

# “Two-colour capsules”: Commonly used non-prescribed antibiotics in the self-management of self-diagnosed illness amongst pharmacy customers in Maputo city.

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## Research

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# Abstract

**Background:** After analgesics, antibiotics are the most commercialized, prescribed and utilized drugs worldwide. The persistent inappropriate use of these precious drugs is developing, with non-prescription sales and the consequent practices of self-medication with antibiotics (SMA) undermining the global efforts to rationalize their use and contain the antimicrobial resistance (AMR). This study aimed to identify the commonly used antibiotics and the main health conditions leading to the practice of self-medication with antibiotics.

**Methods:** We conducted a qualitative study with 32 pharmacy customers and 17 pharmacists working in nine private pharmacies in Maputo city. In-depth interviews and focus group discussions (FGD) were conducted with customers while in-depth interviews were held with pharmacists. The interviews were audio-recorded, transcribed, coded and analysed using latent content analysis. The COREQ (Tong, 2007) checklist for interviews and FGD was performed.

**Results:** Frequent use of non-prescribed antibiotics (NPA) was admitted by 30 of the 32 customers while 15 of the 17 pharmacists admitted NPA dispensing. Antibiotics such as amoxicillin cotrimoxazole, azithromycin, and metronidazole, amoxicillin with acid clavulanic, tetracycline, doxycycline and erythromycin were used after participants self-diagnosed or self-perceived health conditions related to sore throat, fever, cough, vaginal discharge, eye problem, common flu, urinary infection, respiratory infection, wounds, and toothaches.

**Conclusion:** The therapeutic itineraries customers adopt, such as practicing SMA and/or seeking healthcare at the pharmacy, together with the suboptimal dispensing practices of pharmacists, and weak regulatory and law enforcement, are enabling the growing but dangerous practice of SMA among Maputo city private pharmacies customers. Multifaceted interventions are needed to involve public health stakeholders, pharmacists and healthcare professionals to enlighten customers through public education regarding the inappropriate use of antibiotics at all levels.

## Background

The inestimable value of antibiotics for health and life expectancy makes a plausible case for why antibiotics are the most commercialized, prescribed and utilized drugs in the world after analgesics [1, 6, 105, 138]. Hollis and Ahmed (2013) suggest that between 2–10 years of life expectancy increases can be reasonably attributed to antibiotics [139]. At the same time, the persistent, irrational and abusive use of antibiotics in the pursuit of health in agriculture, veterinary and human health is driving the development and spread of antimicrobial resistance globally. Antibiotic resistance accounts for more than 2 million infections and at least 23,000 deaths annually in the United States of America [3] and 25,000 deaths in Europe [64, 74]. While in most low- and middle-income countries (LMIC), data and surveillance reports of infection and antibiotic resistance rates are limited, some reliable estimates consider these rates to be

higher in these countries [5, 75, 76] due to poor infection prevention control (IPC) measures and the increased burden of infection.

Global trends of antibiotic use estimate that antibiotics are over-used in all regions, with a high incidence in resource constraint countries, some of which use three times the amount of antibiotics per population head compared to other countries with similar disease profiles [139]. Moreover, between 2000 and 2010, the consumption of antibiotic drugs increased in 71 countries by 35%-36%, with countries such as Brazil, China, India, Russia,, and South Africa accounting for 76% of this increase [11, 62].

The non-prescription sales and consequent practices of self-medication with antibiotics (SMA) undermines global efforts to reduce their consumption, rationalize their use and contain antimicrobial resistance (AMR). Notwithstanding that self-medication is considered a component of self-care when it is responsibly practiced, SMA may lead to delays in seeking medical advice when needed, misdiagnosis, incorrect choice of therapy, incorrect manner of administration of the antibiotic spectrum being either too narrow or too broad, delayed antibiotic therapy in critical patients, and unnecessary use of antibiotics. This may expose patients to increased health risks, such as dangerous drug interactions, adverse drug effects, the masking of severe disease, and, most distressing, accidental death and drug resistance [4].

Globally, the sales of antibiotics have increased considerably, especially within the LMICs, where the robustness of their control and law enforcement capabilities are limited, faulty or non-existent. For example, it is reported that 23% of the increase in the global retail sales volume of antibiotics was attributable to India, where regulations to control over-the-counter sales of antibiotics are poorly enforced [11]. In sub-Saharan African countries, the proliferation of pharmacies and the non-prescription sales of antibiotics have been reported in countries such as, Democratic Republic of Congo, Malawi, Mozambique, Tanzania and Zambia and [33, 126].

