




BMJ Open Access to and utilisation of antimicrobials among forcibly displaced persons in Uganda, Yemen and Colombia: a pilot cross-sectional survey

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ABSTRACT

Objectives Identifying key barriers to accessing quality-assured and affordable antimicrobials among forcibly displaced persons in Uganda, Yemen and Colombia and investigating their (1) utilisation patterns of antibiotics, (2) knowledge about antimicrobial resistance (AMR) and (3) perception of the quality of antimicrobials received.

Design Pilot cross-sectional survey.

Setting Data were collected from five health facilities in the Kiryandongo refugee settlement (Bweyale, Uganda), three camps for internally displaced persons (IDPs) in the Dar Sad district (Aden, Yemen) and a district with a high population of Venezuelan migrants (Kennedy district, Bogotá, Colombia). Data collection took place between February and May 2021. The three countries were selected due to their high number of displaced people in their respective continents.

Participants South Sudanese refugees in Uganda, IDPs in Yemen and Venezuelan migrants in Colombia.

Outcome measure The most common barriers to access to quality-assured and affordable antimicrobials.

Results A total of 136 participants were enrolled in this study. Obtaining antimicrobials through informal pathways, either without a doctor's prescription or through family and friends, was common in Yemen (27/50, 54.0%) and Colombia (34/50, 68.0%). In Yemen and Uganda, respondents used antibiotics to treat (58/86, 67.4%) and prevent (39/86, 45.3%) a cold. Knowledge of AMR was generally low (24/136, 17.6%). Barriers to access included financial constraints in Colombia and Uganda, prescription requirements in Yemen and Colombia, and non-availability of drugs in Uganda and Yemen.

Conclusion Our multicentred research identified common barriers to accessing quality antimicrobials among refugees/IDPs/migrants and common use of informal pathways. The results suggest that knowledge gaps about AMR may lead to potential misuse of antimicrobials. Due to the study's small sample size and use of non-probability sampling, the results should be interpreted with caution, and larger-scale assessments on this topic are needed. Future interventions designed for similar humanitarian settings should consider the interlinked barriers identified.

STRENGTHS AND LIMITATIONS OF THIS STUDY

- ⇒ This cross-sectional, multicentred study identified challenges and barriers that limit access to quality-assured antibiotics/antimicrobials among forcibly displaced populations in low-income and middle-income countries.
- ⇒ Our study covered different forced migration scenarios and identified commonalities across all three sites.
- ⇒ Our international consortium included researchers from the three study sites to ensure the investigation was well adapted to the target populations.
- ⇒ This was a pilot study to assess the feasibility and gather preliminary insights; our sample size was limited, and the study's findings should be interpreted with caution.
- ⇒ Two out of three study sites used non-probability (snowball) sampling, potentially limiting the representativeness of the samples.

INTRODUCTION

Antimicrobial resistance (AMR) is one of the most significant global health challenges of our time. Although the development of resistant pathogens striving to survive is an inherent part of nature, current practices in the overuse and misuse of antibiotics¹ have accelerated this process. Between 2000 and 2015, antibiotic consumption increased by 65%, mainly driven by the economic growth of low-income and middle-income countries (LMICs).² At the same time, the pipeline of new antibiotics is drying up.³ Although the drivers of resistance are manifold, one pillar consists of anthropogenic factors, such as inappropriate and broad use of antibiotics, poor treatment adherence and increased disease transmission through global travel and trade.³ In addition, poor quality or

substandard antimicrobials continue to proliferate in LMICs^{4,5} and contribute to AMR even when the patients are adherent.^{6,7}

Another pressing global challenge is the unprecedented number of people who are forcibly displaced from their homes due to conflict, climate change and economic collapse.^{8–10} The term forcibly displaced persons includes ‘refugees, asylum-seekers, other people in need of international protection and internally displaced people’.¹¹ The United Nations has called the past ten years the ‘decade of displacement’, and the most recent United Nations High Commissioner for Refugees (UNHCR) numbers show that over 100 million people are currently displaced globally due to conflict and persecution,¹² often housed within countries with fragile health systems with inadequate capacity to diagnose, manage and treat life-threatening illnesses.¹³ Migrants are exposed to many socioeconomic determinants that contribute to negative health outcomes, including high population concentration in a small area, unavailability of adequate healthcare and poor sanitary conditions, among others. These determinants may also increase the risk of disease transmission and act as drivers for AMR.¹⁴ Access to healthcare services among displaced populations is further challenged by restrictions due to migrant status, language barriers, financial limitations and discrimination.¹⁵

Uganda, Yemen and Colombia are among the countries affected by high numbers of forced displacement in their respective continents.^{16–18} In response to the challenge of AMR, many countries,¹⁹ including Colombia and Uganda,^{20,21} have developed National Action Plans (NAPs) and strategies for AMR stewardship. Both countries have also launched national educational campaigns to improve the understanding of AMR among the general population.^{22,23} It is, however, unknown what effect, if any, these interventions have had among forcibly displaced populations. Antibiotics are classified as prescription-only medicines in both countries. Nevertheless, self-medication and over-the-counter sales have been reported as common.^{24,25} In Yemen, the over-the-counter availability of antibiotics is coupled with the lack of coordinated efforts to eliminate the inappropriate use of antibiotics.²⁶ The country only recently (at the end of 2022) published an NAP to combat AMR.²⁷ The potential effects of this NAP have still yet to be investigated.

