

Knowledge of pregnant women in rural Mozambique on routine practices to prevent and treat common conditions at the antenatal care clinic

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Abstract

Background: Despite an increasing proportion of pregnant women accessing antenatal care (ANC) in low-income countries, preventable maternal morbidity and mortality remains high. Limited women's knowledge on common diseases during pregnancy and on the indications of routine health interventions delivered at the ANC clinic may reduce the compliance and effectiveness of these interventions. We assessed pregnant women's knowledge on common diseases in pregnancy and on routine interventions delivered at the ANC clinic as well as their compliance with these interventions.

Methods: From December-2019 to October-2020, we undertook a qualitative study using individual semi-structured and in-depth interviews in 79 pregnant women attending the ANC clinic of a rural hospital in Mozambique. Participant's ability to identify the drugs administered was assessed by showing them the drugs without the label (antiretroviral, ferrous sulfate, cotrimoxazole, isoniazid, mebendazol and antimalarial). Interviews were recorded, transcribed, coded and a combined Content and Thematic analysis technique used. NVivo 12 software was used to store and retrieve the data.

Results: Most of the participants recognized that infectious diseases such as HIV, malaria, sexually transmitted infections, tuberculosis and COVID-19, could be harmful in pregnancy. Overall, knowledge on the indication of the prescribed drugs was limited, being higher for antiretroviral drugs and ferrous sulfate, and lower for mebendazol and isoniazid. The general perception was that all drugs prescribed at the ANC clinic prevent or treat malaria infection. Knowledge on the indication of the prescribed drugs was generally higher in HIV-infected pregnant women compared to HIV uninfected women. Forgetting daily medication intake, non-compliance with the drug intake schedule and perceived importance given to some drugs instead of others, were practices found regarding compliance to the pharmacological interventions.

Conclusion: Knowledge of Mozambican pregnant women on health interventions delivered at the ANC clinic was generally limited. The latter may reduce compliance and adherence with these interventions and thus their effectiveness and safety. Reinforcing Information and education on ANC health interventions targeting women of childbearing age would improve maternal and infant health.

Introduction

Maternal mortality rate in Mozambique has dropped from 408 per 100,000 births in 2011 to 289 deaths per 100,000 births in 2017, as result of the considerable improvement during the last years, in coverage of antenatal care (ANC) and institutional deliveries, as well as in the management of obstetric complications and underlying diseases (1). However, the maternal mortality ratio remains unacceptably high within the country (1, 2). Obstetric hemorrhage, gestational hypertension and infections, such as malaria and HIV/AIDS are among the main causes of maternal mortality and morbidity in Mozambique with a significant number of deaths occurring at health facilities (3–5). Other contributory of maternal deaths

and not directly related to pregnancy, include inadequate human resource for health, delay in seeking care, inadequate equipment, lack of transport, and delay in referrals services (6).

In Mozambique, at the ANC clinic, HIV-infected pregnant women (HIVPW) receive lifelong antiretroviral therapy (ART) plus ferrous-sulfate combined with folic acid for treatment and prevention of anaemia and fetal malformations, cotrimoxazole prophylaxis (CTXp) to prevent opportunistic infections and isoniazid prophylaxis to preventive tuberculosis (TB) (7). The latter implies, on average, self-administration of four to five tablets from different medications daily during the pregnancy course, which can lead to errors in drug administration and lack of treatment adherence (8, 9). On the other hand, management of HIV-uninfected pregnant women (No-HIVPW) also includes ferrous-sulfate combined with folic acid and intermittent preventive treatment (IPTp) of malaria with sulfadoxine-pyrimethamine (10). In addition, all women receive mebendazol for deworming at first ANC clinic visit, and other drugs may be prescribed depending on the occurrence of other diseases such as urinary infections, sexually transmitted diseases (STDs) or non-communicable diseases (11, 12).

Beyond their clinical efficacy, the effectiveness of the above interventions depends on several factors, including attitudes, behaviour and knowledge of pregnant women and the wider community, which are shaped by social and cultural factors (13). We hypothesized that limited knowledge on common diseases during pregnancy and on the indications of routine health interventions delivered at the ANC clinic might reduce the compliance and effectiveness of these interventions. In fact, a study conducted in Eswatini revealed that 90% of breastfeeding mothers living with HIV who presented high knowledge of prevention of mother to child transmission (PMTCT) strategies, demonstrated a positive attitude and behaviour towards them (14). In contrast, a study conducted in Southern Ethiopia has reported that despite pregnant mothers' knowledge and attitude about malaria and insecticide-treated bed nets (ITNs) was considered fairly good, insecticide-treated nets ownership and utilization was noticeably very low (15). In addition, there is evidence that illiteracy and misinformation may lead to non-compliance to a recommended measure (16, 17). Therefore, research on knowledge on diseases is a critical step to identify the factors that may be affecting effectiveness of preventive and pharmacological interventions for this same disease (18, 19).