Concerning the frequently used NPA and their related health problems, the evidence indicates that, especially in LMICs, the main complaints that predispose SMA practices are health problems and symptoms that often do not necessarily need antibiotic treatment [57, 140, 141]. The reported common ailments for which SMA is used were cough, cold and flu, fever, headache with fever, cough with running nose, genito-urinary infections, bronchitis, sore throat, dental infections, genital pain and rhinitis [24, 142–146]. Amoxicillin and amoxicillin-clavulanic acid, followed by antibiotics such as tetracycline, cotrimoxazole, erythromycin, azithromycin, cyproflaxin and ampicillin, were reported to be the most commonly used NPA for self-treat to address self-perceived health problems [23, 72, 119].

Investigating the frequently used NPA and health complaints leading to the practice of SMA has the potential to generate evidence to better inform policymakers, health care providers and health promoters. Through this evidence, tailored-made interventions to improve the infection prevention control (IPC) measures and promote the rational use of antibiotics at all levels can be implemented. Thus, this study aimed to identify the commonly used NPA and their related health problems among pharmacy customers.

# Methods

## Study design and setting

This study uses a cross-sectional qualitative approach to develop a deep understanding of the complexity of the phenomenon of SMA and the commonly used antibiotics for self-diagnosed health problems among pharmacy customers. Data collection occurred from October 2018 to March 2019 in nine private pharmacies from three socio-economic areas (high, middle and low) of Maputo, the capital city of Mozambique.

Private pharmacies were included as public pharmacies are run by state-related organizations that strictly enforce the prescription-only dispensing of antibiotics. Private pharmacies are owned by individuals who are licensed to dispense and whose pharmacies are registered with the Ministry of Health (MoH). Although there is legislation governing prescription only medicine (POM), enforcement in the private sector is difficult to non-existent. The National Directorate of Pharmacy (NDP) provided the researcher with a list of 451 private pharmacies, 150 of which are based in Maputo city.

## Study participants

Two categories of participants were included: the pharmacy customers and the pharmacy professionals (pharmacists). All participants were residents of Maputo city and spoke Portuguese, the official language of Mozambique. While the inclusion of customers was due to the need to describe the practice of SMA and record the commonly used antibiotics and reasons for their use, the inclusion of pharmacists was based on the need to enrich the data and capture the views and the perspectives of the dispensers.

## Sampling and recruitment strategies

### *Sampling Pharmacies and Pharmacists*

There are at least 150 pharmacies in the city in three different socio-economic areas. Registered private pharmacies on the government list were categorized according to the socio-economic status (high, middle and low) of their location (zone) in the city. Using the Excel random number function, three pharmacies were randomly selected from each socio-economic area (n=9). The first three pharmacists from pharmacies in each of the socio-economic zones were recruited by telephone based on information provided to us by the NDP at the Ministry of Health, with modified snowball sampling technique being used to recruit the other pharmacists working in their pharmacies. This was done by asked senior each pharmacist to identify at least two other pharmacists working in the identified pharmacies who were most likely to consent to participate. We contacted 19 pharmacy professionals, of whom 17 agreed to participate, but after the withdrawal of two, conducted 15 face-to-face in-depth individual interviews.

### *Sampling Pharmacy customers*

Using a purposeful sampling strategy, the researcher approached pharmacy customers after they had exited the pharmacy. All customers who purchased any medicine between 8:00 am to 6:00 pm during the six-month study period and could not provide a valid prescription was cordially invited to show their medication purchases. If the purchased medicine was an antibiotic in the form of tablets, capsules, pills, drops, cream/ointment or syrup, the customers were invited to participate. Customers less than 18 years old and those purchasing antibiotics on behalf of someone else were excluded.

Overall 84 customers were approached, of whom 44 had valid prescriptions and were excluded. The remaining 40 without a valid prescription was reduced to 32 with the refusal by eight to participate. Twenty gave consent to participate in individual interviews only and 12 to participate in the FGD only. Followed by in-depth interviews, two FGD was held with six participants each.

