Factors Contributing to Self-Medication of Antibiotics in the Context of Afghanistan

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by

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Abstract

Introduction: Afghanistan is a landlocked country that has gone through conflicts over the last three decades. In 2003, health system reconstruction started by introducing the basic package of health services. Self-medication of antibiotics is a public health problem in Afghanistan. The prevalence of self-medication of antibiotics (SMA) is 73% higher than in many low-and-middle-income countries. SMA increases antimicrobial resistance, thus, threatening the possibility of treating infectious diseases in the future in Afghanistan, where infectious diseases form 46% of the burden of diseases.
Methodology: A systemic approach literature review is used to search for papers to explore the factors leading to SMA. Andersen's framework was used to explore the environmental factors and population characteristics.
Results: Economic and conflict factors affect people's utilization of health services. Health system factors increase SMA, including quality, poor regulations, and accessibility. Moreover, population characteristics factors contribute to SMA. People's beliefs, education, gender, availability of medicines, and people's perception of need also lead to SMA.
Discussion: Factors overlap leading to SMA. Economic collapse due to past conflicts and the current Taliban situation led to the weakening of the health system. Poverty due to economic factors deprives Afghans of accessing health care leaving SMA as their last haven to be treated. High illiteracy percentage, especially among women, due to cultural beliefs, affects their number in the health workforce, which affects their access to health services since a female health worker can only check them which encourages SMA.

Keywords: Self-medication, Antibiotics, Antimicrobial resistance, Antibiotic resistance, Afghanistan.

Word count: 12,527

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Abbreviations

AHP = Analytical Hierarchical Process

BPHS = Basic Package of Health Services

CME = Continuing Medical Education

Diagnosis = Dx

EML= Essential Medicines List

EmONC = Emergency Obstetric and Neonatal Care

EPHS = Essential Package of Health Services

GMP = Good Manufacturing Practice

HCP= Health Care Professional

IDP = Internally Displaced Person

IMCI = Integrated Management of Childhood Illness

LMIC= Low-and-middle-income-countries

LRTI = Lower Respiratory Tract Infection

MoPH = Ministry of Public Health

MRA = Medicines Regulation Authority

MSF = Médecins Sans Frontières

NAP-AMR = National Action Plan on Antimicrobial Resistance

OTC = Over the Counter

POCCRP = Point-of-Care C-Reactive Protein

RTDs = Rapid Diagnostic Tests

SMA = Self-Medication of Antibiotics

TCCC = Tactical Combat Casualty Care

UN = United Nations

URTI = Upper Respiratory Tract Infections

UTI = Urinary Tract Infections

WHO = World Health Organization

Key Terms

Off-label = “Prescribing currently available and marketed medications but for an indication (e.g., a disease or a symptom) that has never received Food and Drug Administration (FDA) approval”(1).

Antibiotic resistance = “Occurs when bacteria, viruses, fungi, and parasites change over time and no longer respond to medicines making infections harder to treat and increasing the risk of disease spread, severe illness, and death”(2).

GMP (Good Manufacturing Practice) = “Describes the minimum standard that a medicines manufacturer must meet in their production processes”(3).

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Introduction

My name is Tamer Bahamish from Yemen. I am a public health professional with a pharmacological background. I have always been motivated by health promotion and the rational use of drugs. As pharmacist, I worked as a community pharmacist for some time during my bachelor's degree training. During that time, I noticed people's irrational use of antibiotics and the effects on the spreading of antimicrobial resistance. I was always looking for a way to make a change in that regard, but as a community pharmacist, the effect would have been limited.

I also worked in a pharmaceutical company where I had close contact with physicians, which gave me the chance to understand that the prescription behavior of health workers may lead to the irrational use of drugs and antibiotics.

At the same time, I was working in public health, believing that one can encourage and promote good health behavior in public health. Self-medication of antibiotics is prevalent in my country, Yemen, for many reasons, including the disrupted health system, poor regulations, conflict, economic crisis, and most importantly, the lack of awareness of the irrational use of drugs.

I chose this study to explore the factors leading to self-medication with antibiotics in Afghanistan for many reasons. First, the context of Afghanistan is close to the context of Yemen. Both countries are going through conflicts, economic hardships, and have disrupted health systems. What makes Afghanistan different is that since 2001, the international community has been supporting Afghanistan's health system and economy. As a result, many international organizations and researchers were studying the context of Afghanistan, which resulted in much literature analyzing the situation in Afghanistan and making it more apparent.

Therefore, the context of Afghanistan is an excellent chance to predict and analyze problems in similar contexts going through the same hardships as Yemen.

This study aims to contribute to a better understanding of the behavior of self-medication in Afghanistan which may help better understand the problem in other similar contexts.

1. Background

1.1. Geography

Afghanistan is a country that has no sea borders with a surface area of 652.9 thousand square kilometers(4)(5). It borders Pakistan, Iran, Turkmenistan, Uzbekistan, Tajikistan, and China(5). The nearest coast to Afghanistan, the Arabian sea, is 480 kilometers away from the country, making it a landlocked country(5). Afghanistan is divided into 34 provinces and 398 districts on a subnational level, with Kabul being the country's capital (6).

Figure 1. Afghanistan Map with Administrative divisions. Adapted from Allchin et al(5).

1.2. Demography

Afghanistan's population is 38.93 million, with a population growth of 2.3%(4). Most of the population, 75.6%, live in rural areas, while the rest, 24.4%, live in urban areas(5). Life expectancy in Afghanistan is 65(4). Almost half of the population is under 15(5).

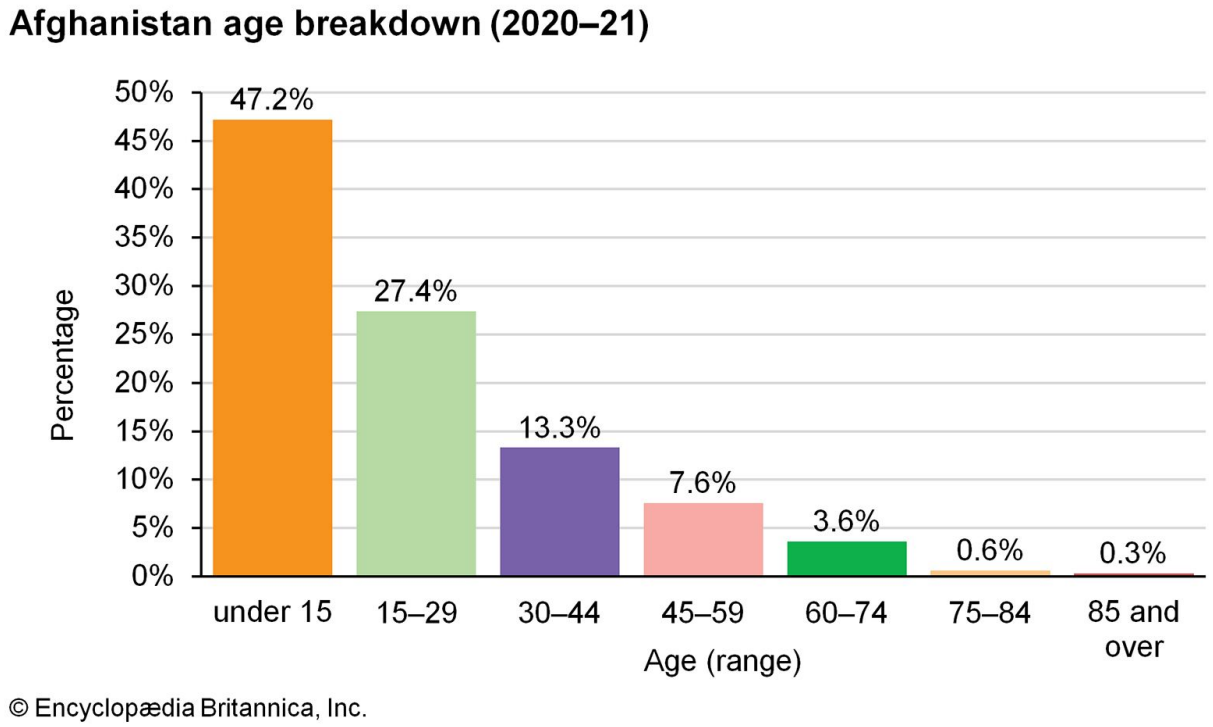

Figure 2. Afghanistan Age Breakdown. Adapted from Allchin et al(5).

1.3. Health System

The health system of Afghanistan is controlled by the ministry of public health (MoPH). It is responsible for resource allocation, assessment of health essentials, establishing policies, and establishing the borders of the private and public sectors(7). Afghanistan is a poor country with many wars and conflicts(8)(9). In 2001, when the era of the Taliban ended, the MoPH in Afghanistan adopted a basic package of health services (BPHS). This increased access to health services which covered only 9% of Afghans(7). In 2005, an essential package of health services (EPHS) was also adopted after the success of BPHS of reaching accessibility of 66% during the first years and 85% in 2008(7)(10). BPHS was an excellent option, especially as it succeeded in many post-conflict countries like Cambodia and Rwanda(11).

BPHS was established to provide the necessary health services to overcome people's pressing health problems. Donors supported the health system of Afghanistan in the first five years, starting from 2003 with 820 million US dollars. As a result, 312 health facilities were built, and 451 were rehabilitated. BPHS depended on a contracting-out policy to provide the health services in which non-governmental organizations enter tenders to get a contract from MoPH for running health care

services for one to three years(11). This model is used in thirty-one of the provinces of Afghanistan, while MoPH provides these services in the remaining three provinces(11).

The BPHS is formed from different levels providing defined health services, and each has a catchment population assigned to it, starting from the district hospital at the top of the pyramid of BPHS, comprehensive health center, primary health center, health sub-center, and health post at the bottom of this system of health services provision. EPHS was then introduced as a continuum from the district hospitals to provincial, regional, and specialized hospitals, so EPHS represents the hospital sector. EPHS is the package that defines the health services provided in the hospitals. The referral system is done from the primary health units to the district hospital, which forms the link between BPHS and EPHS, where the district hospital is the top level of BPHS and the starting point of EPHS(Annex 1)(11).

The financing sources for health expenditure in Afghanistan depend mainly on out-of-pocket expenditure, which forms 75.5% of the total expenditure(7)(12). The participation of the government from the budget in this expenditure is only 5.1%, while the rest of 19.4% forms the external aid part(12). This puts the health system in Afghanistan at risk since a high portion of the health expenditure comes from donors, which, if stopped, would put the government in a difficult situation. The government then has to cover 24.5% of the health expenditure, which is not possible for a low-income country like Afghanistan(7)(12)(13).