In this study we aimed to assess Mozambican HIVPW and No-HIVPW's awareness of common diseases in pregnancy and their ability to identify and acknowledge the indication of pharmacological interventions delivered at the ANC clinic as well as their compliance with these interventions.

Methods

Study design

This is a qualitative descriptive study which included in-depth and semi-structured exit interviews to HIVPW and No-HIVPW attending the ANC clinics of the Manhiça district Hospital (MDH), in southern Mozambique.

Study Setting

The Manhiça District is located 80 kilometers north away from the capital city, Maputo. The Manhiça Health Research Centre (CISM) runs a demographic surveillance system (DSS) since 1996, involving intensive and regular monitoring of a population of about 216,000 inhabitants in covering the entire district an area of around 2891.1 km² (20,21). There are 21 healthcare centers, of them, one is a rural hospital, Xinavane Rural Hospital and another one is a referral district hospital, Manhiça District Hospital (MDH). Overall, the coverage of first ANC clinic visit attendance within the district is high (90-93%) but it tends to decrease in subsequent visits (22). Pregnant women are managed according to Mozambican national guidelines (7,23). The area is endemic for malaria and the community prevalence of HIV is as high as 30% at ANC (24,25). Retention on HIV care is a challenge. At the end of 2019, the country reported that among the 97% of all HIVPW receiving ART at ANC clinics, only 77% and 83% were retained in care at 33 days and 99 days, respectively (22). The completion of this study coincided with the start of the COVID-19 pandemic in Mozambique (26).

Sampling and recruitment strategies

An intentionally non-probabilistic sampling was followed to enroll study participants. Health care workers and nurses working at the ANC from the MDH, supported the team to identify study candidates from women attending their first ANC clinic visit. HIVPW and No-HIVPW were informed about the study objective and invited to undergo the study semi-structured exit interview. Those willing to participate were asked to sign the study informed consent. HIVPW were all participants of an ongoing clinical trial aiming at assessing the efficacy and safety of an antimalarial drug for malaria prevention during pregnancy (27). Ten women from each group (HIVPW and No- HIVPW) were also invited to participate in the in-depth study interviews. Although the determination of sample size in qualitative studies does not necessarily follow quantitative study models, for this study a sample size was calculated. This was due to the fact that the semi-structured exit interviews would generate quantifiable constructs, and for that the exit interviews were subjected to a sample size calculation of 10% of the number of HIVPW expected to be enrolled in the on-going clinical trial in Mozambique (444 participants). In order to capture visits information related to No- HIVPW, a final sample size was defined by saturation in the subgroup of No- HIVPW.

Data collection and analysis

Using semi-structured exit interviews, the following thematic areas were explored i) the awareness of common diseases during pregnancy, ii) the awareness of the most severe diseases during pregnancy, iii) the ability to distinguish the different drugs prescribed at ANC, iv) the knowledge of the indication of the pharmacological interventions implemented at ANC and v) home compliance to drugs prescribed at ANC. We assessed the participant's ability to identify the drugs administered at the ANC by showing the drugs (antiretroviral, ferrous sulfate, cotrimoxazole, isoniazid, mebendazol and fansidar) to the participants, as they were delivered at ANC but without any drug label with the exception of antiretroviral drugs (Figure 1). While we considered "awareness of diseases in pregnancy" if the pregnant women mentioned at least

one of the most common and severe diseases in pregnancy, “Accurate knowledge of the indication of pharmacological interventions” was considered if the pregnant woman just gave the correct answer for questions related to knowledge of the indication of each pharmacological interventions (each drug). Home compliance to the drugs prescribed at ANC was explored through in-depth interviews with specific question about forgetting daily medication, non-complying with drug intake schedule and perceived importance given to some drugs. All the interviews were conducted by trained social scientists in the preferred language of the participants. The interviews were recorded after participant’s permission using digital voice recorders, followed the interviews verbatim transcription in MS Word, mostly by the same team members who collected the data. The social sciences team leader performed the data quality checks by reviewing the transcripts while listening to the audio recording. The transcripts were then imported to NVivo version 12 (QSR International Pty. Ltd. 2015) Software. We performed combined Content and Thematic analysis technique through the following steps: generating categories, coding text according to each category; annotating emerging themes and patterns and readjusting the categories and relationships between them (28). The research team conducted the coding of all Portuguese transcripts at CISM.