## **Study tools and Data collection**

### ***Pharmacists***

The interview guide for pharmacists was developed after an extensive literature review of similar studies. Primary data were collected using face-to-face in-depth interviews with open-ended questions. The interview guide was based on the objectives of the study and consisted of demographic information (e.g. age, gender, education level, profession), of questions regarding dispensing practices and reasons, the perceptions of pharmacists regarding customers attitudes and behaviours towards antibiotics use, as well as about compliance with the law and guidelines for antibiotic dispensing. Interviews occurred at places and times determined by the pharmacists. At the end of each interview, pharmacists were given the freedom to express their views.

### ***Customers***

The individual interview guide for customers consisted of demographic characteristics (e.g. age, gender, education level, profession), knowledge about antibiotics, attitudes and behaviors towards antibiotics use, patterns and reasons for SMA, sources and the commonly used antibiotic. Definition of antibiotics, self-medication, antibiotic resistance as well as the list of antibiotics being officially used within the country was included. The FGD aimed to find commonly recurring themes, trends and reasons behind the practice of SMA. Participants from the FGD were different from the individual interviews to ensure a variety of participants. These two tools were combined to reach the central characteristics of the phenomenon across different participants in the individual and group perspective to enrich the data and enhance the trustworthiness of findings [61]. Semi-structured interviews allow for structure, flexibility, and flow, ensuring that the interviewer addresses the research questions in full, prompting and probing respondents for further information where necessary.

Customers participating in the FGD received a small amount (500.00 MTN=R100=10 USD) to compensate for transport and call/SMS expenses due to the need to arrange a suitable day and time for the discussion. FGD took place in a public municipality garden in the city centre and in the mornings (a

less popular time). week before data collection, a two days' workshop on the research instruments and objectives of the study took place. To ensure that clarity, length, and quality of interview guide, after first 2 interviews, with all categories of participants, research assistants, and the main researcher had a two-hour section to discussing and reviewing the interview guide.

### **Data management and analysis**

The interviews were audio-recorded in Portuguese, transcribed verbatim and translated. To check the accuracy of the translation, one randomly selected record was translated and then back-translated by a bi-lingual researcher. The transcripts were coded and thematically analysed. The lead researcher read the transcripts to familiarise herself with the data and made analytical notes to inform the coding stage. Data were coded by two coders. During coding, a selection of transcripts was read line by line and initial labels or 'codes' applied to each passage that described the essential meaning of the data within. The coding tree included the main questions, the answers of participants, and the extracted themes and subthemes.

## **Results**

The result are presented below according to seven themes that emanated form the analysis process namely: a) customers' perceived need for self-management of illness, b) customers' understanding medicines, c) expectations and concerns when practicing SMA, d) the importance of time in the self-management of illness, e) the past successful experience with antibiotics, f) the antibiotics used for self-medication and g) the main illnesses leading to SMA.

### **Demographics of participants**

Participants who presented purchased NPA were included men 10 (31%) and women 22 (69%) ranging in age from 19 to 67 years old. The average age was 35 years old. The researcher identified four levels of education: primary (1st–7th graders), secondary (8th–12th graders), and first degree (university graduate level). Table 1. Shows the demographic characteristics of customers with variation in age (range: 19 – 67), education level (range from primary to a university degree), and gender (with 22 women and 10 men participants). Table 2. shows the demographic characteristics of pharmacists with variation in age (range: 24 – 47), professional training and years of professional experience (range: 1 – 12).

### **Customers' purchased antibiotics**

During the recruitment, process participants were invited to show the medicines that they had purchased, which the researcher took note of. Together with antibiotics, some participants had purchased other medicines, such as analgesics, anti-inflammatory, and corticosteroids. The list of purchased medicines is presented below (Table 3).

### **The perceived need for self-management of illness**

The need to take responsibility for their own health was noticed, their comments evidenced the need and right to seek cure and treatment for illness, as indicated in their sentiments:

“I just bought cotrisha (cotrimoxazole), I have to treat my cough problem” (Customer 12).

“If I feel sick or one of my kids, I need to take care and seek a cure” (Customer 7).

“When I feel sick? It depends on the problem ...but I make sure I treat myself” (FGD 2).

### **Understanding medicines, expectations and concerns when practicing SMA**

A questions explored the participants understanding of medicines, their expectations are regarding taking antibiotics without prescription. Two participants said:

“Medicines are very important, as they treat our diseases...hmm when I take medicines I hope to recover fast” (Customer 5).

