] and other data that support the findings of this study are available from the list of included studies which the references are part of this article.

Authors' contributions

N.F.T. conceptualized and prepared the draft proposal of the study under the supervision of T.P.M.-T. L.E.M. and V.P.S. assisted with the manuscript redaction. N.F.T. and T.P.M.-T. contributed to writing the first draft of the manuscript. N.F.T. prepared the manuscript, and L.E.M., T.P.M.-T, and V.P.S. reviewed it. N.G. and B.C. contributed to abstract and full-article screening, respectfully. N.F.T., T.P.M.-T, V.P.S., L.E.M., and B.C. contributed to the reviewed draft version of the manuscript and approved the final version.

REFERENCES

1. Mandomando I, Espasa M, Vallès X, Sacarlal J, Sigaúque B, Ruiz J, et al. Antimicrobial resistance of *Vibrio cholerae* O1 serotype Ogawa isolated in Manhica district hospital, southern Mozambique. *J Antimicrob Chemother* 2007;**60**(3):662–4.
2. Roca A, Bassat Q, Morais L, Machevo S, Sigauque B, O'callaghan C, et al. Surveillance of acute bacterial meningitis among children admitted to a district hospital in rural Mozambique. *Clin Infect Dis* 2009;**48**(Suppl. 2):S172–80.
3. Sigaúque BSE. *Situations analysis and recommendations: antibiotic use and resistance in Mozambique*. 2015. p. 32.
4. WHO. *The evolving threat of antimicrobial resistance: options for action*. Geneva: World Health Organization; 2012.
5. Sheldon Jr AT. Antibiotic resistance: who is winning the war? Introductory remarks. *Int J Toxicol* 2003;**22**(2):129–30.
6. Sigauque B, Roca A, Sanz S, Oliveiras I, Martinez M, Mandomando I, et al. Acute bacterial meningitis among children, in Manhiça, a rural area in Southern Mozambique. *Acta Trop* 2008;**105**(1):21–7.
7. Napolitano F, Izzo MT, Di Giuseppe G, Angelillo IF. Public knowledge, attitudes, and experience regarding the use of antibiotics in Italy. *PLoS One* 2013;**8**(12):e84177.
8. WHO. *Antimicrobial resistance, global report on surveillance*. World Health Organization; 2014.
9. WHO AR. *Global report on surveillance. Antimicrobial resistance, global report on surveillance*. 2014.
10. Abdulraheem I, Adegboye A, Fatiregun A. Self-medication with antibiotics: empirical evidence from a Nigerian rural population. *Br J Pharmaceut Res* 2016;**11**(5):1–13.
11. Bilal M, Haseeb A, Khan MH, Arshad MH, Ladak AA, Niazi SK, et al. Self-medication with antibiotics among people dwelling in rural areas of Sindh. *J Clin Diagn Res* 2016;**10**(5):OC08.
12. Osemene K, Lamikanra A. A study of the prevalence of self-medication practice among university students in Southwestern Nigeria. *Trop J Pharmaceut Res* 2012;**11**(4):683–9.
13. Owour I, Alwar J, Oyugi H. Perceptions influencing self medication with antibiotics and/or antimalarials among the households in Nyalenda B sub-location, Kisumu county, Kenya. *Am J Public Health Res* 2015;**3**(3):116–21.
14. Shah SJ, Ahmad H, Rehan RB, Najeeb S, Mumtaz M, Jilani MH, et al. Self-medication with antibiotics among non-medical university students of Karachi: a cross-sectional study. *BMC Pharmacol Toxicol* 2014;**15**(1):74.
15. Abasaeed A, Vlcek J, Abuelkhair M, Kubena A. Self-medication with antibiotics by the community of Abu Dhabi Emirate, United Arab Emirates. *J Infect Develop Ctries* 2009;**3**(07):491–7.
16. Afolabi A. Factors influencing the pattern of self-medication in an adult Nigerian population. *Ann Afr Med* 2008;**7**(3):120–7.
17. Grigoryan L, Burgerhof JG, Degener JE, Deschepper R, Lundborg CS, Monnet DL, et al. Attitudes, beliefs and knowledge concerning antibiotic use and self-medication: a comparative European study. *Pharmacoepidemiol Drug Saf* 2007;**16**(11):1234–43.