Ethics approval and consent to participate

This study was approved by the National Bioethics Committee of Mozambique (311/CNBS/19). After informing the objectives and characteristics of the study, a written informed consent was obtained from each participant. One copy of the consent form was left with the participating women.

Results

The study was conducted from December 2019 to October 2020. A total of 44 HIVPW and 35 No-HIVPW were included in the study.

Socio-demographic and clinical characteristics of the study population

The socio-demographic and clinical characteristics of study participants during the first ANC visit are shown in Table 1. The median age of the women was 27 (IQT 21-32). Fifty-two women (65.8%) were unofficially married and the Christian-Zion was the religion with more believers among the participants. The median gestational age of women was 16 weeks (IQT 13-19) and the median of live children per women was four (IQT 4-5). Fifty-six women (71%) were housewives and 13% had no formal school education (no education or did not complete primary education).

Table 1. Basic characteristics of interviewed pregnant women at the enrolment

Pregnant women’s knowledge about common diseases during pregnancy

Most women from both HIVPW as well as No-HIVPW groups, mentioned HIV, malaria, STDs, TB and non-specific pain as the most common diseases during pregnancy. A minority (5/79) of women mentioned also anemia and arterial hypertension.

“The diseases I know most about during pregnancy, in a pregnant woman, are HIV, tuberculosis, syphilis, malaria hummmm [calling to mind] ... bladder pain.” (HIVPW, 29 years old)

“They may have malaria...they may have HIV. Sometimes a pregnant women come out with a vaginal discharge.” (No-HIVPW,26years old)

Very few pregnant women (9/79) reported not knowing any of the most common diseases in pregnancy.

“hummmm [calling to mind], diseases...depends on the person.....I don't know because it [referring to diseases] has never happened to me....” (HIVPW, 30 years old)

Compared to No-HIVPW, the HIVPW were aware of many more diseases that may occur during pregnancy (Figure 2).

Pregnant women's knowledge about the most severe diseases during pregnancy

Pregnant women were also asked to mention the diseases they considered to be the most serious in pregnancy. That is, the realization that a disease can have serious consequences. The HIVPW consider HIV, malaria, STDs, TB and COVID-19 as the most serious diseases during pregnancy, while the No-HIVPW mentioned only HIV, malaria and COVID-19.

For clarity purposes, we have grouped and presented below, the perceived concerns of the first two diseases considered by pregnant women to be the most serious in pregnancy, which at the same time were the focus diseases of the ongoing clinical trial. In addition, despite being a relatively new disease, we presented the participants 'perceptions about COVID-19 because this was raised as an emergent relevant theme.

Perceived concerns on HIV infection

The perceived risk of transmitting HIV to the baby was the most commonly mentioned concern for all women regardless of HIV infection status.

“It worries me because the child may be at risk of being infected. The baby will not be born with lack of organs but it will not be a child with a pleasant appearance.... It is as they say (Referring to the health providers). We have to take HIV pills, if you refuse and do not follow, the child is born looking not pleasant, even any person can pick him up and see that, really the child is not there pleasant, starting from the pregnancy for not doing the follow-up.” (HIVPW, 35 years old)

“Because it (referring to HIV) can infect my child.” (No-HIVPW, 22 years old)

Other concerns differed according to the pregnant woman's HIV infection status. The risk of the disease leading to the women death constitutes the concern among HIVPW. On the other hand, No-HIVPW stated that they would not be able to endure taking antiretroviral on a daily basis and for the rest of their life and the stigma of being marked as HIV positive.

“Because if you have this disease (referring to HIV), if you don't comply with the medication, you will leave [die] now.” (HIVPW, 27 years old)

“*uhh* [coughing] because I don't want to be the sick one.” (Referring to the stigma of being marked as HIV positive) (No-HIVPW, 23 years old)

Another No-HIVPW considered the fact that she was too young to have the disease.

“It worries me because I'm still a child. I still have a future; I still want to live.” (No-HIVPW, 22 years old)

Perceived concerns on malaria infection

Regarding malaria, the perceived risks concerns varied according to the pregnant woman's HIV infection status. The HIVPW mentioned maternal death, congenital malaria and miscarriage as consequences of malaria.