The necessity for research at the nexus of the two global challenges of AMR and forced displacement was emphasised in the latest Global Evidence Review on Health and Migration series by the WHO. In their systematic review, the authors highlight the significant research and knowledge gaps on access to antibiotics by refugees and migrants in LMICs and point to qualitative studies reporting the importance of informal pathways (such as over-the-counter pharmacy disposal), as well as research looking into the use of substandard and falsified antibiotics in these settings.²⁸ Similarly, gaps in research concerning the accessibility of healthcare for internally displaced persons (IDPs) have been identified.²⁹ Access

to quality-assured and affordable antibiotics is not only crucial to battle AMR, but the provision of essential medicines, including priority antibiotics, is also a basic human right under international law.³⁰

This pilot study looks at the nexus of the two global challenges by identifying key barriers to access quality-assured and affordable antimicrobials for refugees from South Sudan in Uganda, IDPs in Yemen and migrants from Venezuela in Colombia. Furthermore, we aimed to investigate (1) utilisation patterns of antibiotics among refugees/IDPs/migrants, (2) knowledge about AMR among the beneficiary population and (3) perceptions of the quality of antimicrobials they received.

METHODS

Study populations

Uganda hosts one of the largest displaced populations in Africa, with about 1.5 million refugees, mainly from the neighbouring South Sudan (57.2%) and the Democratic Republic of Congo (31.5%).¹⁸ Most of these refugees are housed in settlements alongside the host community across the country.³¹ The Ugandan Government has a progressive asylum regime and works closely with the UNHCR and national and international organisations to integrate refugees into Ugandan society. For the healthcare sector, this means that refugees have access to the public healthcare system and the same health facilities as the host population.³² Yet, Uganda’s main challenge with refugee inclusion and the provision of equitable healthcare is the country’s dependency on financial aid from the UNHCR and other humanitarian aid organisations.³¹

In contrast, most of the forcibly displaced people in Yemen are not refugees from another country but IDPs, who are almost all Yemeni citizens. As of the end of 2021, more than 4 million people were estimated to have been forced to flee their homes since the beginning of the conflict in Yemen in 2014.¹⁶ Although the majority of IDPs are hosted within communities, it is estimated that more than 1.5 million live in more than 2300 unplanned and informal settlements.³³ IDPs often experience exclusion because of challenges related to integration into host communities, areas of origin, education levels and access to income and aid. Little data are available on the current situation on the ground. Public healthcare financing decreased in the years leading up to the conflict, and the Yemeni healthcare system became reliant on the provision of healthcare services by external organisations, such as the UNHCR and the International Organization for Migration, that work alongside other non-governmental organisations (NGOs).³⁴ The protracted conflict has led to an economic crisis, with 81% of Yemenis living below the poverty line, as well as a healthcare crisis with only 50% of public health facilities being operational. This, combined with reductions in humanitarian assistance due to funding shortfalls, has led to increased levels of vulnerability for those who rely on humanitarian assistance.³⁵

Colombia's situation is different from both Uganda and Yemen. Most of the 2.4 million forcibly displaced migrants are Venezuelans who were forced to flee their country due to political turmoil, an economic collapse and a resulting humanitarian crisis.^{17 36 37} Furthermore, Colombia also has one of the largest IDPs in the world, with 7.5 million reported in 2016.³⁸ Most of them were forced out of their homes due to the decades-long internal conflict in the country. Unlike Uganda or Yemen, there are no camps for displaced people in Colombia, and the displaced population lives alongside the non-displaced local population. Although Colombia has had a plan for Venezuelan migration since 2018, the main problem is posed by the fact that the majority of the migrants in the country lack a legal migration status due to reaching Colombia through informal border crossings and the impossibility of obtaining official documents in Venezuela.³⁹ Therefore, most of them are not recognised as refugees by the Colombian state.⁴⁰ Due to their irregular migration status, Venezuelans can only access healthcare services in emergencies or for public health interventions, like vaccinations.⁴¹