Afghanistan lags behind the recommended health care professionals for every 1000 people. World Health Organization (WHO) recommends that the ratio be 2.3 for doctors, nurses, and midwives. In Afghanistan, the ratio of doctors per 1000 is 0.15, 0.14 for nurses, 0.08 for midwives, and 0.02 for pharmacists(7).

The availability of medical supplies in a health facility in Afghanistan depends on the obligations of the country's BPHS and EPHS. The two service packages make the availability of medical supplies dependent on the level of care needed and whether it is done at the primary, district, or provincial levels(7). Almost all kinds of antibiotics are available in both BPHS and EPHS, and they can be found in all levels of health facilities, from the health posts up to the district hospitals in BPHS and from the district hospitals up to the regional hospitals in EPHS(14).

2. Problem Statement and Justification

Self-medication is defined as treating the signs/symptoms of an illness by oneself using medications not prescribed by a health care professional(15). Self-medication has been introduced to allow the treatment of minor ailments that are not serious and manageable by oneself(15). This can be achieved through certain listed drugs that can be dispensed without a prescription and are called over-the-counter (OTC) drugs(15).

Many governments introduced self-medication to decrease the pressure on the health systems in mild cases allowing the health care professional to focus on the more severe cases(15)(16). Even though self-medication is considered a part of the self-care by WHO, misconduct in self-medication can lead to serious public health problems(15)(17) (18). Misconduct of self-medication includes taking a drug for an indication not listed in its leaflet (Off-label), taking the wrong dose, stopping or continuing the treatment before/beyond the recommended period, sharing medicines with others, and taking prescription drugs without a medical prescription(17). This misconduct can lead to several problems, including the interaction of drugs when taken with other drugs which cannot be used together, eating or drinking some kinds of food that can affect drug efficacy, and hiding the symptoms of diseases so one cannot know when he/she is sick. Also, this misconduct leads to antibiotic resistance when microbes become resistant to antibiotics and antibiotics lose their efficacy on some strains of microbes(17)(19).

WHO reported that people use 80% of the antibiotics without a prescription in low-and-middle-income countries LMIC(20). The percentage of irrational use of these antibiotics is between 20%-50% of the total antibiotics consumed by the general population in LMIC(20). Estimations show that two-thirds of the antibiotics in LMIC are used for self-medication(20)(21).

Antibiotic resistance is a serious public health problem that not only affects health by making microbes resistant to antibiotics and prolonging the time needed to be cured as well as the increased mortality of the resistant microbes' strains but also endangers the constant economic thrive of the countries(22). Although there are many determinants of antibiotic resistance, self-medication with antibiotics(SMA) is the most critical one(23)(24).

Irrational use of antibiotics as misconduct of self-medication leads to antibiotic resistance; therefore, it increases the already existing burden of infectious diseases and adds to the economic cost, especially in LMIC(22)(25). Patients with antibiotic resistance need more time to be fully treated; thus, they spend more time in hospitals and need more resources. According to a report from WHO, mortality of infectious diseases doubles when the disease is caused by a resistant microbe(20). This increases the economic burden of infectious diseases, especially in LMIC, where the burden of infectious diseases is high(8)(26).

In LMIC, where access to health facilities is poor, and people have to pay for the available health services, the low financial status of those people makes them seek other cheaper alternatives, either through self-medication or getting their medications from informal health services. In developing countries, the pharmacies are sometimes run by the owner of the pharmacy, who is not a pharmacist, which results in improper guidance on the use of antibiotics(17). SMA prevalence is higher in LMICs, where a systematic review of 34 studies from LMICs in 2015 that included 31,340 participants stated that the overall prevalence is 39%(27). Therefore, the inappropriate use of antibiotics increases, leading to antibiotic resistance(25).

In Afghanistan, infectious diseases form 46% of the burden of diseases, and the primary treatment medication for those diseases are antibiotics that are easily accessible by the people(9)(17). The absence of strict regulations and control of antibiotics leads to increased SMA prevalence (9). Several studies estimated that the prevalence of SMA in Afghanistan is more than 73% which is a very high percentage even when compared with LMIC, where a systemic review showed that the total prevalence of SMA is 39%(17)(24)(27).

In Afghanistan, antibiotics are available in public facilities for free and can be purchased and used without a prescription in the private sector. The war made the borders hard to control, which made the smuggling of antibiotics to the country more accessible. Also, the availability of low-quality antibiotics due to poor quality control and inappropriate storing conditions makes many available antibiotics of low or no activity. Self-medication of antibiotics is widely spread. Lack of awareness of the people on the threats of antibiotics on their health increases the irrational use of antibiotics(9).

The constitution of Afghanistan states that public health services are free for all. BPHS and EPHS cover all the medicines listed in Afghanistan's essential medicines list (EML). EML of Afghanistan contains most of the antibiotics available, which means that all the antibiotics are free in public health facilities for all the population in Afghanistan(14)(28). Afghanistan's health system only provides 50% of the medicines needs, and patients buy the rest from private pharmacies(28). The private sector represents 95% of the pharmacies in Afghanistan(24). A descriptive cross-sectional study estimated that 76.5% of people got their antibiotics for SMA use from a pharmacy(17).

WHO recognizes antibiotic resistance as global public health risk (29). It is estimated that 700,000 people die annually due to antibiotic-resistant diseases(30). In 2015, the World Health Assembly launched a global action plan for antimicrobial resistance(9)(29). In 2016, the United Nations general assembly agreed with member state officials to have more coordinated efforts to explore the original causes of antimicrobial resistance to control it(29). Afghanistan is a low-income country where antimicrobial resistance emerged as a real threat to public health (8). Furthermore, as the control of antibiotics entrance into the country and the quality control of the antibiotics entered into the country is poor, SMA can be easily practiced(9).

Afghanistan's conflict in 2021 resulted in the Taliban's comeback and the government's collapse. The World Bank stopped its funding to Afghanistan as a result of the context changes. This resulted in the stoppage of 2331 health facilities, and 25,000 health care professionals lost their jobs. The health system of Afghanistan has collapsed rapidly, and the poor people in Afghanistan are deprived of health care services(31).

Afghanistan is one of the countries working toward exploring the root causes and has developed an action plan to limit antibiotic resistance(9). With a prevalence of 73%, SMA is the critical cause of antimicrobial resistance in Afghanistan, with many factors leading to it(24). This research explores the factors that lead to SMA in Afghanistan.

2.1. Objectives

2.1.1. General objective

To explore the factors that lead to self-medication with antibiotics in the context of Afghanistan from the consumers' and health systems sides to provide evidence-based recommendations to policymakers to address the problem.

2.1.2. Specific objective

1. To explore the external factors in the context of Afghanistan that affect the self-medication with antibiotics among patients.

2. To explore health system factors and the characteristics of the population that lead to the behavior of self-medication of antibiotics (SMA) in Afghanistan.

3. To explore the best practice interventions in similar contexts that aim to reduce SMA.

4. To give evidence-based recommendations on SMA reduction to policymakers.

3. Methodology

3.1. Study design

This thesis follows a systematic approach to literature review to reproduce material based on peer-reviewed and gray literature.

3.2. Search strategy

Literature for the study was searched through the VU library, PubMed, Google Scholar, and Google search engines. Gray literature was also retrieved from the websites of WHO, UN agencies, non-governmental organizations, and Afghanistan's ministry of public health. The keywords used to search for peer-reviewed papers and gray literature are listed in Table 1. They were used alone or in combination to look for peer-reviewed papers and gray literature. The relevance of the articles for this study was decided from the titles and abstracts of the retrieved articles. Articles were then thoroughly read to decide whether the text was relevant to the study's objectives. Snowballing was also done to get more articles from the already found ones. Papers on the topic studying the Eastern Mediterranean region (EMRO), LMIC, and low-income countries were also included. Papers specific to countries other than those of EMRO or LMIC were excluded. Articles in English from 2000 on were included; those in other languages or published before 2000 were excluded.

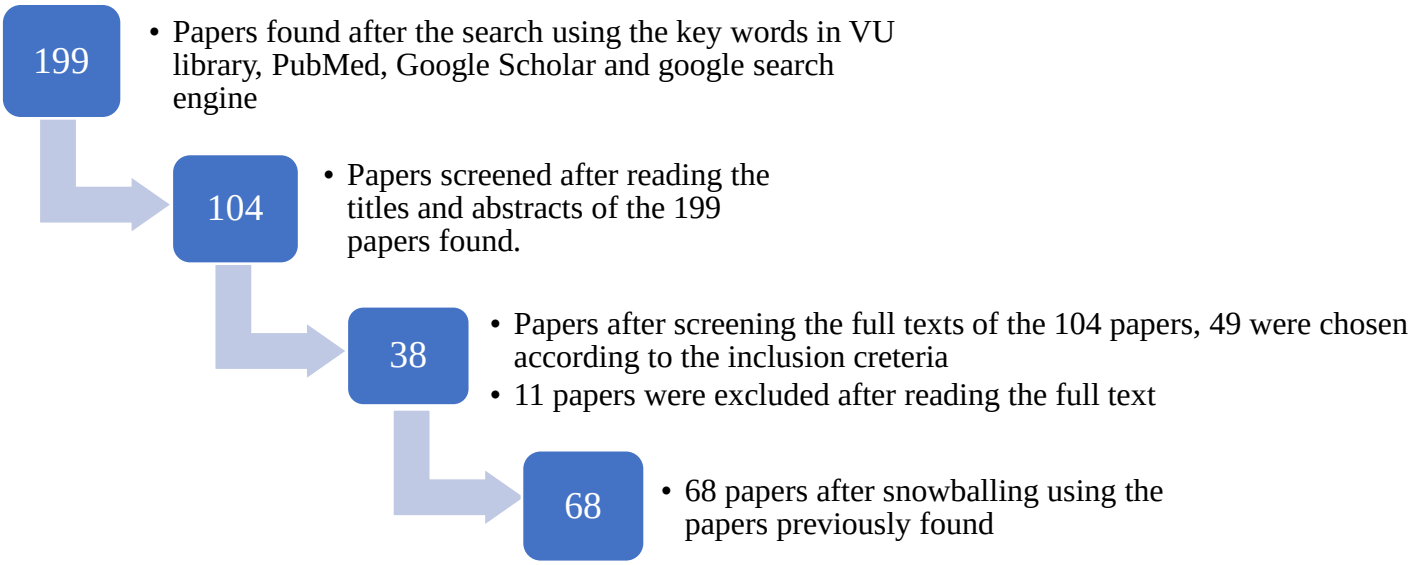

Figure 3. PRISMA flowchart on the search and screening strategy.