“Because malaria kills. Yes, it kills when no...if it is not answered immediately.” (HIVPW, 23 years old)

“Because it (referring to malaria) can abort the pregnancy.” (HIVPW, 29 years old)

Questioned about malaria perceived risks concerns, some No-HIVPW mentioned fear and feeling vulnerable to the disease but were unable to mention severity markers or consequences.

“Interviewer: Malaria. Why are you worried? What makes you afraid of malaria?”

Respondent: [silence].

Interviewer: You don't know why you are afraid, but you know that you are afraid of malaria. You don't know why the fear?

Respondent: [silence].” (No-HIVPW, 31 years old)

“And malaria for a pregnant woman is not good. It's dangerous.” (No-HIVPW, 23 years old)

“I'm afraid of malaria because I might have it because there are many mosquitoes.” (No-HIVPW, 38 years old)

Perceived concerns on COVID-19

In relation to COVID-19, perceived risks concerns include easy transmission from individual to individual, non-existence of a curative treatment, risk of death and the fact that it was not known how it could affect the baby.

“It (referring to COVID-19) worries me because I'm not in a normal state.... I'm pregnant..... and this is a heavy disease for me to bear and they (Referring to the health providers) say that for us pregnant women, the disease is serious and easy to catch” (HIVPW, 29 years old)

“...*heyshi* [worry] coronavirus, its transmission is also easy...it scares me. In the case of buying something... because of the money... if you took the money if you forget to pass the *alcon* [alcohol] your fingers; the disease is already there. So *hey* it's a disease *hum* [laughs and worry] ...now *hum* [worry] corona-vi...as [coronavirus] it's a pandemic for which ...the medicine isn't known correctly...” (No-HIVPW, 37 years old)

“Well, it's just that we don't know, or at least the news doesn't even know... They (Referring to the health providers) don't know how this disease can affect a pregnant woman.” (No-HIVPW, 28 years old)

Pregnant women's ability to recognize the drugs prescribed at the ANC

Overall, few women were able to identify the drugs by their real names at the first look, at the same time, most of them use an assigned name to identify them (Table 2). Moreover, the results evidence that the interviewed women used the container, format, color, size, stamping and perceived adverse effects based on previous personal experience or that of a relative, to identify the drugs administrated at ANC.

“Because my sister took these pills (referring to antiretroviral drugs)... *hummmm* [reminding herself] but she died. [Cough]. It's just that she had HIV disease and they gave her those pills.” (HIVPW, 36 years)

“Because when I'm pregnant they always give me these (referring to ferrous-sulphate).” (HIVPW, 36 years old)

“I know them (referring to ferrous-sulphate), but I have a problem that when I take it, it doesn't do me any good... I feel a hunger that is not worth it.” (HIVPW, 22 years old)

Table 2. Assigned names to different medication administered in the antenatal care visit

It is noteworthy the fact that antiretroviral drugs are commonly called HIV pills or just antiretroviral but never by its generic name (Table 29).

“They are antiretroviral.” (HIVPW, 32 years old)

“They are HIV pills.” (HIVPW, 18 years old)

Ferrous-sulphate was the drug most frequently identified by its real name, by both groups of pregnant women. In addition, this pill was identified by its red color.

“Because I saw [laughs] because they're red.” (HIVPW, 27 years old)

“I see because it's red.” (No-HIVPW, 38 years old)

“They are ferrous-sulphate.” (HIVPW, ageless)

“They say they are ferrous-sulphate.” (No-HIVPW, 32 years old)

Mebendazol and fansidar tablets administered under direct observation at the ANC visit room together with isoniazid were the least recognized at the first look and the least identified by their real name.

“*Hihhh* [hesitation], the name I don't know.” (Referring to mebendazol). (HIVPW, 35 years old)

“I don't know the name, it's just that they gave me to prevent malaria, for the baby.” (Referring to fansidar). (No-HIVPW, 18 years old)

The participants distinguished antiretroviral and cotrimoxazole through the type of stamping on the tablet, that is, the existence of a digit and a line on the antiretroviral drugs and cotrimoxazole respectively.

“There's a number.” (Referring to antiretroviral drugs) (HIVPW, 29 years old)

“It's just that the way it is, I already know, I already know. It is round and has a line in the middle without writing anything.” (Referring to cotrimoxazole) (HIVPW, 29 years old)

Because of the used marker signs, women very often mistook cotrimoxazole with paracetamol and isoniazid, while ferrous sulphate was mistaken with multivitamin (known as appetite medicine).