“They are goods! In fact, they (medicines) are very important after all they help to combat some pathologies that the immune system cannot itself, we take and use them willing to get rid of illness and go on with life”(Customer 1).

Participant’s concerns using NPA were assessed throughout the question: do you have any concerns and fears regarding your SMA attitude? What are your fears when you use these medicines? Despite the majority referring that they had never had problems with self-medication, two in the FGD expressed some fear related to the use of the drugs but did not express any guilty or regret taking NPA, as they were wanted to treat their conditions despite possible bad outcomes. They remembered that they had experiencing problems, such us diarrhoea and skin allergies after taking amoxicillin and cotrimoxazole tablets:

“Medicines they help, but sometimes depends on your body... I once took cotrimoxazole and got pimples and dark itching skin...but the cough disappeared” (customer, FGD2).

“we took then to became well...me, I got diarrhoea after taking these famous tablets (amoxicillin), the pharmacists said I shouldn’t take with milk or after eating yogurt”(customer, FGD1).

### **The time management in the self-management of illness**

The time spent at the pharmacy when seeking health care plays an important role in the practice of SMA. Participant’s complaint about the long time they needed to spend in the health facilities waiting to be seen. They noted that time is a precious resource and is not worth spending many hours or the whole day, knowing that they can adopt other therapeutic itineraries, such us going to seek advice and request medicines from the pharmacy, two participants said:

"I went to the hospital with him, stayed there all day and a nurse gave a skin cream and savlon (antiseptic liquid) to wash the wounds, which did not work"(customer 9).

"Most of the times you just get to the public hospital to find out that the nurse or doctor is late, you wait forever to be assisted and when assisted you get the prescription, but they have a shortage of drugs...so you should go buy at outside private pharmacies, which is simply a good thing" (customer 17 ).

### **Past successful experience with antibiotics**

In this study, participants often stressed that they knew about antibiotics from their own or relatives' successful past experiences. This experience appeared to be considered when a new sickness event appears, and when individuals have to take decision on the strategies to seek health care. The following was stated by two:

"I got the prescription before when I had to seek medical appointment! Hmmm...This time I have same difficulties swallowing, but they are almost finishing so I need more of this (antibiotic- azithromycin)." (Customer 1).

"I know these tablets (amoxicillin with Clavulanic acid) I went to a doctor before...months ago (...)" (Customer 2).

According to the pharmacists, patients take advantage of physicians' prescriptions and medical information from past experiences or other sources, such as the internet, to the point that they can request the less popular and even more potent non-prescribed antibiotics. Two pharmacists expressed:

"the internet is doing its part in this process...it looks like we are all health care professionals now, and it looks fine until you get into troubles "( Pharmacist 3).

"Patient seeks medical help at the hospital or clinic, once, then twice, the doctor or nurse prescribes the same antibiotic for any pain amoxicillin, for any cough...cotrimoxazole, so people get confidence in a certain antibiotic..." (Pharmacist 8).

### **Which antibiotics were used for self-medication?**

During the interviews, with the support of the national list of imported antibiotics, participants were asked to indicate or talk about antibiotics (other than the ones purchased) they have used without prescription despite having purchased NPA, two participants from the high socio-economic area denied any past use of antibiotic without prescription:

"...No, I've never used it before without the paper...I'm buying for the first time."(Customer 18).

"Without a prescription?! I never used antibiotics, today I bought to complete the dose" (Customer14).

The remaining participants mentioned they have used a variety of antibiotics, such as amoxicillin, cotrimoxazole, azithromycin, metronidazole, amoxicillin with acid clavulanic, tetracycline, doxycycline and erythromycin. As the quotes below indicate:

"I used azithromycin and (...) I used the cotrimoxazole" (Customer 10).

"I already used erythromycin once to my child...and I already used cotrimoxazole and azithromycin, yes." (Customer 3).

"I ask the pharmacist for "two colours" used to treat inside wounds" (Customer 2).

"We live in a very dusty environment, so time to time we have a cough and blocked nose, I bought cotrisha (cotrimoxazole), they treat cough very well" (Customer 17).