Table 1. Keywords used in the search for peer-reviewed articles and gray literature. (Keywords were combined using AND horizontally and OR vertically)

No.	Literature	Search database	Problem	Factors related terms	Geographical Scope
1	Peer-reviewed articles	VU library, PubMed, Google Scholar, Google search engine	Self-medication, Irrational use, Antibiotics resistance, Antimicrobial resistance	Antibiotics, Health system, Health services utilization, Health inequality, Policies, Prescription behavior, Health-seeking behavior, Accessibility, Availability, Affordability, Patients' perception, Basic Package of Health services, Essential Package of Health Services	"Afghanistan" "Eastern Mediterranean region" "Low-and-middle-income-countries (LMIC)"
2	Gray literature	WHO, UN agencies, non-governmental organizations, Google search engine	Self-medication Irrational use Antibiotics resistance Antimicrobial resistance	Antibiotics, Policies, Medicines national policy, Essential drug list,	"Afghanistan" "Eastern Mediterranean region" "Low-and-middle-income-countries (LMIC)"

3.3. Conceptual framework

Andersen's model (Figure 4) was developed to explore the reasons and modalities for accessing health services. It helps in studying various categories of factors leading to the behavior of accessing a particular health service. Those categories are:

- Health care system (national health policies and organization of health resources)
- External environment (conflict, political and economic factors)
- Population characteristics
    - Predisposing characteristics (demographics, social status, etc.)
    - Enabling factors (income, education, medical service, etc.)
    - Need factors (Need for self-medication and severity of illness as perceived by people and evaluated by health care professionals).

Andersen's model was used to explore the factors that lead to health behavior, which is the focus of this thesis, self-medication of antibiotics. This model allows for studying the factors leading to a health behavior from three aspects, the population characteristics, the health system, and the external environment factors. This will allow for better clarification on how those factors overlap to lead to SMA. Since Afghanistan has been going through many conflicts in the last decades, this model will allow for more understanding of the external factors. Additionally, it will allow for a better understanding of how external factors interact with the population and health system factors that yield a specific health behavior.

This study focuses on the factors leading to the SMA, so the outcome part of the framework will not be used since it measures the health effects of a particular health behavior which is out of the scope of the objectives of this study. The focus of this study is to explore the factors leading to SMA while the outcome of this behavior is antimicrobial resistance which has, in addition to SMA, other factors leading to it which are outside the scope of this study.

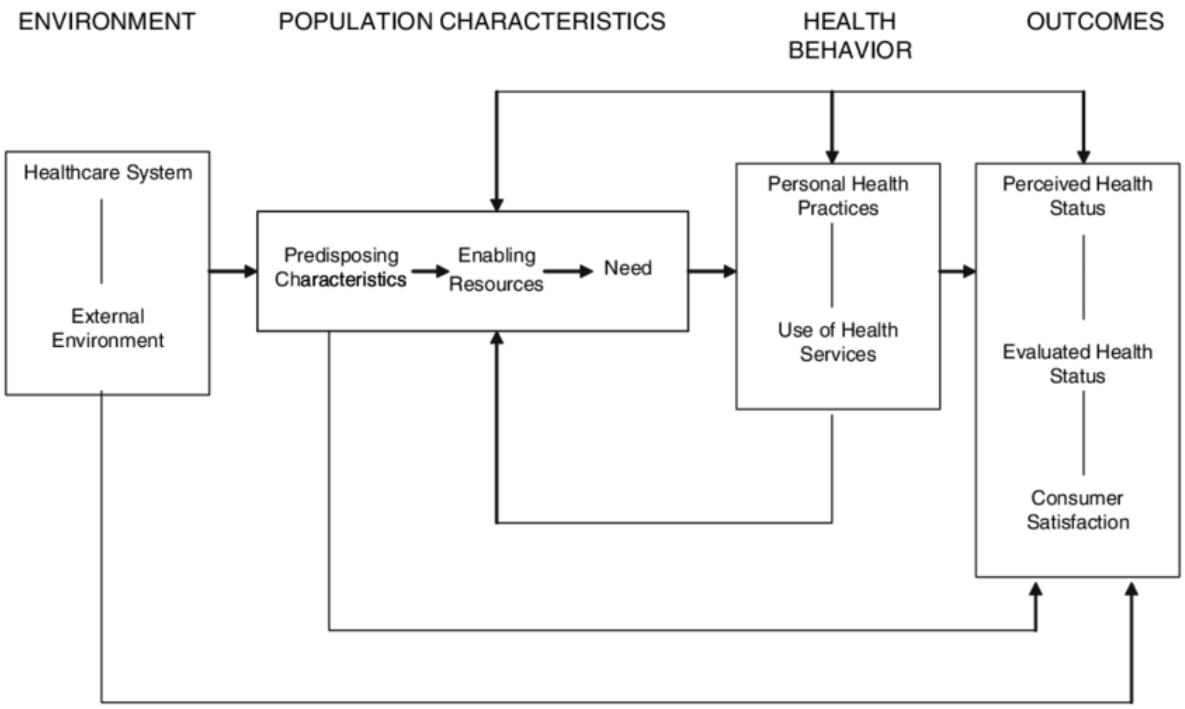

Figure 4. Conceptual framework of the modified Andersen model of health service utilization. Adapted from Andersen RM(32).

3.4. Study limitations

This study is a literature review, depending mainly on the available literature. Papers on self-medication in Afghanistan are scarce, and as papers on antimicrobial resistance mention self-medication, those papers were included to get some information. The studies on self-medication are sometimes limited to a specific region or city of the country, and their results cannot be generalized. Gray literature on the topic is available, but there are not many reports and numbers about Afghanistan, or the data is older than the time frame of this study. This study will not study the outcomes of the SMA since it is out of the scope of this study, and the magnitude of that outcome in Afghanistan is not yet known.

4. Results

In line with Andersen's framework, the result section will discuss environmental factors, including the external environment and health system. This section will also discuss population characteristics that include predisposing factors, enabling resources, and needs.

4.1 Environment

4.1.1 External environment

Afghanistan has been going through wars and conflicts in the last three decades. War has resulted in a collapse of the health system where health services quality, delivery, and availability were negatively affected. In war, keeping the health system functioning is a problematic mission where health care professionals are displaced by war, and medical supplies are hard to be delivered(8)(9).

After the end of the violent Taliban era in 2001, the government of Afghanistan worked closely with international donors to rebuild the disrupted health system of Afghanistan, taking advantage of the improved security status of the country. After more than a decade of the presence of international forces and decreased violent activities, the forces' mission ended. In 2013, the violent activities started to escalate, and people casualties increased more than they were during the presence of international forces by 13.5% more than in 2012. As a result, it was registered that the number of internally displaced people (IDP) is 630,000(32). One hundred twenty-four thousand IDPs resettled in other places in 2013. About 2.6 million Afghan people fled from the country to neighboring countries(32).

According to a study done in 2013 in four provinces, 78% of the people attributed not going to a public health facility to insecurity and military activities. In a qualitative study by Médecins Sans Frontières (MSF) in 2015, 20% of the responders stated that they have a relative who lost his/her life because conflicts hindered him/her from reaching the health facility(32). Health care professionals also tend to avoid the facilities located in conflict areas with poor security status (32). In 2018, It was reported that as a result of conflict, 98 health facilities were attacked, 19 health workers were killed, 25 health workers were injured, eight health facilities were damaged, and two health vehicles were destroyed(33). People also flee from conflict sites to refugee camps where the density of people is high, and health services are not available(8)(9).

A report in 2018 showed that 33% of Afghanistan's territories are suffering from violent conflicts, 12% are under the control of Taliban, and only 53% are under the complete control of the government. These continuous conflicts resulted in the internal displacement of people, that 356,000 were found to be internally displaced. As a result of the violence, 10,000 people were killed or injured just in 2018(34)(35). Injuries and wounds caused by war need special care that includes the use of antibiotics to heal as they are mostly open unclean wounds(8)(36).

Also, part of soldiers' training is to respond to open injuries by taking certain antibiotics before going to the battlefield. A guideline called Tactical Combat Casualty Care (TCCC) is used for that training(36).

A study done in 2014 to evaluate the adherence of antibiotics used in the cases of open wounds in conflicts and wars concluded that antibiotics provided were either not used or no proper kind of antibiotic was administered(36). Moreover, in such an environment, counterfeit, expired, and poorly stored antibiotics become available to people allowing for SMA (8). Therefore, SMA increases during the conflict as a leading predictor of antimicrobial resistance(17).

The long-lasting conflicts in Afghanistan affected the economy of the country. People have low resources to access health care(8). In a health system mainly financed through out-of-pocket resources, the people of Afghanistan find it difficult to afford health services in the country's economic crisis (8)(12). It is estimated that more than 49.4% of the population is below the national poverty line(4)(37). Unemployment is 11.7% of the total population, and even the 35% of the employed population over the age of 15 gets less than 1.90$ a day(37).

In August 2021, Taliban took over the country, and the economic effects devastated the already weak economy. Sanctions that led to the isolation of the central bank of Afghanistan led to the deprivation of millions of Afghans from the essential humanitarian aid and salaries of millions of employees, including health workers(38). A report in February 2022 by Save the Children estimated that 82% of the households in Afghanistan lost their source of income, and 20% sent their children to the labor market to work for meager wages(39). Preceding the Taliban's control of the country, the country went through the worst drought in 30 years, leading to the worst harvest for people working in farming that year. Knowing that the country's economy was mainly dependent on external aid for 20 years, which forms 43% of Afghanistan's gross domestic product, cutting that aid led to an economic collapse which drove the collapse of other sectors in the country, including health(31)(38). Non-governmental organizations run primary health care in Afghanistan through contracts from MoPH. MoPH is also running the hospitals in the country. After taking over of Taliban, they found a well-structured health system, but they had no experience in running a health system, and they changed the minister of health to a member of their group called Mullah. This endangers the funds allocated for a health system that, if reallocated by Taliban, the health care services provision would be in danger(31).

SMA in such an environment sets itself as an available cheaper alternative, especially since antibiotics regulations and control become weaker during conflicts and antibiotics can be found easily in the pharmaceutical market(8)(9)(17). In a community-based cross-sectional study in Kabul in 2022, the highest percentage of all responders, 27%, confirmed that economic problems were the reason for practicing SMA(24). 22.7% of the responders attributed the lack of time to visit a health care professional as their reason for practicing SMA(24). This can be well understood given that more than 90% of the workforce in Afghanistan is in the informal sector, where missing some hours or a day in the job can seriously impact income(40). It is reported that after the last conflicts and the seizing of Afghanistan's capital by Taliban, 900,000 jobs were lost just in the second quarter of 2022, wages reduced by 9.5%, and working hours dropped by 13% in the third quarter of 2021(41).

Conflicts that restrict people's movement to seek health services and poverty that deprive them of getting the proper health care they need are among many factors leading to SMA.