“I see by color because all appetites tablets are red.” (Mistaking ferrous sulfate for multivitamin) (HIVPW, 20 years old)

“...but its paracetamol, *ahh* [laughs] you can see that this is paracetamol.” (Mistaking cotrimoxazole for paracetamol) (HIVPW, 27 years old)

Pregnant women's knowledge and attributed indication of drugs prescribed at ANC Concerning to the pregnant women's knowledge of the indication of the drugs prescribed at ANC, the results evidence how some participants interestingly mentioned the perceived indication of the drugs by relating them to a specific disease and not mentioning if for either preventive or treatment propose.

“Interviewer: This one? Do you know this pill? (Referring to fansidar used for malaria IPTp)

Respondent: They are for malaria.” (No-HIVPW, 26 years old)

“Interviewer: - Do you know this pill? (Referring to isoniazid used for TB IPTp). They usually come on a paper (card) like this one, but it's white and this one is a little dirty. There are 30.

Respondent: I don't know! Are not they for tuberculosis?” (HIVPW, 38 years old)

Furthermore, with the exception of isoniazid, some participants perceived that all the drugs prescribed at the ANC could also be used to prevent or treat malaria infection (Table 3). However, attributed indications were found for mebendazol, isoniazid, cotrimoxazole and antiretroviral drugs. On one hand, the results

evidence participants tend to attribute several indications to each drug or similar indications for different drugs, for example, the attributed indication to ferrous sulphate included increasing blood, stimulating appetite, protecting and growing the fetus and preventing malaria. Similarly to antiretroviral drugs, both cotrimoxazole and isoniazid were mentioned to have the role of increasing the level of CD4 cells. Conversely, some participants showed poor knowledge of indication for mebendazol and isoniazid.

“...When CD4 went down...hum [calling to mind]... they increase the CD4.” (Referring to cotrimoxazole) (HIVPW, 35 years old)

“At that time I was in the visiting room, they (referring the health providers) told me! They said it [Referring to isoniazid] serves to increase CD4.” (HIVPW, 29 years old)

Table 3. Pregnant women’s knowledge about the indication of prescribed medication given at the antenatal care visit

Home compliance to pharmacological interventions

In our study, we examined the home compliance with medication among the twenty women invited for the in-depth interviews. We used descriptive compliance aspects of the medication intake such as forgetting daily medication, non-compliance with intake schedule and perceived importance given to some drugs compared to others to assess how the participants’ practices could affect compliance to the pharmacological interventions, as well as the strategies used to avoid forgetfulness. Most of the women (14/20) reported taking their medication daily without failure. However, according to the participants, the medication intake time depends on the routine daily activities; in general, the intake time was mentioned to be, for example, right after waking up, after personal hygiene or after breakfast.

“Interviewer: You don't know. Ok. So, how did you remember to take your pills? Did you do anything to remember to take this one, the ferrous salt?”

Respondent: I took it in the morning after breakfast” (No-HIVPW, 20 years old)

“I would wake up, shower, brush (teeth) and then take pills.” (No-HIVPW, 32 years old)

When asked which of the medications received at the ANC they considered the most important that they would never fail/forget to take them daily, most HIVPW (8/10) reported they would never forget antiretroviral drugs, while No-HIVPW reported they would never forget ferrous-sulphate, as seen in the quotes below;

“Interviewer: So, which one for you, you never got into your head that you should never fail?”

Respondent: It's ferrous-sulphate.” (No-HIVPW, 28 years old)

“Interviewer: No. Okay. So, out of all these pills here, which do you think you should never fail?”

Respondent: It's HIV's." (HIVPW, 20 years old)

In terms of strategies to avoid missing a dose, the women with predetermined medication intake time, mentioning using a reminder alarm to be able to take the medicine at exactly the same time, daily.

"...like those of mine I take at 7 o'clock. Yes, I did that alarm on my phone." (HIVPW, 38 years old)

"I looked at the clock. As I always tell myself that at X time, I should take it." (No-HIVPW, 21 years old)

Notwithstanding, forgetting daily medication intake was common and similar between HIVPW and No-HIVPW. In this case, one of the participants reported having taken the medication as soon as she remembered. Below are some illustrations of the women who reported forgetfulness and failure to daily intake (6/20):

"Interviewer: What pills did you forget to take?"

Respondent: The ones I really forgot are the ones I take 2. (Referring to cotrimoxazole)." (HIVPW, 33 years old).