Study design and sample size

We performed a cross-sectional survey using a semistructured questionnaire for data collection. Data collection took place between February and May 2021 in all three countries. It comprised questions with single-choice and multiple-choice answers as well as open-ended survey questions. To have a broader focus, the questionnaire asked about antimicrobials unless the questions focused specifically on antibiotics. The questionnaires were primarily composed of validated instruments and questions used in other research studies^{15 42} as well as the German Health Interview and Examination Survey for Adults, a national representative survey that was developed by the German Robert Koch Institute.⁴³ In collaboration with our research team members in Uganda, Yemen and Colombia, the instruments were adapted to forcibly displaced people in the settings of these three countries. The questionnaires were developed in English and translated into Arabic and Spanish by our team members (online supplemental files 1–4). We trained the people in charge of the surveys and a supervisor did a quality control of each survey. Feedback was then provided to the people who conducted the surveys. Additionally, each researcher team had training on standardisation and survey quality control beforehand. Following guidance on sample size for pilot studies,⁴⁴ we aimed to include 50 participants from each country. In Yemen and Colombia, the sample size was reached, while 36 refugees answered the questionnaire in Uganda.

In each setting, participants were recruited and surveyed by the local research team. In Uganda, the study was conducted in the Kiryandongo refugee settlement located in Bweyale in the Kiryandongo district. Seven public and private health facilities in the settlement and its periphery were targeted (Panyodoli Health Centre III, Panyodoli Hills Health Centre II, Nyakadote Health Centre II, Kiryandongo Hospital, Lacor Allied Medical Centre, Juba

Link Medical Centre, Bweyale Medical Centre) and the data were collected in the first five. Systematic sampling of respondents was employed, where every second client exiting each clinic was chosen (100% of eligible participants selected agreed to participate). In Yemen, the participants were selected from the three most crowded IDP camps in the Dar Sad district of the Aden governorate. In Colombia, migrants were chosen from the Kennedy district of the city of Bogotá, where a high rate of Venezuelan migrants live. Due to social gathering limitations of the COVID-19 pandemic at that time, snowball sampling was performed in Yemen and Colombia to reach the necessary sample size.

Data collection

The questionnaires included six sections focusing on (A) utilisation patterns and perception of quality of medicine, (B) treatment adherence and AMR awareness, (C) trust in the healthcare system, (D) factors limiting access and the access to quality-assured (and affordable) antibiotics and (E) patients' sociodemographic and socioeconomic parameters. Participants were asked to rate the importance of different limiting factors according to their experience. These factors comprised: 'language barriers', 'non-availability of certain medicines', 'financial barriers', 'the medicine I need is a prescription only medicine', 'time to reach the nearest healthcare centre', 'time to reach the nearest pharmacy' and 'no trust in the staff at the healthcare centre'. Each factor could be rated on a five-point scale: 'no effect at all' (1), 'mainly no effect' (2), 'some effect' (3), 'mainly large effect' (4) and 'very large effect' (5) (online supplemental files). A multiple-choice question asked participants about factors influencing their decision to get medicines. Possible answers were as follows: 'quality', 'price', 'distance' and an open-ended answer with 'others (please specify)'.

Variables and data analysis

We used descriptive statistics to analyse the quantitative data. Because of the small sample size, we primarily conducted univariate analysis and reported percentages and frequencies for single-choice and multiple-choice question. For the five-point scale questions, we reported the median values and frequencies. Analyses of quantitative data were performed using IBM SPSS Statistics version (SPSS 23.0). Of the 42 questions, 8 were not answered by all participants (response rate >97.0%). Due to the small sample size, no imputation was conducted. The results were reported in relation to the denominator equal to the number of responders.

Patient and public involvement

None.

RESULTS

Study population

Out of the 136 refugees, IDPs and migrants included in this study, the majority were female (27/36, 75.0% in Uganda, 27/50, 54.0% in Yemen and 36/50, 72.0% in Colombia).

Most of the participants were unemployed (25/36, 75.0% in Uganda, 22/50, 44.0% in Yemen and 26/50, 52% in Colombia), and an overwhelming majority had no health insurance (32/36, 89.0% in Uganda, 50/50, 100.0% in Yemen and 44/50, 88.0% in Colombia). Information about the respondents' other sociodemographic characteristics (period of current residency, highest educational level, expenditures) can be found in [table 1](#).

Access to affordable, quality antimicrobials through formal and informal pathways

Section A of the questionnaire focused on the quality of antimicrobials. When asked, apart from two participants (2/50, 4.0%) in Colombia, none of the respondents knew the producer of the antimicrobial agent across all three study sites. Moreover, in Yemen and Uganda, no participant knew the expiration date of the administered antimicrobial. In Colombia, 32/50 (64.0%) of Venezuelan migrants knew the expiration date, and out of these, 5/34 (14.7%) had received expired antimicrobials within the last year. Most participants in Colombia were satisfied with the quality of the used medicine (41/50, 82.0%), followed by Uganda (22/35, 62.86%) and Yemen (26/50, 52.0%). There was no way of testing the quality of the used medicine in Yemen and Uganda. Yet, in Colombia, 8/50 (16.0%) respondents reported that they have a way of testing them.