4.1.2 Healthcare System Factors

The population of Afghanistan is mainly distributed in the rural areas where 75.6% of Afghans live(5). Disparities between urban and rural areas regarding health care access exist. The difference in the ratio of health workers in urban and rural areas of Afghanistan is noticeable since there are 36 per 10,000 in the urban areas compared to 16.7 per 10,000 in the rural areas where most of the population lives(11).

It is also reported that the more qualified health workers are concentrated in urban areas(11). Most people in rural areas receive their health care from basic facilities that provide limited health

services, and people need many efforts to reach quality health services(42). Accessibility of health facilities was at 9% after three decades of conflict and disrupted health system(7)(10). Only 9% of the population of Afghanistan live one hour's walking distance from a health facility(11). After rebuilding the Afghan health system, the objective was to increase its accessibility by introducing BPHS in 2003 and then the EPHS in 2005. As a result, accessibility increased from 9% to 85% in 2008, which means that people mostly need no more than 1 hour using any transportation means to reach the health facility(7)(10).

Health services provided by those facilities are primary care services, and more specialized services are hardly accessible(42). Also, the rural areas were poorly covered by health services, despite the high percentage of coverage of BPHS and the presence of most of the population in the rural areas. This can be elaborated by knowing that the percentage of coverage of BPHS is high, but it only expresses the health facilities' geographic coverage and the designated number of people they should cover regardless of the ability of people to access and utilize those health care services(11). Moreover, as the BPHS was delivered by contracts with out-of-the-government organizations and those services were funded mainly by donors' aid, most of those services were focused on secured regions where the international forces were present. Insecure regions were deprived of many health services(32).

Although health services became available for people in Afghanistan, health care services utilization is low(10). A cross-sectional study in 2011 done in 78 referral health facilities stated that despite the availability of emergency obstetric and neonatal care (EmONC) in their facilities, the utilization was 17% of the capacity the facility could deliver for their given population. The study also stated that only 20% of the expected women with complications received the available services(43). Negative perceptions about the quality of the health system services hinder many Afghans from using the available health services because of quality issues that most of the time are based on previous experience or due to the difficult access to health services. Public health facilities are overwhelmed by many patients, and the waiting time is extended(10).

On the other hand, private facilities are overpriced for the people of Afghanistan, where more than 49% of them live at the poverty line(4)(24). Infectious diseases are highly prevalent in the rural areas of Afghanistan, where most Afghans live, and the treatment of most of those diseases is through antibiotics(21)(42). SMA is widely practiced in such environments because it is a low-cost choice, and the loose regulations for antibiotics make them easier to get and put the pharmacies as the source of medical care(24). Therefore, the underutilization of health services driven by low-quality health services leads to the intensification of SMA(10)(24).

In LMICs, medicines form a substantial amount of the total expenditure on health that falls between 20%-50% of that expenditure. Antibiotics are extensively used in LMICs due to the high burden of infectious diseases(21). Antibiotics use should be rational to prevent the occurrence of antibiotic resistance(44). WHO reported that more than half of the medications are irrationally prescribed. Therefore, patients have plenty of unused or expired antibiotics that they did not get the proper guidance from health care professionals on how to use (45). According to WHO, fifty percent of the patients do not know how to use antibiotics(45). Patients stop using the antibiotics after feeling well without completing the total required dose, or they get more than they need as a result of irrational prescriptions and then share the leftover with others(24)(45)(46).

The most prescribed antibiotics by health care professionals in Afghanistan were penicillin, metronidazole, amoxicillin, and ceftriaxone. Those four antibiotics were also found to be the most used antibiotics by people for SMA(24).

A cross-sectional study conducted in 2014 in a district hospital run by MSF and included the analysis of 9678 out-patient prescriptions concluded that more than half of the prescriptions included antibiotics. Some prescriptions included wrongly prescribed antibiotics for conditions that other antibiotics must be prescribed according to MSF guidelines(47). WHO recommends that prescriptions including antibiotics should not exceed 30% of the total prescriptions of a health facility(34). The study analyzed prescriptions in warm and cold seasons and concluded that over-prescription of antibiotics was higher than WHO recommendation since it was 60% and 50% in warm and cold seasons, respectively(47).

The sample size of this study is good, and it might give a good picture of the situation of prescribing antibiotics, and prescriptions were analyzed in different seasons to avoid time period bias; however, the limitations of it might be that it is specific to one department, out-patient department, and one hospital.

Irrational prescription of antibiotics is highly prevalent in Afghanistan. A retrospective descriptive study in Kabul, Afghanistan, in 2018 showed that irrational prescription of antibiotics is prevalent that 66% of the prescriptions collected from the most prominent public and private hospitals in the study included antibiotics(44). This percentage is higher than WHO's recommendations that a maximum of 30% of the total prescriptions in a facility should include an antibiotic(34). Of the 66% of the prescriptions including antibiotics, some included a combination of two or three antibiotics, 18.2% and 5.1% of the total prescriptions, respectively, while the remaining 43% included one antibiotic (Figure 5). Patients did not have the proper explanation from health care professionals on how to use the antibiotics and for how long(44).

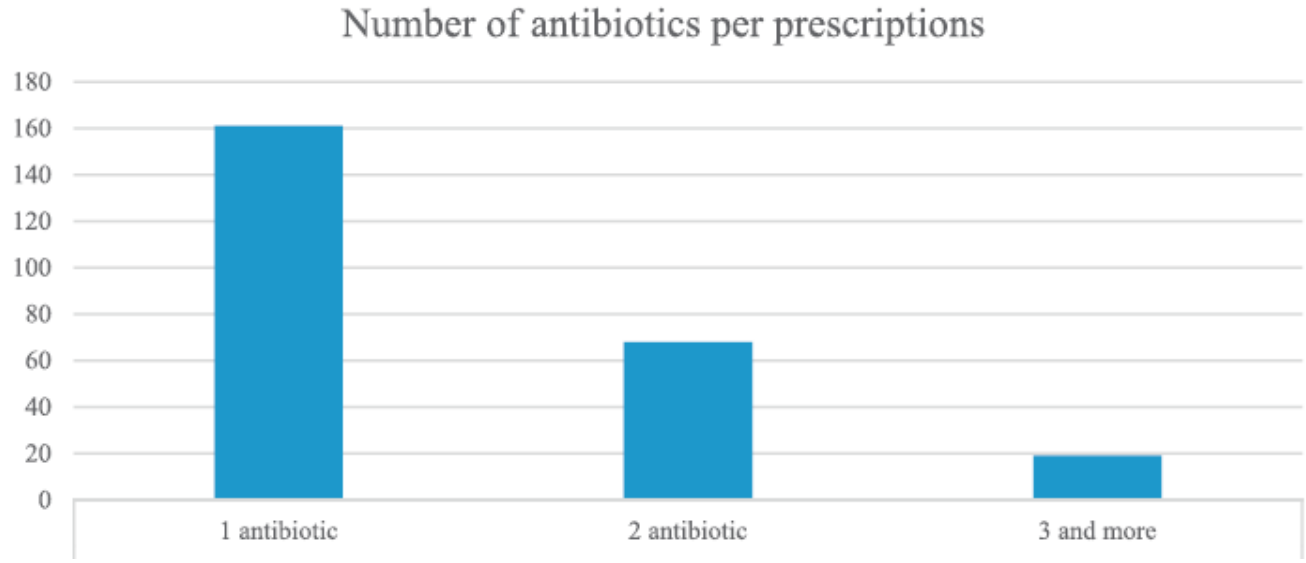

Figure 5. Number and prevalence of antibiotics in the prescriptions in Kabul's public and private hospitals. Adapted from Mousavi SH et al.(45).

This study shows the prescription behavior of health care professionals in different sectors, private and public hospitals, and might give a broader picture about the situation of antibiotics prescription. However, the limitation of this study might be the small sample size since, from 6 hospitals, only 374 prescriptions were included in the study.

The results of this study support the results of the previous study that was done in a specific department in one hospital and might give a more generalized picture about the prescription behavior of antibiotics by health care professionals.

Children are also affected by the irrational prescription of antibiotics. A mixed method study, including a cross-sectional study, was held to assess the integrated management of childhood illness (IMCI) in children aged between 2-59 months in Afghanistan in 2017. The study found that only 29.8% of the total antibiotic prescriptions included the correct guidance on how to use it. About 30% of antibiotic prescriptions to children were unnecessarily prescribed. Health care professionals without training prescribed more antibiotics irrationally(48).

The global action plan to combat antimicrobial resistance states that antibiotics potency should sustain as much as can be so infectious diseases can be treated effectively. In order to achieve that, quality assurance of antibiotics must be adequate to assure the availability of active antibiotics. The plan confirms that antibiotics should be used rationally by both the people and health care professionals. National plans and policies should guarantee the achievement of the global action plan(9).

Afghanistan has a medicines national policy, National Medicines Policy (NMP), developed in 2003; however, it does not have an enforcement strategy. Medicines Regulatory Authority (MRA) is the division of the ministry of public health in Afghanistan with the law power to implement the medicines regulations in the country. However, this division cannot enforce regulations and has no authority over the inspection of pharmacies and quality control of medicines(28). Good manufacturing practice (GMP) is the minor production requirement that the manufacturer must comply(3). Pharmaceutical companies in Afghanistan are required to undergo an official examination of their facilities as a requirement for licensing from the ministry of public health; nevertheless, the international GMP certification is not required. GMP is only a requirement of international pharmaceutical manufacturers but not domestic ones(28).

Afghanistan has a national plan to reduce antimicrobial resistance, National Action Plan on Antimicrobial Resistance (NAP-AMR); the plan time scope is 2017-2021. The plan aims to overcome antimicrobial resistance in Afghanistan since it is an escalating health problem in Afghanistan. It also aligns with the global efforts to reduce the effects of this health problem. The plan explicitly focuses on bacterial resistance. It aims to reach its goal through strengthening governance and enhancing stakeholders' capacities(9).

Regulations and laws for medicines that enter Afghanistan are present. Implementation of those regulations is not sufficient. Importers of medicines are required to pass their products through testing measures at the ports; however, it is mostly not done due to the low capacities of the authorities in charge. Importers and wholesalers cannot work without a license in Afghanistan but are not obliged to follow good distribution practices by law(28).

National good pharmacy practice guideline does not exist in Afghanistan. Pharmacies are required by law to be registered and licensed. However, pharmacists do not have a guide regarding antibiotic dispensing(28).

Quality control requirements are not part of medicine purchasing and can be conducted only in two situations: if there are complaints about the product or as a requirement for registration(28). The quality of antibiotics is essential since the spread of poor-quality antibiotics leads to prolonged and failed treatment, leading to antibiotic resistance(9). Poor-quality drugs contain less or no therapeutic substances from the original manufacturer or improper storage and distribution conditions. Distribution poor conditions might lead to the degradation of the active therapeutic substance of the antibiotics. Therefore, Patients take antibiotics with a sub-therapeutic active substance which exposes the pathogens to the substance without curing the disease and lead to the development of resistance from pathogens against those antibiotics(49).