"It was just one day...that I forgot (Referring to ferrous-sulphate)... I remembered while it was the 29th...as soon as I remembered, I took it." (No-HIVPW, 28 years old)

Discussion

This study aimed at exploring pregnant women's awareness on diseases in pregnancy and their ability to identify and knowledge the indication of pharmacological interventions prescribed at ANC. In addition we explored pregnant women's compliance with these interventions. Our findings evidence that, while pregnant women attending ANC in Manhiça district, revealed awareness of the most common diseases in pregnancy, there is limited knowledge of the indication of the pharmacological interventions implemented at ANC. This limited knowledge's might lead to poor compliance and negatively affect drug efficacy and safety and contributing to the poor effectiveness of MoH strategies for disease control in pregnant women

The perceived most common and severe diseases during pregnancy

The results show that HIV, malaria, STDs, TB and non-specific pain constitute the perceived most common diseases in pregnancy. Nevertheless, it is a concern that compared to No-HIVPW, HIVPW showed more accurate awareness of many more diseases that may occur during pregnancy. These differences may be due to the strong sensitization and awareness campaigns of diseases more targeted to HIVPW in recent years in Mozambique (29–32). This finding could also be explained by the fact that HIVPW have more frequent contacts with the health facility compared to No-HIVPW women. Therefore, there is a need to intensify health programs for the general population, with special attention to women in childbearing age, to homogenize the level of disease knowledge that may affect pregnant women. Nevertheless, our

findings regarding pregnant women's knowledge about common diseases in pregnancy are similar to those of other authors who investigated malaria, HIV STDs and TB in other African settings (33–36).

Furthermore, HIV, malaria, TB and COVID-19 (indirect causes) were also considered the most severe diseases during pregnancy. Previous studies conducted by the MoH have shown, with exception of COVID-19, that the above diseases are the main causes of maternal mortality in Mozambique; thus, these results indicate that pregnant women from Manhiça District are aware of most severe diseases during pregnancy (3–5). However, knowledge of direct causes such as hemorrhage, gestational hypertension (also quite frequent in this setting) remains low.

This study was conducted at the beginning of COVID-19 pandemic in Mozambique (on 22 March 2020) when few evidence on the COVID-19 dynamics was available. The participants mentioned COVID-19 as one disease to fear during the pregnancy. Moreover, it is important to mention that during the outbreak of COVID-19, the national health authorities, recommended and implemented the suspension of monthly ANC visits, stating that pregnant women were only recommended to visit the ANC every three months. Although not conclusive, the above-mentioned implemented measure might have an influence on the participant's fear of contracting COVID-19 during pregnancy. This represents an interesting emerging theme that needs to be taken into consideration, as this has the potential of anticipating insights on acceptability of COVID-19 containing interventions targeted at pregnant women, such as vaccination (37,38). Furthermore, altogether, it indicates how the social dynamics and the emergence of diseases influence the pregnant women's knowledge even in a context of non-conclusive and scarce information such as when we conducted this study. New and emerging diseases are important to consider as influencing all or part of women's knowledge. Therefore, there is a need to always consider the research context and understand how these contexts and its social constructs influence the knowledge's and health seeking behaviour in Mozambique.

Similarly to what was reported in previous studies, the main criteria for a disease being considered more severe by pregnant women was the risk of affecting their offspring (39,40). In this study, some participants expressed their fear of contracting diseases such as malaria and HIV in pregnancy not only because it can affect the pregnant women, but mostly because it can affect the fetus. Moreover, the fear of contracting COVID-19, is related to the fact that it was a new disease and less evidence on how it can affect women was available. Strategies aimed at improving drug compliance in pregnant women should emphasize the benefit of specific intervention in protecting their offspring. On the other side, because this study used a more exploratory approach, without previously defining disease severity markers according to its conceptual framework, we observed that No-HIVPW tend to use other disease severity markers and not necessarily the consequences from disease to health. For example, fear of stigma, being too young to be infected and fear of taking lifelong antiretroviral drugs should be taken in account by the health authorities, health promoters and health policy makers when re (designing) interventions for pregnant women in Mozambique.

The knowledge of the drug indication and the recognition of the drugs prescribed at ANC

Through the results of this study, we verified poor ability to identify and knowledge of indication of the drugs prescribed at the ANC which suggests some communication gaps between health care provider and patient during the ANC visits. This is worth considering due to the following challenges frequently encountered in some LMICs such as Mozambique; i) some drugs prescribed at ANC are dispensed in a small unspecified zip lock plastic or paper made bag identified with a handwriting that easily disappears over time or in paper made bags susceptible to destruction by moisture and time; ii) because of fear of stigma, frequently the tablets are removed by HIV-infected individuals from their original container and put in plastic zip lock bag with no identification or a different identification; iii) finally national illiteracy standing at 45% is almost twice more common in women than in men (41), so that identification of the drugs relies on marker signs such as the container, format, color, size and stamping of the drugs as has been found in a previous study regarding antibiotic use in rural Mozambique (42).