The list of antibiotics purchased by the participants shows that amoxicillin was the most purchased (customers), with participants requesting the simple amoxicillin, or the one combined with clavulanic acid one to treat various health conditions. This was endorsed by two customers and mentioned in one FGD, where participants confessed using amoxicillin, and amoxicillin with clavulanic acid:

"I think amoxicillin...I use a lot even for the family, yes... amoxicillin and the other white one for cough, cotrisha (cotrimoxazole)." (Customer 9).

"If you have on your list...I bought the new amoxicillin the big white tablets...I think is with acid something...It is for a respiratory problem."(Customer 11).

" what I see...hum...we use a lot of that amoxicillin, I see many people, friends, family using hmmm using the "two colours capsules" and now there is a better one with an acid...white one, expensive but also good..." the other participants agreed. (Customers FGD 1).

Pharmacists corroborated that the most commonly dispensed and/or sold antibiotics in a daily basis are amoxicillin 500mg, popularly known as "two colours" (presented in half yellow and half red colours), followed by amoxicillin with clavulanic acid and cotrimoxazole:

"Amoxicillin, cotrimoxazole, oh yes! The most wanted, they request much more amoxicillin in capsules with two colours" (B. Pharm).

"Hum amoxicillin for example, in one month in a high demand pharmacy mine like you dispense between 5000 to 10000 pills...it sells a lot."(Pharm, Technician, ).

"Amoxicillin...the majority requests and purchase..." (Pharm. Technician).

"Oh cotrimoxazole! Yeah, a lot, many HIV positive customers use cotrimoxazole as a prophylactic...we do sell that and the combined amoxicillin."(B. Pharm).

The growing prevalence of sexually transmitted infections (STI) has contributed to the increased demand for some antibiotics that were previously only known by the physicians and pharmacists. They contend that these antibiotics are well known by customers, evidencing that they have information about them, which they request for self-diagnosed problems.

“I don’t know who taught customers about azithromycin and doxycilin...but many customers request these for their reported symptoms related to STI’s”( B. Pharm).

“Amoxicillin combination with clavulanic acid always sells, but nowadays doxycycline and Azytro (azithromycin)...they request a lot.”(Pharm. Technician).

“interestingly I see some changes, some clients don’t want the common “two colours” ...they now use a lot azytro (azotomycin), doxycycline, for complaints of urinary tract infection, sore throat for ...yeah” (B.Pharm).

From the pharmacists’ point of view, clients are knowledgeable about even the more potent antibiotics, and suspect that they are taking advantage of physicians’ prescriptions that were previously less well known, now being requested for self-medication. Two experienced pharmacists argued:

“What I see is trending, even with the prescriptions, is azithromycin and doxycycline, and also cipro (cyproflaxin)... and I think self-medicated patients are also following that trend...maybe...” (B. Pharm).

“before it was...let me say “fancy” to prescribe amoxicillin with clavulanic acid...but now I see prescriptions of azithromycin, ciprofloxacin...then the customers are now learning and purchasing as well, laughs”(B. Pharm).

“You know azithromycin and doxycycline? There are days that I receive 4 or more patients with different prescriptions for the same antibiotic from the same prescriber... and interestingly now we can see that people are now requesting azithromycin and doxycycline for SMA...” (BPharm.).

The pharmacists admitted that they perpetuate the practice of SMA by dispensing NPA as shown in the passages below:

“We, pharmacists, know all the consequences of NPA dispensing, we know. But when you get to the position at the pharmacy as a magic trick you tend to forget all.” (BPharm.).

“The person has fever and cough or pain and comes to the pharmacy...?!! There is a concerning deliberated behaviour of self-medication...and we pharmacists we do contribute” (Pharm. Technician).

Pharmacists not only recognize the increasing practice of SMA, with customers requesting more of the recent and broad-spectrum antibiotics but noted with concern that is not only the growing attitude of self-medication, but also the wrong utilization of self-prescribed antibiotics. Their argument is that customers request antibiotic in small quantities which do not allow them to complete at least a 3- or 5-days course;

“a patient self-medicating with antibiotics, for example, accesses cotrimoxazole and take just 10 tablets for 2 days, or amoxicillin and take for 3 days...they are doing it wrong either”. (B.Pharm).