For the private sector, pricing policies for medicines are not in place. Medicines are being priced according to the market prices. This led to a substantial increase in quality medicines price, making them unaffordable. Therefore, people tend to buy incomplete courses of antibiotics, low-quality antibiotics or do not follow the recommended dose of medicines due to their high prices(50).

Regulations for medicine promotional activities are available and enforced by MoPH. Those regulations are only limited to prescription drugs, and for non-prescription drugs, there are no regulations(28).

Health policies in Afghanistan regarding SMA face several challenges. Long uncontrolled borders of Afghanistan allow for the smuggling of antibiotics that are then sold in the market without a prescription. Those antibiotics do not go through any quality control measures, and their effectiveness is not tested. Poor quality or counterfeit antibiotics are also widespread in Afghanistan because of the open borders. Quality control of the medicines that enter the country is not optimum, and many medicines, even with poor quality, can be available in the market.

Moreover, transporting antibiotics around the country does not follow the pharmaceutical companies' guidelines on transporting and storing pharmaceutical drugs in certain environments makes those drugs less effective. Therefore, most of the antibiotics available on the market are either counterfeit or less effective. This shows that the country's policies and measures to control SMA are not working well because they face many obstacles(9).

Covid-19 is another burden added to Afghanistan's disrupted health system. In 2020, 400,000 Afghani people working in neighboring countries came back to the country from Iran and Pakistan. Then, the number of cases of Covid-19 started to increase and reached 37,424 and 1363 causalities. The real numbers are said to be way higher. Afghanistan's health system was unable to cope with the pressure of Covid-19 patients. The already low number of health workers became even lower because they got infected. It is reported that 10% of the health workers in Afghanistan were infected due to the lack of protective measures. Many services were stopped, and many appointments for preventive services were canceled. Several people could not access health care facilities because of the burden Covid-19 put on Afghanistan's health system(35).

After the Taliban took over in August 2021, the health system of Afghanistan has severely devastated. The health system that was dependent on external aid has been collapsing since

then(31). United Nations (UN) reported in September, a month after Taliban controlled Afghanistan, that less than 20% of the public health facilities are still working(31)(51).

The health system in Afghanistan is going through many difficulties that can be summed up in accessibility, underutilization, irrational antibiotic use, and conflicts which all contribute to SMA.

4.2 Population Characteristics

4.2.1 Predisposing Factors

The gender of the patient can play a role in his/her accessibility to health services. Afghanistan is the 169th country on the gender inequality index. In Afghanistan, females face many restrictions in accessing health care services(52). Women in Afghanistan are less educated and financially deprived. They get five times fewer job opportunities than men and 16% fewer salaries(52)(53).

Religious and cultural norms reduce the ability of women to access health. For instance, women cannot receive health care services from a male health worker. This reduces the accessibility of women to reach health services unless there is a female health worker. Afghanistan has an insufficient number of female health care professionals, which leads to the underutilization of health services. The shortage of female health workers can be attributed to the high illiteracy level among women in Afghanistan, where 88% of women are illiterate due to cultural and religious beliefs that hinders women from education(11).

Men mainly make decision-making regarding seeking health care for women. The demographic and health survey of Afghanistan in 2015 reveals that only 5% of the participant women in the survey said that they make the health-related decision by themselves, while 44% stated that any decision related to their health is taken by their husband(54).

Women who responded to the survey are not financially independent because they are either unemployed or not free to use their earnings by themselves. 87% of married women are unemployed compared to only 3% of unemployed married men. The 13% of employed married women in the survey do not have complete control of their earnings from their jobs, whereas 40% responded that they have the power to decide where to spend the money earned(54).

The recent conflict and wars that resulted in Taliban taking over the country will increase the violations of women's rights and lead to further restrictions, affecting women on many levels. The already existing shortage of female health care professionals will increase due to the restrictions on women's education rights since Taliban only allowed education for women up to secondary school (38)(52). Less accessibility to health services will be one consequence of this shortage due to cultural norms that require a female health worker to treat other females(52).

Moreover, restrictions on job opportunities and the ability to get a source of income will increase, leading to the impoverishment of women. This will deprive them of accessing health care services due to the absence of financial ability to afford transportation to health facilities or paying for health care in the private sector(52).

In such settings, a systemic review in 2019 which studied the factors of SMA in LMIC concluded that gender plays a significant role in SMA where women practice SMA more because they cannot access health care services(21). However, another community-based cross-sectional study in Afghanistan in 2017 found that men practice SMA more than women. The limitation of the previous study was the limited sample size of 385 participants(24).

However, the cross-sectional study cannot be generalized since the sample size is small, and it was done in Kabul, an urban area where the health services are relatively better and female health workers are more than the rural areas. On the other hand, the systemic review can be generalized to the Afghanistan context due to the similarities with the other contexts studied in the review since the systemic review included most of LMICs that are adjacent to Afghanistan, and the total sample size was 7676 participants, so it represents Afghanistan's situation better.

According to studies done in Afghanistan, people under 25 are more likely to practice SMA (24). Almost half of the population of Afghanistan are under the age of 15, and 27.4% are in the range of 15-29 years old (Figure 2)(5). This may be due to the caregiver effect since the caregiver of the people under 15 is mostly mothers, women, who are vulnerable and have less access to health care; thus, their children will have less access to health care.

Language can be a factor in using antibiotics irrationally since the instructions of medicines are in English, and people cannot read other languages, and sometimes they cannot read their language due to the increase of illiteracy(17).

Studies have shown that the prevalence of SMA is higher in urban areas when compared to rural areas. It is estimated that the range is from 48%-58% and 77%-93% in rural and urban areas, respectively(21). This can be attributed to the higher quality and higher ratio of health workers per a given population in urban areas compared to rural areas; thus, people in urban areas are better covered and have better access to health care(11).

Perceptions about the quality of public health services affect the utilization of the available services. According to a qualitative study including semi-structured interviews and focus group discussions by MSF in 2013, among 759 participants, 68.3% of respondents from four provinces said that they do not use the nearby public health services because they believe the quality of services is unreliable and staff is not qualified. Other responders mentioned that they prefer the private sector or informal health services. Responders also mentioned that some of the staff of the public health facilities try to attract them to the private clinics they work in after working hours in the public sector(32). This might give a negative impression on the reliability of the health care professionals. The negative perception of health care facilities in Afghanistan pushed a lot of Afghans to look for health care in neighboring countries, especially Pakistan. Those treatment trips cost them to sell their land or house to cover the expenses(32). This catastrophic expenditure may further impoverish the household.

People of Afghanistan have a particular term to describe antibiotics in their language "zedi cherk" which means anti-dirt. They believe that most diseases are caused by the dirt and the dust that enters the body. They see antibiotics as cleansers for their bodies. The drug's dosage form plays a role in the perception of antibiotic potency. In a survey in a mixed-method study done in 2021 by MSF, 84% of the 351 responders stated that injection dosage forms are better and more potent than pills or tablets. 94% of the responders stated that instructions on how to use the antibiotics were clear; however, they stated that they do not complete the antibiotic recommended course after feeling better because they think that continuing the antibiotic may cause harm to their health(55).

4.2.2 Enabling Resources

Relationships between income and SMA have been reported in many studies in LMIC(21). In a descriptive cross-sectional study in Yemen, the association between SMA and low income was strong. Patients tend to use antibiotics without a prescription to escape the expenses of visiting a

health worker(56). In Afghanistan, approximately half of the population lives at the national poverty line(37). Although the public health services are supposed to be free, visitors of public health facilities report that they pay fees for doctor appointments and other services. Patients also pay for their medicines since most are not available in public facilities. They buy them from private pharmacies, and sometimes they have to pay for medicines even in the public pharmacies(32). Studies in Afghanistan showed that patients tend to self-medicate themselves with antibiotics due to the cheaper cost of SMA compared to health services and the expenses accompanying seeking health services like transportation (24).

Education level can affect the prevalence of SMA among communities where the people are highly educated or illiterate. In communities where the illiteracy ratio is high, in addition to the financial hardships, SMA was found to be highly prevalent. This can be attributed to the lack of knowledge of the consequences of SMA on their health(21). On the other hand, highly educated people were also found to have a high prevalence of SMA (21).

University students, in general, were found to have a high prevalence of SMA in LMIC. Educated populations were found to practice SMA more than the other groups, and the prevalence among this group was high whether they lived in urban or rural areas(21).

In LMIC, the prevalence of SMA is found to be high among medical students (21). For example, studies conducted on students of dentistry in India and nursing students in Nepal found a high prevalence of irrational use and self-medication of antibiotics among those groups despite their knowledge of antibiotics and their proper use(21)(57)(58).

In Afghanistan, the practice of SMA among the educated population is high. A cross-sectional study conducted on first- and fourth-year students in Kabul in 2022 found that the practice of SMA among medical students is high. Of all the medicines they used to self-medicate, antibiotics form 22%, just after the OTC drug paracetamol, which forms 27%. Also, higher university-level students were found to practice SMA more. The prevalence of SMA among first- and fourth-year students was 24% and 76%, respectively(59).

People find SMA an easy way to escape the long waiting lines, crowdedness, and the expenses of traveling to the health facility. Knowledge about the illness as a previous experience might be another reason for practicing SMA. Perception of the illness is another factor since patients who underestimate an illness's seriousness consider it a mild illness that can be treated individually by SMA. In a cross-sectional study in Afghanistan in 2022, 19.5% of the responses of patients who previously practiced SMA attributed their behavior to a previous experience with the illness and its treatment(24).

Social networks also play a role in the practice of SMA in LMIC. Most of the time, antibiotics are recommended by a friend or a family member who had the same symptoms. Moreover, leftovers of antibiotics are shared by a family member or a friend without medical consultancy(21). In a cross-sectional study in Kabul, 23.8% of the people involved stated that information that enabled them to practice SMA was derived from the leftover drug leaflets. Also, 12.4% said they got the information from a friend or a relative(24).

Antibiotics are available for people in Afghanistan without strict regulations. Antibiotics are easily accessible in Afghanistan, and if not acquired through medical prescription or public health facilities, people can buy them from private pharmacies(55). According to Afghani law, almost all

antibiotics are free of charge in the public sector(9)(14). While the public sector can cover only 50% of medicines needed by Afghans, people buy their antibiotics from the private sector, which forms 95% of the pharmaceutical market where they can get them without a prescription(9)(14)(24). In a cross-sectional study in Kabul in 2017, 21.6% of the 385 participants attributed their SMA behavior to the ease of use of antibiotics(24). Moreover, In a survey done in 2021 by MSF, eighty-seven percent of the three hundred fifty-one participants recognized private pharmacies as their source of antibiotics(55).