Moreover, due to its multicultural and multilingual characteristics, Mozambique has several local languages whose translation for medical terms is not harmonized (43,44). It is possible that healthcare providers are using different terminology or explanations for the same drug and this may justify the diversity of drug perception of indications reported by pregnant women for the same drug. In fact, both cotrimoxazole as well as isoniazid were mentioned to have the role of increasing the level of CD4 and it was perceived that all the drugs prescribed at the ANC could serve to treat malaria infection. Therefore, considering only 17% of the country population speak Portuguese as their first language, incorporating local languages into healthcare services and creating opportunities for bilingual local health guideline is key to providing relevant and inclusive health care for all. This would be particularly important in those interventions that requires home intake medication.

All the above-mentioned facts, prompted medicine with the same physical characteristics to cause difficulties in identifying the drugs as well as lead to poor knowledge of the indication of the drugs being prescribed at ANC. Moreover, pregnant women not being able to identify the prescribed drug and its indication, paves the way to *medication* errors. Future studies should deeply explore the above-mentioned facts and their impact on drug compliance. Meanwhile, strategies such as pictograms are needed to increase and harmonize the information provided to pregnant women at ANC clinics considering the high number of medications prescribed, especially to HIV-infected pregnant women.

Another interesting finding is the fact that some participants mentioned the perceived indication of some pharmacological interventions by relating them to a specific disease and not mentioning if for either preventive or treatment propose. Teaching people about the importance of preventive measures is key to making sure more people get recommended care. In countries such as Mozambique, with limited medical resources, high rates of *preventive* care would reduce the risk of being sick or either catch diseases before they become too serious, which would drastically reduce the cost of *treatment*.

Home compliance to the prescribed drugs

Compliance to medication prescription is one the appropriate way of using medicines that prompts good disease outcome and a rational utilization of these valuable substances worldwide. Our study results

show that medication compliance practices, specifically related to forgetting daily medication and non-compliance with intake schedule could be affecting effectiveness of ANC pharmacological interventions. Likewise, the perceived importance given to some medication in comparison to others, may affect the compliance. For example, some HIVPW reported not forgetting to take their antiretroviral drugs while No-HIVPW referred the same to ferrous sulphate. However, cotrimoxazole prophylaxis to prevent opportunistic infections was frequently forgotten by some HIVPW. The lack of knowledge and proper practice about medicines among pregnant women is common in many LMICs and have serious impacts on the health of the mother and child. Thus, effective interventions are needed to improve pregnant women's attitude and practices regarding safe and effective medication intake during pregnancy. Both physicians and maternal and child health nurses have an important role by adequately sensitize the pregnant women about illnesses, complications that may arise and the advantages of correct medications intakes. To this end, pregnant women must be familiar with the drugs and the modalities of their use for the optimal therapeutic outcomes (45).

Study limitations

Limitations of this study include the fact that it was carried out in a period of national restrictions due to COVID-19 in the health facilities and that affected the data collection process. The interviews were carried out as quickly as possible and there was no deep enough exploration of some aspects which may have induced bias. Furthermore, this situation did not allow the interviewers to observe compliance-practices related with medication intake schedules. Finally, the semi-structured exit interviews carried out in a hospital environment may have affected the participants' comfort in giving an honest and open opinion, on the other hand, their performance immediately after leaving the office minimized the occurrence of bias memory. Limitations aside, this study brings information that is worth addressing by public health policy and target appropriate interventions in order to improve compliance pharmacological interventions implemented at ANC for pregnant women. At the same time, this study was an opportunity to investigate women's perceptions of the new disease COVID-19.

Conclusion

This study comes to a conclusion that pregnant women knowledge about the pharmacological interventions delivered at ANC and their indication were limited which paves the way to medications intake errors affecting compliance and adherence while compromising the drug efficacy. Strategies are needed to provide clear information regarding the name of the drugs, its specific indication and the advantages to comply with intake instruction, considering the high number of drugs prescribed, especially to HIV-infected pregnant women. Moreover, effectively promoting health and educating the women and the overall community by constantly providing correct information regarding the drugs prescribed as well as its value, is key to raise awareness, improve their knowledge towards the rational use of the drugs while increasing adherence.