“Some customers buy 10 capsules of amoxicillin 500mg, which only takes 3 days...see it’s another problem then”. (Pharma. Technician)

### **Which illnesses drive the practices of self-medication with antibiotics?**

All the participants expressed their intention to recover from a bad health condition as the main motive for seeking medication. They mentioned sore throat, fever, cough, vaginal discharge, eye problem, common flu, urinary infection, respiratory infection, wounds, and toothaches, as the illnesses for which they self-medicated with antibiotics. Two participants said:

“... the weather is bad so I got fever in the night and now I have cough and pain, I know these tablets (amoxicillin with clavulanic acid) will treat me.” (Customer 26).

“... these (azithromycin and amoxicillin) are to treat this sore throat and the fever I have, this (chloramphenicol) is for my eyes.” (Customer 22).

“Hum...I have to get rid of the pain when going to the toilet...then I bought these medicines (doxycycline and cotrimoxazole vaginal cream) and the cream to apply (Customer 21).

This was endorsed by pharmacists, who reported that most customers purchase antibiotics, and some share the health problems for which they request them. They indicated that they mainly dispensed NPA for colds, flu, cough, sore throat, tract respiratory problems, vaginal discharge, eye problems, fever and pain, dental pain and urinary infections.

“The person has fever and cough or pain and comes to the pharmacy...request antibiotics!!” (Pharma. Technician).

“People buy amoxicillin for flu, cotrimoxazole for cough...they want tetracycline and chloramphenicol for eyes, many complaints.” (B. Pharma).

“Some complain of cough with mucus and difficulty breathing...some young ladies buy amoxicillin with cotrimoxazole for vaginal discharge...most share with me since I’m a lady also...laughs” (Pharma. Technician).

## **Discussion**

This research applied a qualitative approach to identify the commonly used NPAs and illustrate the health problems that lead people to indulge in SMA practices people face during their daily life and the practice of SMA. The findings confirm the inappropriate use of NPA among Maputo city private pharmacy clients, the drugs often being used incorrectly or inappropriately for self-diagnosed health problems. This paves the way for the irrational use of antibiotics, one important cause of the growing public health

concern of antibiotic resistance. Despite evidence-based information regarding the antibiotics used for self-medication and health problems related to the already known practice of SMA being valuable to inform decisions and actions of physicians, public health promoters and pharmacists, to date, Mozambique has no published data.

Medicines are indicated as an important part of the process of health-care seeking, being essential to the health care system [120]. With most customers using NPA combinations to self-treat self-diagnosed and self-perceived illnesses, this research highlighted the easy accessibility of a variety of NPA by customers at private pharmacies in the city. These results are in line those reported by other researchers [4, 23, 36, 77, 99, 126, 138, 147-150], where customers had no difficulties accessing NPA.

### **Customer's self-management of illness**

It was evident that by using antibiotics, participants were expressing their desire to recover from bad health conditions. They might not perceive the aetiology of the disease, and do not look to kill or inhibit the growth of bacteria, they simply want to alleviate or cure the disease [114]. Implicitly, participants demonstrated the right to take responsibility for their health by adopting health promotion measures to embrace healthy habits and practicing responsible self-medication. These responsibilities and health promotion measures are supported by the WHO and health authorities. Nevertheless, despite being concerned with the possible bad outcomes, customers did not express remorse or guilty for practicing SMA. This behaviour was rather regarded as a right to be entitled to their health. However, what participants may not understand is that using NPA is against the law and the health safety of customers. Having correct knowledge and understanding of the bad outcomes and disadvantages of using NPA concomitant to other health promotion measures could contribute to discouraging the practices.

### **SMA practice as a time management strategy and a therapeutics itineraries**

For the participants, the time spent at the public health care centre does not warrant another visit for symptoms they experienced before, when other therapies and strategies such as consulting and requesting advice from pharmacists, and purchase medicine directly from them is an option. Therefore, the need to self-treat and save time has a great influence on their SMA practices. To date, no research has measured the impact of SMA on antibiotic resistance in Mozambique. Promoting behavioural modifications by providing pertinent and user-friendly information regarding the suitable use of antibiotics within the pharmacies and health care centres would be key to the success of strategies for managing antibiotic resistance. Contextually adapted behavioural theories, including the theory of planned behaviour [52], supported by health Anthropology and other social sciences, could be suitable approaches to better understand and address the self-medication behaviour among the general public.

### **The antibiotics used and related illnesses**

The results show that amoxicillin and amoxicillin with acid clavulanic were the most requested and used antibiotics, with cotrimoxazole tablets and vaginal cream also being commonly used by the participants.