4.2.3 Need factors

People's perceptions about specific symptoms make them predict their need for antibiotics to treat such conditions. In LMIC, people tend to use antibiotics based on their diagnosis and not professional opinion. People use SMA for common conditions: diarrhea, common cold, sore throat, headaches, toothache, cough, flu, sexually transmitted diseases, skin diseases, inflammation, and upper respiratory tract infections. The most common diseases are common cold, flu, and sore throat, in which SMA is widely practiced regardless of the need for antibiotics in those conditions(21).

People of Afghanistan also consider antibiotics to clean the body to treat health problems like infertility. They believe that when a woman has uncleaned blood, she will not be able to get pregnant. The belief in the cleansing properties of the antibiotics is rooted in poor hygiene, elevated levels of air contamination, and the belief of impurity in their community. People in Afghanistan need antibiotics due to the belief that antibiotics are the most effective drugs to treat diseases and give quick results when used to treat infections regardless of the type of infection. Afghans also use antibiotics to treat diseases resulting from direct contact with animals(55).

The Suspension of Amoxicillin, an antibiotic, is the most requested medicine for children after Paracetamol, a pain killer and fever reducer. This antibiotic is needed based on positive experience, a previous prescription from a health worker, or recommendations from family members or friends. People seek fast relief from their illness; that is why Afghan people believe that Amoxicillin suspension is a potent treatment that guarantees fast improvement. Moreover, people think that more antibiotics mean faster and better treatment. Additionally, people in Afghanistan use antibiotics to keep themselves healthy. They believe that antibiotics help to clean and protect the body from diseases and to enhance the immune system(55).

Patients expect to have antibiotics in their prescriptions as a sign of an effective treatment plan; they feel upset when they discover that it is not included in the prescription at the pharmacy. In many cases, when they fail to convince a male health worker to prescribe an antibiotic, they seek medical help from a female health worker since they think it is more possible to convince a female health worker to prescribe an antibiotic(55).

They also seek health care from the private sector to get antibiotics. Health care professionals in private clinics are stressed because of those expectations of getting antibiotics or losing patients. Patients evaluate the quality of health services according to the medications they get, especially antibiotics. People use antibiotics in Afghanistan for indications that they do not need antibiotics for. For example, during menstruation, for general body pain, after birth, for the common cold, and flu. People believe that antibiotic side effects are outweighed by their benefits. Antimicrobial resistance as a consequence of SMA is unknown for people in Afghanistan(55).

Prescription behavior and adherence to the guidelines of antibiotics prescription define the evaluation of the need for antibiotics from the perspective of health care professionals (60)(44). It is estimated that irrational prescription of antibiotics by health care professionals reached 75% in teaching hospitals in developing countries. Only thirty percent of the developing countries have properly working authorities to regulate drug use. Health care professionals are usually at the center of evaluating the need for antibiotics. The evaluated need in Afghanistan seems to be affected by patients' perceptions(46).

In a retrospective descriptive study in 6 public and private hospitals, parenteral dosage forms of antibiotics were found to be the most prescribed among other dosage forms like pills and capsules, with 42.51% of the total prescriptions. Moreover, Amoxicillin was found to be one of the most prescribed antibiotics, and the prevalence of prescribing antibiotics is higher in the private sector compared to the public sector(44). This might show similarities with patients' perceptions about injectable antibiotics and the preference for Amoxicillin in particular.

In the out-patient department of Ahmed Shah Baba district hospital in the suburbs of Kabul in 2014, a hospital that serves neighboring villages, IDPs who escaped insecurity in the other parts of Afghanistan, and people who returned from Pakistan and Iran, a cross-sectional study to study the patterns of the prescriptions was done. The analysis of 9678 prescriptions showed the patterns of prescriptions of health care professionals and their evaluation of the needed antibiotics for certain diseases. The prescriptions were collected during summer and winter to show the variations in prescribing antibiotics based on seasonal diseases. The study shows that fifty percent of the prescriptions included an antibiotic in winter, while the percentage was sixty-two in summer(47).

Overall, health care professionals' prescriptions show an increased tendency to prescribe antibiotics exceeding the WHO target for out-patient departments, which is 30%(Figure 6)(47). This might show an overestimation of the need for antibiotics from the health care professionals' side. The diagnosis that received the highest rates of prescribed antibiotics were among dental patients, urinary tract infections (UTI), and diarrhea, 100%,100%, and 97%, respectively, which shows an overprescription of antibiotics. Forty percent of upper respiratory tract infections (URTI) prescriptions included antibiotics. It shows that the need for antibiotics is overestimated since most URTIs result from viruses and 60% of diarrhea cases are of viral origin where antibiotics are not needed since they are not used for viral infections (Figure 7). It was also found that certain antibiotics were prescribed inappropriately for some diagnoses where other antibiotics should have been prescribed instead of following the guidelines' recommendations. Moreover, a third of the prescribed antibiotics for dental cases are found to be irrational(47). This might show low adherence by health care professionals to the guidelines of antibiotics prescription and poor evaluation of the need for specific antibiotics.

Health care professionals sometimes prescribe antibiotics according to the patient's perception of need but not their evaluated need. This can be shown in Figure7, where 40% of prescriptions happened with no diagnosis (no Dx), which may reflect the prescribing behavior according to the patient's perception of need and request(47).

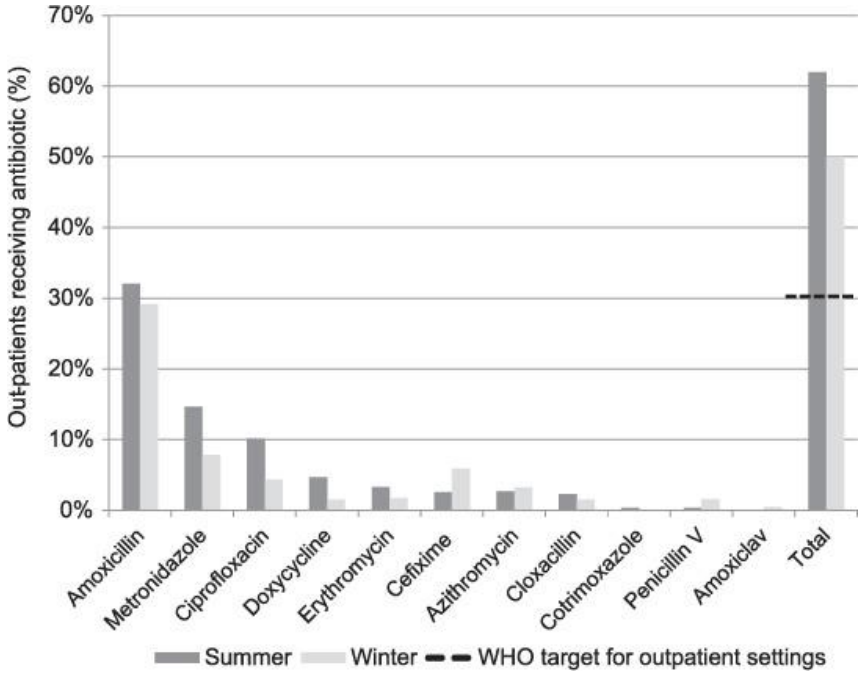

Figure 6. Proportions of the different antibiotics in the prescriptions in summer and winter compared to the WHO recommended target. Adapted from Bajis S et al.(48).

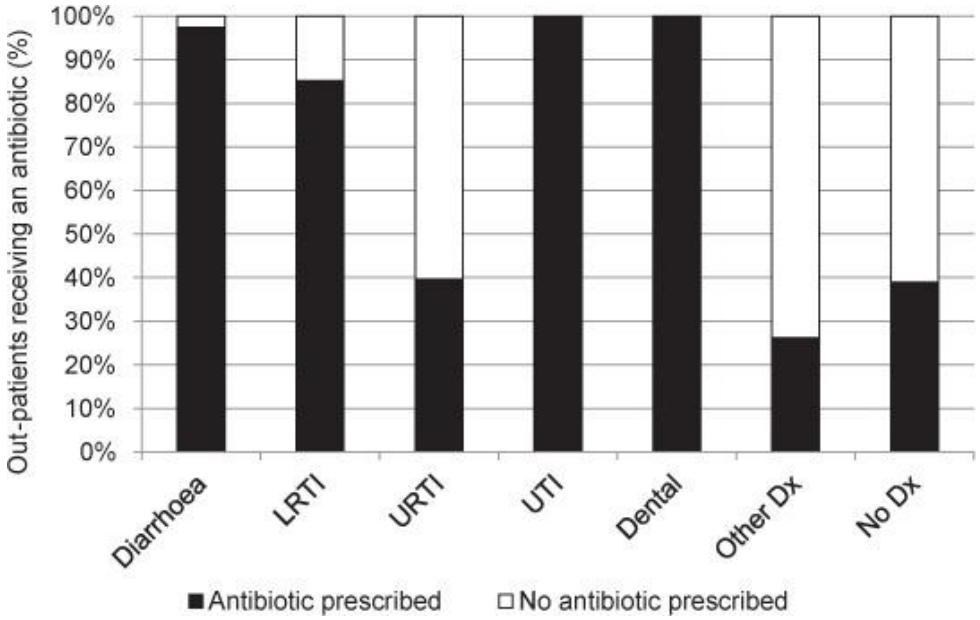

Figure 7. Proportions of the different antibiotics given to different diagnoses. LRTI = lower respiratory tract infection; URTI =upper respiratory tract infection; UTI = urinary tract infection; Dx = diagnosis. Adapted from Bajis S et al(48).

5. Best practice interventions

As seen so far, many overlapping factors contribute to SMA increase, including contextual factors, economic factors, availability of antibiotics, accessibility of antibiotics, perceptions about the quality of health care, regulations of antibiotics, and level of application of those regulations. Level of education, knowledge about diseases, age, and gender are also factors leading to SMA. Moreover, income of the household, cost of medical services, and pricing of medicines contributes to the increase of SMA. In rural areas, the situation of SMA is even worse with low availability of health facilities, long distances to reach the health facility, illiteracy, low income, and simplification of the symptoms(16). Interventions should address those factors and the interlinkages between them in order for the interventions to be effective(21).

Interventions to decrease the prevalence of SMA in developing countries used several approaches to reach their objective. The approaches are educational, economic, regulatory, diagnostic, a combination of two approaches, and multi approaches interventions(46).