Regarding the payment for medicines, 45/50 (88.0%) of Venezuelan migrants and 38/50 (76.0%) of Yemeni IDPs paid it out of their own pocket. In contrast, in Uganda, 18/34 (52.9%) paid out of pocket and 15/34 (44.1%) were given medicine at a healthcare facility.

Furthermore, the responses suggest that informal pathways play an important role in obtaining antimicrobials/antibiotics. Informal pathways or networks are ways of accessing antibiotics without a prescription, such as over-the-counter purchases or sharing antibiotics with friends and family.^{28 45} While 21/34 (61.8%) respondents in Uganda received their medicine through doctors' prescriptions, only 14/50 (28.0%) in Colombia and 23/50 (46.0%) in Yemen did. Many participants received their medicines without a prescription: 32/50 (64.0%) in Colombia and 17/50 (34.0%) in Yemen while another 10/50 (20.0%) of Yemeni IDPs were given their medicine by a relative or friend ([figure 1A](#)). In the follow-up question asking how the patients would receive antibiotics if they did not have a doctor's prescription, 39/50 (78.0%) in Colombia, 32/50 (64.0%) in Yemen and 23/36 (63.9%) in Uganda answered that they would get them from a pharmacy. This was followed by family members in Yemen (10/50, 20.0%) and Uganda (8/36, 22.2%). Overall, 26/50 (52.0%) migrants in Colombia, 24/50 (48.0%) IDPs in Yemen and 18/36 (50.0%) refugees in Uganda ([figure 1B](#)) reported sharing their antibiotics with friends and/or family members.

Moreover, distrust in the healthcare system was a concern in Colombia. 36/50 (72.0%) of participants believed that there is a hostile behaviour of healthcare

workers towards migrants, and almost half of them think that they receive lower quality of healthcare due to their migrant status compared with the host population (24/50, 48.0%). In addition, 21/50 (42.0%) of Venezuelan respondents felt that they have no power in decisions related to their health.

Reporting on their decision about getting medicines, in Colombia, 36/50 (72.0%) answered that 'price' influences their decision the most, followed by its 'quality' (32/50, 64.0%). In Yemen, 25/50 (50.0%) mentioned 'quality and price', followed by 'price' alone 13/60 (26.0%). For Ugandan refugees, 'price' was by far the most influential factor (18/36, 50.0%) while about a quarter of participants mentioned that 'distance' (9/36, 25.0%) and 'quality' (10/36, 27.8%) were influential factors.

Barriers to accessing medicine and healthcare

In Yemen, surveyed IDPs reported that 'the used medicine needs prescription' (median score of 3), 'unavailability of certain medicine' (median score of 3) and 'time to reach the nearest healthcare centre' (median score of 3) were the top barriers to accessing quality-assured antimicrobials. In Uganda, the top two barriers were the financial barrier (median score of 4) and the unavailability of certain medicines (median score of 4). The main access limiting factors in Colombia were (1) financial barriers (median score of 4) and (2) that the used medicines needed prescription (median score of 3). The complete response distribution to this section can be found in [figure 2](#).

Treatment adherence and AMR awareness

Among the participants, the 30-day prevalence of using at least one antimicrobial agent differed in the three study sites while only 13/50 (26.0%) of Venezuelans had taken antimicrobials 30 days prior to the study, the number was higher in Yemen (42/50, 84.0%) and in Uganda (22/33, 66.7%).

Awareness about AMR was low among the participants in all three study sites (see [figure 3A](#)); nonetheless, it differed between the countries. 18/36 (50.0%) participants in Uganda and 21/50 (42.0%) participants in Yemen reported taking antibiotics to prevent a cold. Also, 26/36 (72.2%) of respondents in Uganda said they take antibiotics when they have a cold. In Yemen, the response rate was similar (32/50, 64.0%). When asked if they would 'stop taking antibiotics when they feel worse' (11/50, 22.0% in Yemen and 16/36, 44.4% in Uganda) and 'stop taking antibiotics when they feel better' (15/50, 30.0% Yemen and 11/36, 30.6% in Uganda) both groups showed similar results. Contrasting both countries, responses from Venezuelan migrants differed on these questions: only 5/50 (10.0%) took antibiotics to prevent a cold, 16/50 (32.0%) used antibiotics to treat a cold and 34/49 (69.4%) stopped treatment when they felt better. Overall, across all countries, most participants adhered to the treatment instructions by taking the medicine for the whole duration of the prescribed period ([figure 3B](#)).