A study conducted in Ethiopia found different results, the most used antibiotics being ampicillin/cloxacillin, metronidazole, co-trimoxazole, ciprofloxacin and lastly amoxicillin [151]. The results of our study are similar to studies conducted in Guatemala [23, 72], Zambia [130], and Ethiopia [66]. Regarding the main health complaints that lead to the use of the above-mentioned NPA, the findings indicate the common cold, flu, cough, sore throat, tract respiratory problems, vaginal discharge, eye problems, fever and pain, dental pain and urinary infections. Advances in medicine have proven that antibiotics are not effective to treat non-bacterial diseases and viral infections, and when a bacterial infection is present, specific antibiotics are needed treat particular infections. Physicians and other qualified health professionals are entitled to determine which antibiotic should be used for which bacterial infection upon clinical assessment of the patient. If patients and customers were exposed to this information in all health facilities and pharmacies, in parallel with other information communications education (IEC) actions and an improvement of services at health facilities, the self-diagnosis and self-treatment with antibiotics would be reduced.

### **Some trending changes on the antibiotics used for SMA and NPA request**

The results show some changes in the trends of NPA requesting and use, with customers wanting those that were only known by physicians and pharmacists, such as azithromycin, doxycycline, and ciprofloxacin, which are more potent, and may be linked to the growing occurrence of STI. Despite suspecting that this might be due to the occurrence of bacterial resistant, this study was not able to correlate this trending with the emergence of resistant bacteria. From the pharmacists' perspective, clients are also knowledgeable about the more potent antibiotics, such as doxycycline, ciprofloxacin and azithromycin, as they make use of past experiences and take advantage of physicians' prescriptions that prescribed those that were previously less known. Similar results were reported in a study conducted in India, where the request for non-prescribed but more potent antibiotics, which suggests that customers learn from prescribers and become quickly informed [32, 74]. This ability to learn about health information represents an opportunity for pharmacists', physicians and health promoters to disseminate the correct information about the rational use of antibiotics.

Despite pharmacists admitted they are the ones dispensing the NPA to their customers, they noted with concern that SMA is not only growing but customers are using the self-prescribed antibiotics incorrectly. It was noted that customers request antibiotics in small and suboptimal quantities that do not allow them to complete at least a 3- or 5-days course, with similar results being reported in other studies [88, 152, 153]. This represents another problem that should be addressed by disseminating the correct information. Although some customers are aware of the risks of SMA, they might not be aware of the public health implications of the practice. This represents a problem to be addressed by all stakeholders to improve antibiotic stewardship and conservancy.

## **Conclusion**

The concept of self-management of illness, need to save time, therapeutic agendas customers adopt, such as SMA and seeking healthcare at the pharmacy, together with the suboptimal dispensing practice of pharmacist and the weak regulatory measures, are enabling the growing and dangerous practice of SMA among Maputo city private pharmacies customers. The findings have revealed substantial evidence of the irrational and inappropriate misuse of antibiotics, with private pharmacies customers self-diagnosing, requesting and purchasing NPA to self-treat their illnesses by purchasing antibiotics at private pharmacies with no reference to physicians' advice and prescription. In addition, the majority of drugs are to self-treat illnesses that do not necessarily need antibiotic prescriptions. The non-compliance with dispensing POM is real and concerning, as dispensers were sufficiently trained and aware of the public health implication of their practices. Multifaceted interventions are needed to involve public health stakeholders, pharmacists, and healthcare professionals to enlighten customers, through public education, regarding the inappropriate antibiotic use at all levels.

## **Abbreviations**

AMR - Antimicrobial resistance

GNI - Gross National Income

LMICs - Low-and-middle-income countries

MRSA - Methicillin-Resistant Staphylococcus Aureus

NPA - Non-prescribed antibiotics

PRISMA – Preferred Reporting Items for Systematic Review and Meta-Analysis

POM- Prescription Only Medicine

RCT – Randomized Control Trial

SMA - Self-Medication of Antibiotic

STI – Sexually transmitted disease

UKZN – University of KwaZulu Natal

WHO- World Health Organization

## **Declarations**

### **Ethical approval and consent to participate**

This study was reviewed and approved by the Humanities and Social Sciences Ethical Committee (HSREC) from University of KwaZulu Natal, Durban, South Africa and by the National Bioethics Committee for Health (CNBS) from the Ministry of Health, Mozambique. Subjects gave written consent to participate and written confirmation that there was an understanding of the objectives of the interview, that the subjects themselves were willing and able to participate, and that they could decline to participate further at any time.