18. Ngigi CK, Mwagiru P, Wala J. Self-medication with antibiotics prior to seeking treatment among adult patients attending outpatient Department at Gatundu sub-county hospital, Kiambu county, Kenya. *Imper J Interdiscip Res* 2016;**2**(8).
19. Shubha R, Savkar MK, Manjunath G. Self medication pattern among dentists with antibiotics. *J Evol Med Dent Sci* 2013;**2**(46):9037–41.
20. Ali AS, Ahmed J, Sonekhi GB, Fayyaz N, Zainulabdin Z, Jindani R. Practices of self-medication with antibiotics among nursing students of Institute of nursing, Dow University of Health Sciences, Karachi, Pakistan. *J Pakistan Med Assoc* 2016;**66**(2):235–7.
21. Eticha T, Araya H, Alemayehu A, Solomon G, Ali D. Prevalence and predictors of self-medication with antibiotics among Adihaqi Campus students of Mekelle University, Ethiopia. *Int J Pharm Sci Res* 2014;**5**:678–84.
22. Ocan M, Obuku EA, Bwanga F, Akena D, Richard S, Ogwal-Okeng J, et al. Household antimicrobial self-medication: a systematic review and meta-analysis of the burden, risk factors and outcomes in developing countries. *BMC Public Health* 2015;**15**(1):742.
23. Bank W. *Country classification World bank – list of economies*. 2018.
24. Torres NF, Chibi B, Middleton LE, Solomon VP, Mashamba-Thompson T. Evidence of factors influencing self-medication with antibiotics in LMICs: a systematic scoping review protocol. *Syst Rev* 2018;**7**(1):102.
25. Arksey H, O'Malley L. Scoping studies: towards a methodological framework. *Int J Soc Res Methodol* 2005;**8**(1):19–32.
26. Pluye P, Robert E, Cargo M, Bartlett G, O'cathain A, Griffiths F, et al. *Proposal: a mixed methods appraisal tool for systematic mixed studies reviews*, vol. 2. Montréal: McGill University; 2011. p. 1–8.
27. Awad AI, Eltayeb IB. Self-medication practices with antibiotics and antimalarials among Sudanese undergraduate university students. *Ann Pharmacother* 2007;**41**(7–8):1249–55.
28. Heidarifar R, Koohbor M, Kazemian Mansourabad M, Mikaili P, Sarahroodi S. Selfmedication with antibiotics among Iranian population in Qom state. *J Sci Innovat Res* 2013;**2**(4):785–9.
29. Ilhan MN, Durukan E, Ilhan SÖ, Aksakal FN, Özkan S, Bumin MA. Self-medication with antibiotics: questionnaire survey among primary care center attendants. *Pharmacoepidemiol Drug Saf* 2009;**18**(12):1150–7.
30. Jassim A-M. In-home drug storage and self-medication with antimicrobial drugs in Basrah, Iraq. *Oman Med J* 2010;**25**(2):79.
31. Aditya S. Self-medication among dental undergraduate students: a growing concern. *Int J Pharmaceut Sci Res* 2013;**4**(4):1460.
32. Albawani S, Gnanasan S, Abd AN, Hassan Y. Self-medication with antibiotics in Sana'a city. *Value Health* 2016;**19**(7):A814.
33. Kurniawan K, Posangi J, Rampengan N. Association between public knowledge regarding antibiotics and self-medication with antibiotics in Teling Atas community health center, East Indonesia. *Med J Indonesia* 2017;**26**(1):62–9.
34. Sah AJRK, Shah D. Self-medication with antibiotics among nursing students of Nepal. *IJPSR* 2016;**7**:427–30.
35. Senadheera G, Ranganathan SS, Gunawardane N, Fernando G, Fernandopulle B. Practice of self-medication with antibiotics in the Colombo district, Sri Lanka. *Ceylon Med J* 2017;**62**(1).
36. Sihavong A, Lundborg CS, Syhakhang L, Akkhavong K, Tomson G, Wahlström R. Antimicrobial self medication for reproductive tract infections in two provinces in Lao People's Democratic Republic. *Sex Transm Infect* 2009;**82**(2):182–6.
37. Widayati A, Suryawati S, de Crespigny C, Hiller JE. Self medication with antibiotics in Yogyakarta City Indonesia: a cross sectional population-based survey. *BMC Res Notes* 2011;**4**(1):491.
38. Israel EU, Emmanuel EG, Sylvester EG, Chukwuma E. Self-medication with antibiotics amongst civil servants in Uyo, Southern Nigeria. *J Adv Med Pharm Sci* 2015;**2**:89–97.
39. Ramay B, Córdova L, Cerón A. *Self-medication with antibiotics in four Guatemala city pharmacies: characteristics, sources of information, perceived effects, and motives*. 2016.
40. Ramay BM, Lambour P, Cerón A. Comparing antibiotic self-medication in two socio-economic groups in Guatemala City: a descriptive cross-sectional study. *BMC Pharmacol Toxicol* 2015;**16**(1):11.
46. Morgan DJ, Okeke IN, Laxminarayan R, Perencevich EN, Weisenberg S. Non-prescription antimicrobial use worldwide: a systematic review. *Lancet Infect Dis* 2011;**11**(9):692–701.
47. Aryee A, Price N. Antimicrobial stewardship—can we afford to do without it? *Br J Clin Pharmacol* 2015;**79**(2):173–81.
48. Sahoo KC, Tamhankar AJ, Johansson E, Lundborg CS. Antibiotic use, resistance development and environmental factors: a qualitative study among healthcare professionals in Orissa, India. *BMC Public Health* 2010;**10**(1):629.
49. Alkhatatbeh MJ, Alefan Q, Alqudah MA. High prevalence of self-medication practices among medical and pharmacy students: a study from Jordan. *Int J Clin Pharmacol Ther* 2016;**54**(5):390.
50. Herzlich C. *Health and illness: a social psychological analysis*. Academic Press; 1973.
51. Langdon EJ. A construção sociocultural da doença e seu desafio para a prática médica. In: *Parque Indígena do Xingu: saúde, cultura e história São Paulo: Terra Virgem*; 2005. p. 115–33.
52. http://www.crd.york.ac.uk/PROSPERO/display_record.php?ID¼CRD42017072954.

Appendix A. Supplementary data

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