Table 1 Study population characterisation

		Colombia		Yemen		Uganda		Total	
Number (n)		50		50		36		136	
		n	%	n	%	n	%	n	%
Sex	Male	14	28.0	23	46.0	9	25.0	46	33.8
	Female	36	72.0	27	54.0	27	75.0	90	66.2
Age	18–19	3	6.0	5	10.0	10	27.8	18	13.2
	20–29	25	50.0	13	26.0	14	38.9	52	38.2
	30–39	15	30.0	13	26.0	8	22.2	36	26.5
	>40 and above	7	14.0	19	38.0	4	11.1	30	22.1
Nationality	State citizen	0	0.0	50	100.0	0	0.0	50	36.8
	Foreign (South Sudan, Venezuelan)	50	100.0	0	0.0	36	100.0	86	63.2
Highest educational level	No schooling	0	0.0	8	16.0	5	13.9	13	9.6
	Primary school	2	4.0	12	24.0	22	61.1	36	26.5
	Intermediate school	12	24.0	13	26.0	0	0.0	25	18.4
	Secondary school	22	44.0	14	28.0	9	25.0	45	33.1
	University degree/technical college	14	28.0	3	6.0	0	0.0	17	12.55
Professional status	Not employed	26	52.0	23	46.0	25	69.4	74	54.4
	Part-time employed	4	8.0	12	24.0	4	11.1	20	14.7
	Occasionally/irregularly employed	16	32.0	7	14.0	4	11.1	27	19.9
	Full-time employed	4	8.0	5	10.0	3	8.3	12	8.8
	Other (retired/student)	0	0.0	4	8.0	0	0.0	4	2.9
Residency status	Residency permit for 3 years	5	10.0	All IDPs, therefore, not asked		2	5.6	7	8.1
	Residency permit for 1 year	6	12.0			0	0.0	6	7.0
	Permanent residency	4	8.0			2	5.6	6	7.0
	No residency title	35	70.0			26	72.2	61	70.9
	Other	0	0.0			6	16.7	6	7.0
Health Insurance	Yes	6	12.0	0	0.0	4	11.0	10	7.4
	No	44	88.0	50	100.0	32	89.0	126	92.6
Type of residency	Apartment/house	0	0.0	22	44.0	10	27.8	32	23.5
	Temporary accommodation	0	0.0	20	40.0	22	61.1	42	30.9
	Shared apartment	50	100.0	0	0.0	1	2.8	51	37.5
	Communal accommodation	0	0.0	8	16.0	2	5.6	10	7.4
	Other	0	0.0	0	0.0	1	2.8	1	0.7
Place of residency	Rural area	Not asked		0	0.0	16	44.4	16	18.6
	Small town (5, 0–0, 20 000)			0	0.0	16	44.4	16	18.6
	Medium sized town (20, 0–0, 70 000)			50	100.0	4	11.1	54	62.8
Period of current residency	Less than 1 year	18	36.0	0	0.0	0	0.0	18	13.2
	Between 1 and 2 years	8	16.0	0	0.0	0	0.0	8	5.9
	2–3 years	24	48.0	5	10.0	3	8.3	32	23.5
	5 years	0	0.0	30	60.0	28	77.8	58	42.6
	> 5 years	0	0.0	15	30.0	5	13.9	20	14.7
Duration lived in current accommodation/house	Less than 1 year	38	76.0	Not asked		7	19.4	45	52.3
	1–2 years	8	16.0			4	11.1	12	14.0
	2–3 years	4	8.0			0	0.0	4	4.7
	3–5 years	0	0.0			13	36.1	13	15.1
	>5 years	0	0.0			12	33.3	12	14.0

Continued

Table 1 Continued

		Colombia	Yemen	Uganda	Total			
Number of rooms (bedroom/dining/kitchen)	<2	Not asked	14	28.0	29	80.6	43	50.0
	2–3		34	68.0	2	5.6	46	41.9
	≥4		2	4.0	5	13.9	7	8.1

IDPs, internally displaced persons.

Table 2 gives an overview of the most important findings from the three study sites.

DISCUSSION

This multicountry study looks at the intersection of migration and AMR and investigates access to affordable, quality antibiotics, utilisation patterns, as well as assesses the knowledge about AMR among forcibly displaced communities (refugees/IDPs/migrants) in the three LMICs, Uganda, Yemen and Colombia. Our results indicate that forcibly displaced people face several barriers to healthcare including financial constraints in Colombia and Uganda, prescription requirements in Yemen and

Colombia, as well as unavailability of medicines in Uganda and Yemen. Furthermore, awareness about AMR was low across all three study sites, and the use of informal channels for obtaining medicines was common.

Inter-country variation in access to quality antimicrobials

Our study suggests that challenges in accessing quality antimicrobials are similar across all three study sites. The decision to buy an antibiotic/antimicrobial is mainly influenced by its price, followed by its quality. In Colombia and Uganda, the payment of antimicrobials was perceived as the most significant barrier to the participants. Other studies reported financial barriers as a common challenge for accessing medicines among refugee populations in different countries.⁴⁶

Yet, our study showed that there are some inter-country variations specific to the contextual problems of each country. In contrast to Colombia, participants in Uganda and Yemen ranked the unavailability of certain