One of the educational approach interventions was outcome-based education for GPs working in primary health facilities in Iran. A continuing medical education (CME) program was conducted, focusing on the prescription behavior of drugs. The program was conducted for 16 hours and included interactive learning techniques, learner-centered lectures, case studies, and discussions. The prescription behavior was assessed nine months before and three months after the intervention. The effect of this intervention was the decrease in the mean of drugs per prescription from 4.11 to 3.89 and the reduction in the mean number of injections per prescription from 0.95 to 0.80(61)(62).

Another program in India focused on educational-regulatory intervention to decrease the irrational prescription of antibiotics. The Antibiotic Stewardship, Prevention of Infection & Control (ASPIC) program focused on applying existing guidelines that aim to restrict the use of antibiotics and support the rational use of antibiotics. After creating the guidelines, the regulatory part, the program started to hold workshops each year for health care professionals from 20 health centers on implementing those guidelines practically. The outcomes of this program were a decrease in the proportion of patients receiving antibiotics and controlling the rising use of antibiotics in the next five years after the beginning of the program(61)(63).

In Thailand and Vietnam, another educational-regulatory intervention was conducted to control the over-dispensing of antibiotics from pharmacists. The intervention included a regulatory part where inspectors from the provincial health office visit the pharmacies to orient them about the dispensing regulations of prescription-only drugs, including antibiotics. A formal letter from the provincial health about dispensing prescription-only drugs was also handed to the targeted pharmacies. The intervention also included an educational part in which pharmacists were trained in short courses about antibiotics using materials developed by local clinical experts. The third part was the peer-review part, in which the pharmacists were grouped according to their cities, and group leaders were assigned to each group. The groups meet every other week to discuss the implementation of what they have learned and the difficulties they encountered in dealing with the patients during dispensing. The intervention was conducted for three months. The result of this intervention is the improvement in dispensing of antibiotics where antibiotics upon request were dispensed for 95% of patients, but after the intervention, it reduced to 71%. This happened because pharmacists started to ask for prescriptions and not rely on patients' requests only. The increase in asking for prescriptions was 18% compared to 5% before the intervention(64).

An intervention that is cost-effective and can be applied in resource-limited settings like low-income countries was conducted in China. The multi-faceted intervention was directed toward patients and health care professionals dealing with URTI while considering the total cost for each facility compared to the cost saving due to the intervention. It included several dimensions to reduce the use of antibiotics from the patients' and health care professionals' sides. On the health care professionals' side, they were trained on the evidence-based guidelines regarding the management of URTIs and the proper use of antibiotics. There were also peer-review sessions for health care professionals monthly to assess their application of the training. On-duty training was also conducted during the consultations of health care professionals to give them practical insights about applying guidelines in natural settings. On the patients' side, patients and their caregivers were given instructions about the rational use of antibiotics verbally by health care professionals, by giving them brochures containing the information on the appropriate use of antibiotics, and by playing a video that contains the key messages about the rational use of antibiotics in the waiting area. The intervention proved that it has promising results since it has reduced the use of antibiotics by 29%. The cost saved from the intervention was approximately the exact cost spent to conduct the intervention, so it was cost-neutral and applicable in LMIC, where resources are low(61)(65).

In Afghanistan, it was found that after the introduction of Rapid Diagnostic test RTDs of malaria, the prevalence of prescription antibiotics for patients who have a fever and are malaria-negative is increasing. Health care professionals dispensed antibiotics for most of the patients with fever and malaria-negative without making sure whether they were of bacterial cause. This happened mainly in peripheral health facilities where the capacity to run culture tests is limited. Culture tests are the tests used to ensure the bacterial origin of the disease, and it needs laboratory capacity and takes some time for the results to be ready. A diagnostic intervention was applied in 22 primary health care facilities in Afghanistan for 28 days to evaluate the use of Point-of-Care C-Reactive Protein (POCCRP) tests. These tests allow health care professionals to know whether the cause of the fever is bacterial or not to make it clear for the health care professionals when to prescribe an antibiotic. The test does not need any laboratory, and the results are rapid and can be used in limited capacity settings where antibiotics can be acquired without a prescription. However, this intervention was not yet applied on a larger scale in Afghanistan, and its cost-effectiveness is not well studied. The intervention showed an improvement in prescription behavior. Fifty-four percent of 4391 patients received the correct treatment compared with 45% before the intervention of POCCRP. Antibiotic incorrect prescriptions decreased by 12% compared to the period before the intervention(66).

It is essential to mention that Afghanistan's antimicrobial resistance plan was developed in 2017 and planned to reach its objectives by 2021, NAP-AMR. The plan has proposed several interventions to combat antimicrobial resistance, especially antibiotic resistance. Those interventions aim to elevate awareness and knowledge through communication, education, and training. They also aim to enhance the surveillance of antimicrobial resistance, reduce the incidence of infections, optimize the rational use of antibiotics, encourage research in antimicrobial resistance, and strengthen the collaboration of the country on sub-national, national, and international levels(9).

Data and studies regarding this plan are not available. It is unknown where this plan reached or whether the planned interventions have been wholly or partly implemented.

Several interventions can be implemented to control SMA and reduce the irrational use of antibiotics. In limited resources settings like LMIC, applying all or most interventions to decrease SMA is challenging. Therefore, prioritization of the interventions is needed to implement the most needed evidence-based interventions, especially where the resources are scarce. There are three criteria of interventions, including controlling OTC and prescription drugs, increasing the knowledge of antibiotics and their use, and reducing the cost of health care services. Under these criteria, there are several interventions, including increasing access to the health system, formulating regulations for prescription, enhancing the skills of pharmacists, raising awareness of people about antibiotics, improving the relationship between Health care professionals and patients, improving medicine counseling, and providing health insurance (Figure 8)(67).

A study done in 2022 to prioritize the interventions for reducing the prevalence of SMA used Analytical Hierarchical Process (AHP). AHP is a tool used in the health system to prioritize several criteria options using qualitative and quantitative input to help decision makers make decisions based on experts who use this tool to give efficient and effective solutions. The prioritization was based on three criteria: reducing health services costs, monitoring OTC and prescription-only drugs, and knowledge about the use of medicines. The study was conducted to prioritize interventions used in reducing SMA by 25 experts who gave their opinion using the AHP tool. The result of the study suggested prioritizing the interventions according to the scores from the highest to the lowest scored intervention in the following order: controlling OTC and prescription drugs, increasing access to the health system, raising awareness of people about antibiotics, enhancing the skills of pharmacists, improving medicine counseling, improving the relationship between Health care professionals and patients, and the lowest scored intervention was providing health insurance (Figure 9)(67).

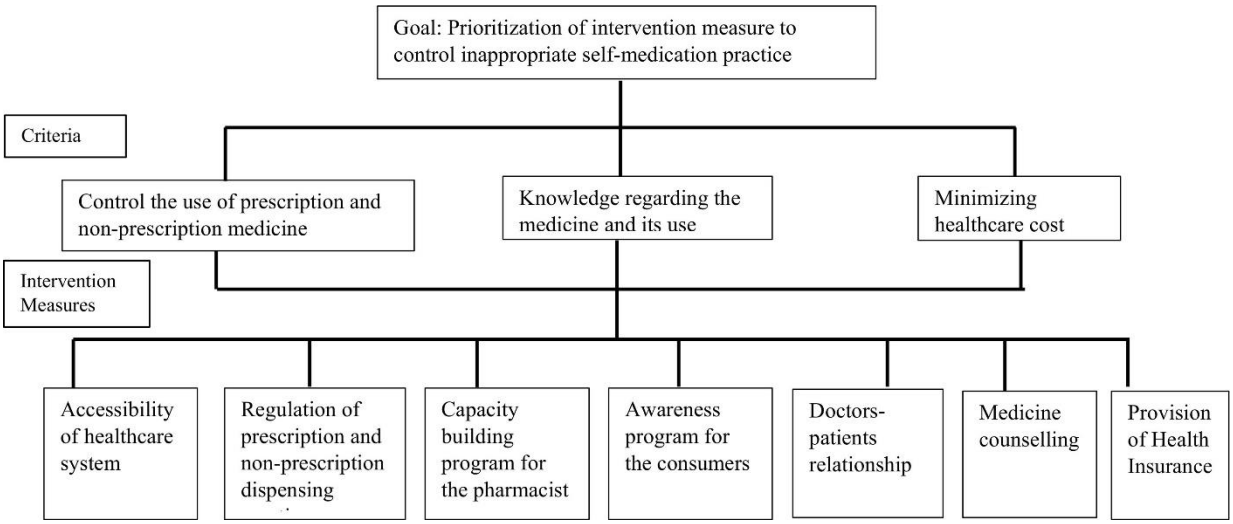

Figure 8. Criteria and intervention measures used in prioritizing hierarchy of SMA interventions. Adapted from Shrivastava B et al.(67).

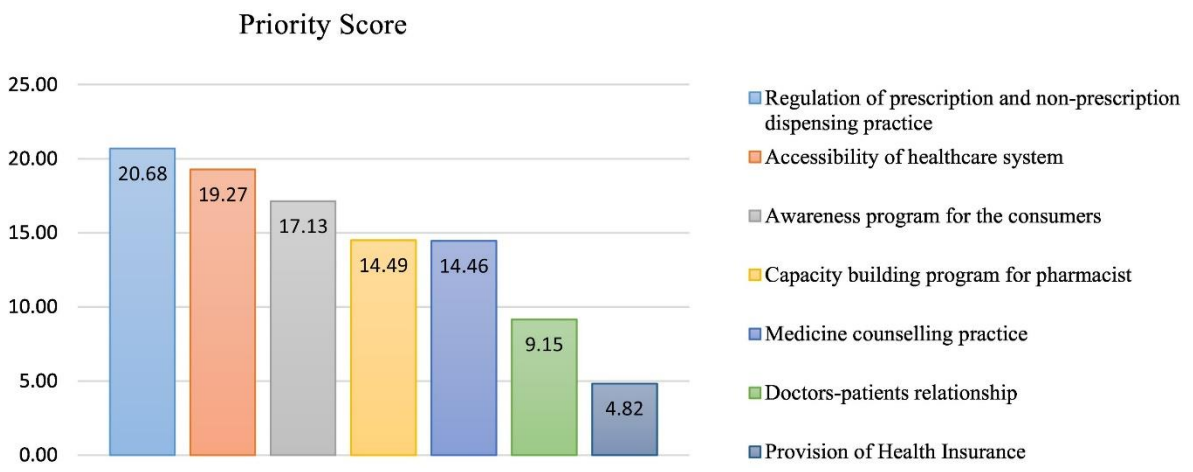

Figure 9. Scores of AHP analysis tool for prioritization of the interventions used to reduce SMA. Adapted from Shrivastava B et al.(67).

6. Discussion

SMA is a critical predictor that influences antimicrobial resistance in Afghanistan. The underlying factors that lead to SMA are environmental factors that include the external environment and health system, as well as population characteristics that include predisposing factors, enabling resources, and need.