Abbreviations

ANC Antenatal care

ART antiretroviral therapy

ARV antiretroviral

CISM *Centro de Investigação em Saúde de Manhiça*

CTXp Cotrimoxazole prophylaxis

DSS Demographic and Health Surveillance System

Declarations

Ethics approval and consent to participate

This study was performed in accordance with the Declaration of Helsinki and the National Bioethics Committee of Mozambique approved the study protocol in 2011 (327/CNBS/11), with subsequent annual renewals until the year 2020. After informing the pregnant women about the study objectives and methods, women consented for their participation, and that of their children, by signing a written informed consent. One copy of the consent form was handled to the participant.

Consent for publication

Not applicable.

Availability of data and materials

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

Competing interests

No conflicts of interests to declare

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Authors' contributions

Project conception and protocol design: TN, CM, KM

Coordination of data collection: TN, CC, MC, MM, KM

Data analysis and interpretation: TN, CC, CM, NT, KM, ES

Contributed to the writing of the manuscript: TN, CC, MC, NT, RG, LG, AM, ES, KM, CM

Reviewed the draft and approved the decision to submit the paper: all authors

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Tables

Table 1. Basic characteristics of interviewed pregnant women at the enrolment

Variable		N (%)
Age (years): median (IQR)		27 (21-32)
Age group	<20	11 (14)
	20-24	20 (25)
	25-34	35 (44)
	>35	13 (17)
Education	No formal education	10 (13)
	Primary	46 (58)
	Secondary	22 (28)
	University	1 (1)
Religion	Christian (Zion)	34 (43)
	Christian (Assembly of God)	16 (20)
	Christian (Others)	26 (33)
	Atheist	3 (4)
Marital status	Married (in facto union)	51 (65)
	Single	28 (35)
Occupation	Housewife/Unemployed	56 (71)
	Self-employed (sales woman)	16 (20)
	Formally employed	6 (9)
Gestacional age (months): median (IQR)		4 (4-5)
Children currently alive: median (IQR)		4 (4-5)
HIV infection	Yes	44 (58)
	No	35 (42)

Table 2. Assigned names to different medication administered in the antenatal care visit

Medication	Assigned names (reported by pregnant women)
Ferrous sulfate	Multivitamin
Fansidar (Sulfadoxine Pyrimethamine)	Paracetamol (acetaminophen)
Antiretroviral	HIV pills Pills to sleep HIV Amoxicillin
Cotrimoxazole	Paracetamol (acetaminophen) Headache pills Malaria pills Cough pills
Isoniazid	Cotrimoxazole
Mebendazol	Roundworms To chew pills Malaria HIV pills

Table 3. Pregnant women's knowledge about the indication of prescribed medication given at the antenatal care visit

Medication	Real role	Assigned role (Number of times reported by pregnant women)		
			HIV+ N=44	HIV- N=35
Ferrous sulfate	Treat and prevent iron deficiency anaemia	Increase blood	29	9
		Stimulate appetite	20	7
		Growth and protection of the fetus	3	0
		Malaria	2	0
		Don't know or no indication mentioned	1	21
Fansidar (Sulfadoxine Pyrimethamine)	Malaria prevention	Malaria	10	16
		Don't know or no indication mentioned	37	19
Antiretrovirals	Treatment of HIV infection: preventing diseases progression and vertical transmission	HIV (HIV does not become AIDS)	36	6
		HIV prevention	6	1
		Increase CD4	2	0
		Prevention of diseases	4	0
		Malaria	0	1
		Don't know or no indication mentioned	3	27
Cotrimoxazole	Prevention of opportunistic diseases	Cough	9	6
		Prevention of disease N=11	10	1
		Increase CD4	3	0
		Headaches	4	0
		Flu	4	0
		HIV	3	0

		Malaria	2	0
		Tuberculosis	1	0
		Fever	1	0
		Don't know or no indication mentioned	15	29
Isoniazid	Tuberculosis prevention	Tuberculosis	16	0
		Prevent diseases	3	0
		Cough	3	0
		Increase CD4	1	0
		Don't know or no indication mentioned	21	35
Mebendazole	Deworming	Deworming /kill worms	16	9
		Malaria	4	0
		Sexually transmitted diseases	2	0
		Don't know or no indication mentioned	22	20

Figures



Figure 1

Tray containing prescribed medication given to HIV infected and uninfected pregnant women at antenatal care without any identification which were used for women to identify them