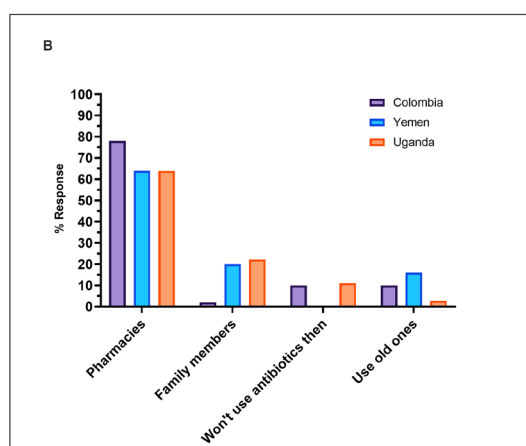
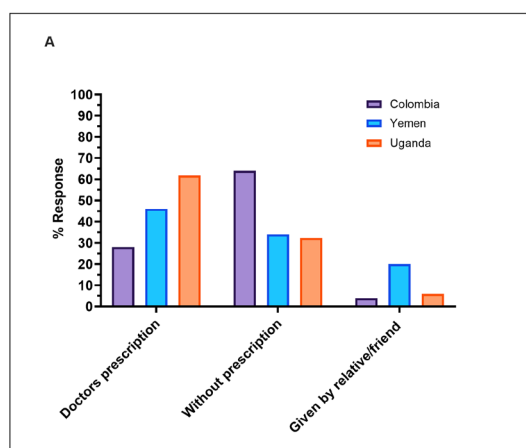


Figure 1 (A) Response distribution (in per cent) among participants how antibiotics are obtained, disaggregated by country; (B) Response distribution (in per cent) among participants obtaining antibiotics without a doctors prescription, disaggregated by country.

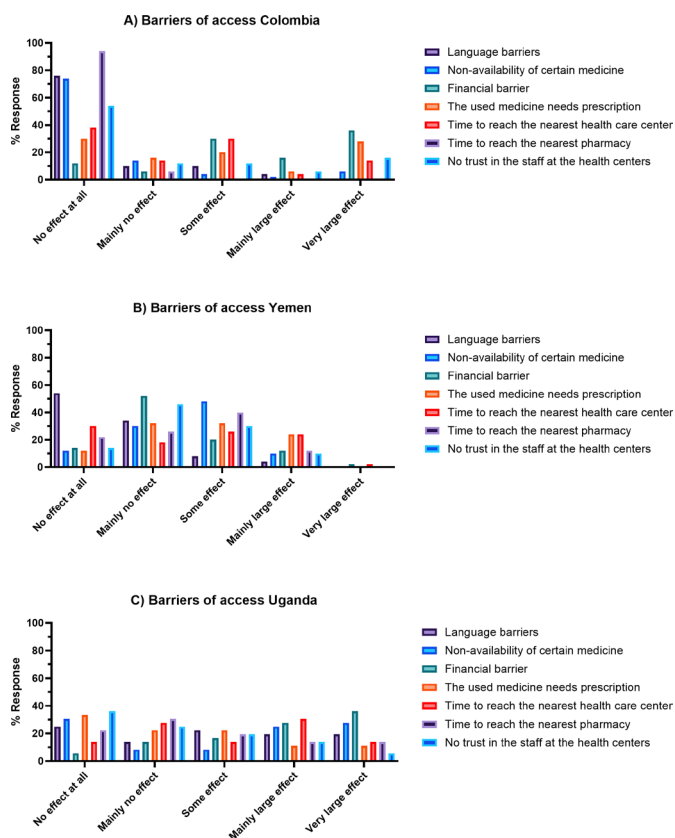


Figure 2 Response distribution to accessing medicine and healthcare is divided by effect.

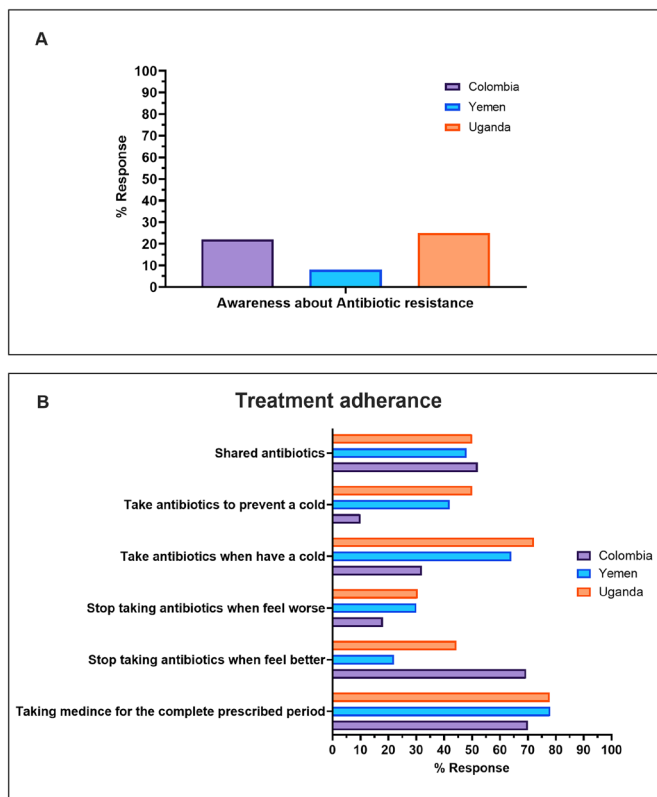


Figure 3 (A) Percentage of respondents among participants knowing what AMR is disaggregated by country. (B) Percentage of respondents among participants in agreement with each statement is disaggregated by country. AMR, antimicrobial resistance.