### **Consent for publication**

*Not applicable*

### **Availability of data and material**

The raw data was attained in Portuguese language, the datasets were transcribed and translated to English. The data are not publicly available as it contains information that could compromise research participant privacy/consent. Therefore, the datasets analysed for this paper will be assessed from the corresponding author upon rational request.

### **Competing interests**

The authors declare that they have no competing interests.

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### **Authors' contributions**

NFT is the principal investigator and the lead author of the manuscript. NFT conceptualized and prepared the draft proposal of the study under the supervision of LEM and VS. Both LEM and VS assisted in all stages of the research process and with the manuscript revision and redaction. NFT, LEM and VS contributed to the reviewed draft version of the manuscript and approved the final version.

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## Tables

[Due to technical limitations, tables 1 and 2 could not be displayed here. Please see the supplementary files section to access the tables.]

Table 3. Antibiotics and other medicines purchased by the participants.

PARTICIPANTS	MEDICINE PURCHASED	PRESENTATION
RESPONDENT 1	Amoxicillin + Chloramphenicol+ paracetamol	"two colors" Capsules + Eye drops + tablets
RESPONDENT 2	Cotrimoxazole + ibuprofen	Tablets
RESPONDENT 3	Amoxicillin with clavulanic acid	Tablets
RESPONDENT 4	Tetracycline + amoxicillin	Eye ointment + capsules
RESPONDENT 5	Amoxicillin + paracetamol	"two colors" Capsules + tablets
RESPONDENT 6	Cotrimoxazole + amoxicillin	Vaginal cream+ tablets
RESPONDENT 7	Azithromycin + paracetamol	Tablets
RESPONDENT 8	Tetracycline+ paracetamol	Eye ointment
RESPONDENT 9	Phenoxymethylpenicillin+tetracycline	Tablets+ ointment
RESPONDENT 10	Metronidazole + Amoxicillin + ibuprofen	Tablets
RESPONDENT 11	Doxycycline+ cotrimoxazole	Tablets =virginal cream
RESPONDENT 12	Cotrimoxazole	Tablets
RESPONDENT 13	Amoxicillin with clavulanic acid+paracetamol	Oral suspension +tablets
RESPONDENT 14	Amoxicillin +Cotrimoxazole+ prednisolone	"two colors" Capsules + tablets
RESPONDENT 15	Amoxicillin with clavulanic acid	Tablets
RESPONDENT 16	Azithromycin	Tablets

<b>RESPONDENT 17</b>	cotrimoxazole	Tablets
<b>RESPONDENT 18</b>	Amoxicillin with clavulanic acid	Tablets
<b>RESPONDENT 19</b>	Amoxicillin+ tetracycline+ cotrimoxazole	"two colors" Capsules + tablets
<b>RESPONDENT 20</b>	Cotrimoxazole	Tablets
<b>RESPONDENT 21</b>	Doxicilin and cotrimoxazole	Tablets + vaginal cream
<b>RESPONDENT 22</b>	Amoxicillin with clavulanic acid+ loratadin+paracetamol	Oral suspension +tablets
<b>RESPONDENT 23</b>	Cotrimoxazole	Tablets
<b>RESPONDENT 24</b>	Doxycycline+ cotrimoxazole	Tablets +virginal cream
<b>RESPONDENT 25</b>	Amoxicillin +Cotrimoxazole+ prednisolone	"two colors" Capsules + tablets
<b>RESPONDENT 26</b>	Amoxicillin with clavulanic acid	Tablets
<b>RESPONDENT 27</b>	Azithromycin	Tablets
<b>RESPONDENT 28</b>	Amoxicillin + cotrimoxazole	"two colors" Capsules + tablets
<b>RESPONDENT 29</b>	Amoxicillin with clavulanic acid	Tablets
<b>RESPONDENT 30</b>	Amoxicillin+ tetracycline+ cotrimoxazole	"two colors" Capsules + tablets
<b>RESPONDENT 31</b>	Cotrimoxazole	Tablets
<b>RESPONDENT 32</b>	Metronidazole + Amoxicillin + ibuprofen	Tablets

## Supplementary Files

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- [Table1BMC2012.docx](#)
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