Conflict in Afghanistan has heavily affected the country's economy, putting most of the population in poverty and affecting the capacity of the health system to provide services to the people of Afghanistan. Conflicts in Afghanistan resulted in economic hardships for the country, which led to an underfunded health system. The disrupted health system of Afghanistan, even after reconstruction and upscaling, still cannot provide equitable services to all Afghans. Those issues are not only because the health system does not have the proper resources or capacities to provide health care for all, but also because the underutilization of this health system by people is another reason. In conflict settings, the accessibility of health facilities can be affected by security issues. People may not be able to reach the health services, or they do not have the resources to reach the health facility due to the economic crisis resulting from the conflict. In such a setting, people are directed to self-care, where they tend to treat themselves with the available and affordable alternatives that give fast relief like antibiotics regardless of the adverse effects on their health and community due to the spread of antimicrobial resistance.

Regulations that organize importing, registering, and dispensing antibiotics either do not exist or are poorly implemented in Afghanistan. This allows for poor quality antibiotics that either did not pass through systematic quality control or violated the instructions of storage and distribution as directed by the manufacturer. The spread of poor-quality antibiotics in the Afghani medicines market is another predictor of losing trust in the health system. The physician may follow the proper guidelines in prescribing antibiotics but the poor quality of the antibiotic fail to treat patients who then tend to treat themselves with antibiotics due to a lack of trust in the treatment plan they got from the physician.

Pharmacies in Afghanistan do not follow a dispensing guideline, and most pharmacies are in the private sector. Public pharmacies provide antibiotics for free; however, they do not cover all the needs of antibiotics since they only cover 50% of the medicines required. Patients then buy their antibiotics from the private sector, where they can get antibiotics without a prescription. Poor regulation of antibiotic dispensing and the availability of smuggled antibiotics increase the availability of antibiotics for people and provide an accessible treatment that lets them pass the crowdedness and long lines in the public health system. SMA presents itself as an affordable alternative to the private and public health system, where studies proved that people even pay in the public sector even though it is free by law. The availability of antibiotics and the SMA are not new to Afghanistan. In a country that went through extended times of conflict and health care deprivation, SMA became part of the culture, and it is embedded in their routine self-care where there are many wrong concepts about antibiotics effects like body cleansing, immunity enhancement, and fertility solutions. This suggests that interventions that would be applied in Afghanistan should consider the community part, and increasing the awareness and knowledge of the general population should go hand in hand with other regulations and interventions to limit SMA.

Afghanistan's health system succeeded in increasing health services coverage from 9% in Taliban times to 85% after introducing BPHS and EPHS; however, many barriers face the health system. The Health system in Afghanistan is underutilized due to the inequity in providing services for urban and rural areas where the quality services and more qualified health personnel are more concentrated in urban areas leaving most of the population of Afghanistan in the rural areas in need of quality services. Cultural-based gender reasons exert some other barriers to health services by depriving women of getting the health care services they need unless there is a female health worker to provide them. This gender dilemma is also a reason for the shortage of female health workers since cultural restrictions deprive women of their education rights. This cycle of gender inequalities leads to less access to health services for women. Therefore, choosing the available and easily accessible antibiotic from the nearby pharmacy becomes a better choice, especially for women. This explains the increase of SMA among women compared to men. Barriers existing in the health system and cultural settings in Afghanistan are the motivators of SMA since any barrier to access to the health system will lead to underutilization of the health services and thus SMA.

Covid-19 has further worsened the situation for the health system where the burden on the health system increased, affecting the health system's workforce and increasing the need for health care by people. People then found that their health system could not serve them well during that time, which pushed them to look for choices like SMA to treat either Covid-19 flu-like symptoms that they wrongly use antibiotics to treat or other conditions when they got their appointments with health care professionals canceled as a consequence of the hardships Covid-19 caused to their health system. According to people's beliefs in Afghanistan, they will also find antibiotics as a haven to enhance their immunity and clean their bodies against the novel Covid-19, increasing SMA's prevalence.

The health system's situation after Taliban took over in 2021 is worse, and since only a fifth of the public health facilities are functioning and the economic hardships where most of the population lost their income, SMA is expected to be even higher. People will not be able to get health services for many reasons, either economic or because of the stoppage of most health facilities providing services. People will then shift to the option of treating themselves with antibiotics which will increase SMA and thus antimicrobial resistance.

Overprescribing antibiotics from health workers is noticeable and is linked to many factors. Less qualified health workers tend to prescribe more antibiotics. Generally, the less qualified health workers work in the rural areas where most of the population of Afghanistan exists. This allows people to get more antibiotics than they need, especially in the public sector, where the medicines are free. A friend or a family member usually uses the leftover antibiotics. Over-prescription can be an alarming indicator of the spread of antimicrobial resistance. Health workers may prescribe many antibiotics because they do not get the health outcomes needed from certain antibiotics, which means that microbes have developed resistance against antibiotics, and other kinds of antibiotics are needed to reach the needed health outcome of the treatment. This prescription behavior affected people's perception of antibiotics, thinking that more antibiotics mean better and faster results. This perception may worsen the antimicrobial resistance status that existed in Afghanistan. Over-prescription is a factor in forming people's behavior of SMA since the most prescribed antibiotics are the same antibiotics used for SMA. It also can be the opposite way that antibiotics people believe in their efficacy are being prescribed by health care professionals as a response to their request, which elaborates the considerable number of antibiotics prescribed without a diagnosis. This can be seen more clearly in the private sector, where health care

professionals prescribe more antibiotics and tend to respond to consumer requests to keep a high number of patients coming to their facilities.

Education seems to have a different effect on the practice of SMA. Illiterate people found to be practicing SMA and people with higher education too. The reason behind that for illiterate people is straightforward and can be explained by the lack of knowledge and awareness about antibiotics. SMA is also prevalent in highly educated people, primarily university students. This can be attributed to their high level of knowledge, which gives them a false sense of confidence that they know the diagnosis and the treatment of their symptoms, which leads to using antibiotics without a prescription.

Interventions to reduce SMA primarily focus on the health system and regulations. Most interventions are directed to the health care professionals to educate them about the proper use of antibiotics or to train them on following the regulations. However, in the Afghanistan context, interventions must include the general population. People in Afghanistan play a significant role in spreading SMA, and interventions focusing on behavior change should include them. Among the mentioned interventions, an intervention that was conducted in China seems to be of good applicability in Afghanistan since it includes the communities as well as the regulations and training for health care professionals. It is also cost-effective and can be applied in Afghanistan since it has zero cost on the health care facilities.

The behavior of SMA in Afghanistan is linked to many factors leading to this health behavior. Factors in the health system leading to this behavior, sources that enable people to practice SMA, external factors that either allow them to practice SMA or put barriers to their access to health care services, their need to practice SMA, and the predisposing factors. Andersen's framework allows for a better understanding of those factors, which gives a better understanding of the source of SMA behavior and allows for better planning to change this behavior through effective interventions. The framework was of great help in this study to understand the interlinkages between the different factors and how each factor affects the other. However, the framework is quite limited in studying the organizational factors in the health system that lead to health behavior. Understanding how the health system works and what kind of providers and services are offered to whom can better explain why a person chooses not to access health care. This will allow for a more precise idea of health system barriers than understanding the coverage, bed capacities, and other numbers that do not fully explain the health system mechanisms. The framework also does not allow for a deep understanding of health behavior social networks, and culture.

Limitation of the study

Many of the peer-reviewed papers in this study were conducted in urban areas and the studies done in rural areas are pretty limited. Also, the security situation in Afghanistan limits the geographical area that the papers found conducted their studies in. Most of the time, conflict areas in Afghanistan are not included in the samples of the studies found, which limits the overall picture that the objective of this study aimed to reach.

7. Conclusion

Antimicrobial resistance is a concealed threat to the health of Afghans. SMA is the most critical reason leading to antimicrobial resistance. Many factors interact and play a role in the behavior of SMA. The conflict and the recent return of Taliban to control Afghanistan affected the country's economy and health system. It also deprives people of seeking health care. The Health system in Afghanistan failed to provide good-quality health services for all and to build the trust of Afghans in their health system. On one side, even when people of Afghanistan seek health services provided by the health system, many barriers deprive them of doing so. On the other side, many enablers to practice SMA contribute to the increase of this behavior, including the poor implementation of regulations of the medicines market, irrational prescription of health care professionals, and people's beliefs about antibiotics. In Afghanistan, interventions should consider many aspects, including limited resources, intervention priority, health beliefs, and enforcement of regulations.

8. Recommendations

SMA is a critical problem in Afghanistan that needs many interventions at different levels to be solved. The problem has different factors leading to it, and those factors interact with each other to magnify this problem, which in turn leads to an increasing antimicrobial magnitude in Afghanistan. The following are some recommendations that can help in behavior change of SMA:

1. Health education and literacy should focus on the problem of SMA as long as this behavior is more prevalent among illiterate and highly educated people. Literacy for illiterate people about the effects of SMA and its consequences and health education for highly educated people should address the problem.
2. Health care professionals should be educated about the consequences of SMA and the overprescription of antibiotics.
3. Training on adherence to the guidelines and regulations of antibiotic dispensing should be held for health care professionals.
4. Regulations of medicines, especially antibiotics in Afghanistan, should be stricter, and regulations should be enforced.
5. All antibiotics should be prescription-only drugs, and pharmacies should be monitored to follow the regulation.
6. Antibiotics registry system should be part of licensing pharmacies where a prescription should accompany every antibiotic dispensed by a pharmacist.
7. In reality, health system financing should be adjusted to reduce out-of-pocket financing since even in the public health sector, which is free by law, people pay to get health care services.
8. Communities should be involved in any intervention targeting SMA in Afghanistan since beliefs and culture play an essential role in this behavior.
9. Awareness campaigns should be held about SMA and include topics in the school curriculum.
10. More qualitative studies are needed regarding SMA to have better knowledge about SMA. Most of the studies on SMA are cross-sectional studies.
11. More randomized control trials should study the effect of SMA on antimicrobial resistance to have an evidence-based base that leads the interventions in Afghanistan.
12. Health services should address equity coverage so that all people, regardless of their gender or geographical area, can get the same quality of service.
13. Health facilities in rural areas should have outreach activities for people who cannot access health services since the number of health care professionals is less in rural areas, and most Afghans live in rural areas.
14. Women should be encouraged to be educated and join the health system to cover the shortage of female health care professionals, depriving many women of getting the health services they need.

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Annexes

Annex 1. The link between Basic Package of Health Services (BPHS) and Essential Package of Health Service (EPHS) (Hospital Sector). Adapted from Ministry of Public Health, Afghanistan(68).