antimicrobials as one of their most influential barriers to access. (see figure 2). In Uganda, this is not a unique problem to the Kiryandongo district but has also been reported in other districts in the country. A study from 2021 showed that in a refugee settlement in the Yumbe District, on average, 32% of antibiotics were unavailable on a given day and were frequently out of stock at healthcare facilities.⁴⁷ Challenges in healthcare supply

chains like ineffective coordination and management, inadequate funding, and weak regulatory and governance structures at national and subnational levels have been reported as possible causes for this issue.⁴⁸ In Yemen, the non-availability of medicine comes as no surprise since the Yemeni healthcare system has been struggling due to the years-long, still ongoing civil war. Mohamed Ibrahim *et al* reported in their study from 2020 that only 52.8% of medicines investigated were available in public and private healthcare settings in three governate districts of the country.⁴⁹ Additionally, time to reach the nearest healthcare centre was identified as one of the biggest barriers of access in Yemen, confirming previous findings.⁵⁰ In 2021, the year our study took place, the International Committee of the Red Cross reported that an estimated 20 million people in Yemen lacked access to basic healthcare, with only 51.0% of health facilities across the country still functioning.⁵¹ To combat this issue, humanitarian NGOs such as the International Medical Corps have implemented mobile healthcare centres in order to provide for essential medical needs.⁵²

In Colombia and Yemen, participants reported that the necessity of prescription of antimicrobials was an influential barrier to access. Yet access to antibiotics/antimicrobials through informal pathways, like over-the-counter sales in pharmacies, remained high among our study participants. Inadequately equipped healthcare facilities (Uganda, Yemen), as well as legal difficulties in integrating into the public health insurance system (Colombia) combined with a knowledge gap about AMR among forcibly displaced people, could drive them to access antimicrobials outside of the regulated system. The prevalence of substandard or falsified antibiotics is especially seen to be common in LMICs.^{53 54} While substandard or falsified antibiotics are one of the driving factors of AMR,⁵⁵ their questionable safety and potential ineffectiveness might cause serious harms.⁵⁶ Therefore, it is crucial to consider the quality of antibiotics/antimicrobials available on the

Table 2 Summary of most important results

	Uganda	Yemen	Colombia
Top barriers of access	Financial barrier (Median score 4)	The used medicine needs prescription (Median score 3)	Financial barrier (Median score 4)
	Unavailability of certain medicine (Median score 4)	Unavailability of certain medicine (Median score 3)	Used medicine needs prescription (Median score 3)
	Time to reach the nearest healthcare centre (Median Score 3)	Time to reach the nearest healthcare centre (Median score 3)	Time to reach the nearest healthcare centre (Median score 2)
Obtaining antibiotics through informal pathways	13/34 (38.2%)	27/50 (54.0%)	34/50 (68.0%)
Awareness about AMR	9/36 (25.0%)	4/50 (8.0%)	11/50 (22.0%)

AMR, antimicrobial resistance.

market while discussing questions about their appropriate use.

Access to antibiotics through informal pathways

Although medicines regulations and policies are in place, there is a gap between policies and the actual situation on the ground. As shown above, informal pathways, such as pharmacies dispensing antibiotics/antimicrobials without prescription, played an important role in accessing healthcare across all three study sites. The importance of these access points must be recognised, and pharmacists should be better educated about AMR and antibiotic prescription patterns. Results of our study showed that the majority of migrants in Colombia, IDPs in Yemen and a half of the participants in Uganda paid for their medicine out of pocket. Ensuring that forcibly displaced populations receive essential medicines, such as antibiotics, free of charge and dispensing them at certified healthcare sites could have a positive effect in three ways: first, the quality of the dispensed medicine could be monitored. Second, the beneficiary population would interact with healthcare professionals directly. They could then monitor their health status and decide if a certain antibiotic is necessary and/or effective. And third, this could aid in building trust in the local healthcare systems and potentially lead to less utilisation of informal pathways. Of course, different country-specific contexts must be considered. As mentioned above, 'time to reach the nearest healthcare centre' was an influential challenge in Yemeni IDPs while less than half of Sudanese refugees in Uganda have ranked this factor to have a 'very large' or 'large' effect on accessing quality antimicrobials. Therefore, the proposed dispensaries would need to be easily accessible to have a positive impact. Possible solutions could be the installation of mobile health clinics in key locations like The United Nations Relief and Works Agency for Palestine Refugees in the Near East has done in parts of Yemen (as mentioned above) as well as in Syria and Palestine.⁵⁷ Although this was a well-received practice, there were concerns about the sustainability of this intervention.

Knowledge gap leads to misuse of antibiotics

Awareness about AMR was low across all study sites. This lack of knowledge manifests itself in treatment adherence patterns of said population, such as taking antibiotics to prevent a cold. Nowadays, it is known in the medical field that most colds and coughs are caused by viral infections, for which antibiotics show no effect. On the contrary, the overuse and abuse of antibiotics are drivers for antibiotic resistance.⁵⁸ Combatting the overuse of antibiotics was also adopted as one of the main objectives of the WHO Global Action Plan on Antimicrobial Resistance, which was released in 2015.⁵⁹

In Colombia, 68% of participants said that they stopped their course of treatment when they felt better. Other studies have shown similar results when surveying migrants. In Australia, almost 70% of participating

Chinese migrants said they would stop their course of treatment once they started feeling better.⁶⁰ Additionally, physicians in Germany and the Netherlands perceived treatment discontinuation due to 'feeling better' as a major challenge; they stated in interviews that migrant patients frequently discontinued antibiotic courses when they were free of symptoms.⁶¹ Although the scientific opinion about completing an antibiotic course for the whole period is slowly deviating and short-course antibiotics for common infections do not show inferior results,⁶² the problem with not completing a course might be the misuse of antibiotics by the patients afterwards. They are at risk of keeping the antibiotics and self-prescribing them when faced with a similar ailment⁵⁷ or sharing them with friends/family. Our study showed that sharing antibiotics with family members or friends was a common practice across all countries. One of the main objectives of the WHO Global Action Plan of 2015 is the improvement of 'awareness and understanding of AMR through effective communication, education and training'.⁵⁹ Targeted interventions are likely needed to improve AMR awareness and appropriate use of antibiotics among displaced populations.

A solution to this problem could be digital interventions, like mobile applications. In recent years, with the help of Artificial Intelligence, mobile applications have been developed to mainly support healthcare workers in regions lacking qualified personnel.⁶³ However, mobile applications targeting patients directly are scarce. They could not only inform patients about AMR and best practices of antibiotic use but could also guide them to the nearest qualified healthcare centre or get them in contact with a healthcare professional in proximity.

Strengths and limitations

This study has a number of strengths. First, our study covered different forced migration scenarios (internal displacement, cross-border forced migration) in three different continents. We were able to shed light on this topic in the South American context, which has been underrepresented in research. Second, our study has identified challenges and barriers that limit forcibly displaced populations from accessing quality-assured antibiotics/antimicrobials, laying the ground for further research into developing and implementing interventions. Third, our study assessed the knowledge of forcibly displaced persons about AMR and exposed potential misuse of antibiotics among this study group.

There are, however, several limitations. First, we used non-random sampling due to the lack of sample frames in the three countries. Two out of three study sites used non-probability (snowball) sampling. The use of this sampling method can lead to sampling biases which may affect representativeness of our results to the forcibly displaced populations in the three countries. The lack of sampling frames is a common challenge facing research studies in the context of forced migration and healthcare.⁶⁴ Second, not all questions of the questionnaire were answered

across the three study sites. For example, section C (trust in the healthcare system) was only answered in Colombia. As a result, comparative cross-sectional analysis was only possible for some parts of the questionnaire. Additionally, response rates to the open-ended questions were low and not answered across all three study sites. Therefore, we refrained from including the results in this manuscript. Third, the sample recruited for this study was rather small. This was related to the pilot nature of the study with limited time and resources, but also due to the challenges of conducting interviews during the COVID-19 pandemic. The COVID-19 pandemic and the subsequent social gathering limitations also forced us to enact three different sampling approaches in the three study sites.

CONCLUSION

By assessing behavioural, organisational and social barriers to access to quality antimicrobials, this study sheds some light on the situation of forcibly displaced people in three distinct settings. Affordability and accessibility of antimicrobials from regulated healthcare sites remain a challenge across the study countries. Furthermore, we identified antibiotic utilisation patterns of refugees and IDPs and found knowledge gaps regarding AMR, which may have led to antibiotic misuse among the study population, like using antibiotics to prevent or treat a cold. The use of informal pathways by refugees to access antibiotics/antimicrobials, such as over-the-counter sales in pharmacies, is of concern. Training pharmacists on drivers of AMR and (mis)use of antibiotics/antimicrobials could be a possible approach to improve the appropriate use of antibiotics/antimicrobials in these settings. Our study calls for interventions that take into account the complex and interlinked barriers to accessing antimicrobials in humanitarian settings. Yet, due to the small sample size and non-probability sampling of our study, larger-scale assessments should be performed to confirm these preliminary results.

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