Inappropriate use of antibiotics, its reasons and contributing factors among communities of Yirgalem town, Sidama regional state, Ethiopia: A cross-sectional study

Azmach Dache¹, Aregahegn Dona¹ and Amanuel Ejeso²

Abstract

Objectives: The aim of this study was to assess the inappropriate use of antibiotics, its reasons and contributing factors among communities of Yirgalem town, Sidama regional state, Ethiopia.

Methods: The study was conducted in Yirgalem town from 1 March to 30 March 2019. A cross-sectional study with interviewer administered structured and pretested questionnaire was used. A multistage sampling procedure was employed involving a total of 568 participants who used antibiotics in the past 1 year prior to the study period. Data were entered into Epi data version 3.1, and then exported to statistical package for social science version 20 for analysis. Descriptive statistics, bivariate and multivariate logistic regression analysis were done. \( p \)-value < 0.05 was used to consider significant variables.

Results: The magnitude of inappropriate use of antibiotics was 37.9% (95% confidence interval (34.0, 41.5)). Main reason(s) for inappropriate use were long delays in health facility, cost-cutting and busy day’s program. Being employed (adjusted odds ratio = 3.45, 95% confidence interval (1.98, 6.02)), age 25–34 years (adjusted odds ratio = 2.89, 95% confidence interval (1.43, 5.84)), being male (adjusted odds ratio = 1.90, 95% confidence interval (1.20, 3.02)), seeking modern healthcare in private clinic (adjusted odds ratio = 2.54, 95% confidence interval (1.20, 5.36)), delayed waiting time in healthcare facilities (adjusted odds ratio = 4.87, 95% confidence interval (2.17, 10.91)), experienced with similar symptom/disease (adjusted odds ratio = 3.02, 95% confidence interval (1.89, 4.83)) and family size above five (adjusted odds ratio = 8.92, 95% confidence interval (3.56, 22.38)) were predictors positively associated with inappropriate use of antibiotics.

Conclusion: The magnitude of inappropriate antibiotics use was high. Attention should be given to community education through involvement of the private health sector and healthcare providers about rational use of antibiotics.

Keywords

Inappropriate use, antibiotics, Ethiopia

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Background

Antibiotics and related drugs, as one called antimicrobial agents, have been used for the last 80 years to treat infectious disease. These drugs have greatly reduced illness and death from infectious disease.¹ Development and improvement in health systems the world has also lead to increase in accessibility and access to antimicrobials.¹ However, these drugs have been used so widely and for so long that the infectious organisms the antibiotics are designed to kill have adapted to them, making the drugs less effective.² Inappropriate use of antibiotics is a fairly widespread practice worldwide, both high-income and low-income nations.³ Significant use of antibiotics the pattern 80 years, both appropriate and inappropriate, has led to increase incidence and spread of bacteria that are resistant to antibiotics.⁴ The emergence of antimicrobial resistance (AMR), the main cause of morbidity and mortality from previously treatable infections, is mainly attributed to the use, over use or misuse of antimicrobials.²

¹Department of Social and Population Health, Yirgalem Hospital Medical College, Yirgalem, Ethiopia
²Department of Environmental Health, College of Medicine and Health Sciences, Hawassa University, Hawassa, Ethiopia

Corresponding author:
Azmach Dache, Department of Social and Population Health, Yirgalem Hospital Medical College, Yirgalem, Sidama 184, Ethiopia.
Email: dacheazm@gmail.com
In Africa, antibiotics are among the most commonly prescribed medicines and a survey on predictors of antibiotic use in five countries in Africa showed that 90% of individuals with acute illness sought care outside the home with 95% receiving medicines and 36% received antibiotics. Of the antibiotics received, cotrimoxazole, amoxicillin and metronidazole represented 75% of received antibiotics. Over 30% of individuals accessed antibiotics without prescription and one in four individuals obtained antibiotics from an informal dispenser.

In Ethiopia, access to healthcare services has improved in the past two decades. However, the reports of Ethiopian Drug Administration and Control Authority have shown an increased prescription of antibiotics in the country. However, there are insinuations of unreasonable use of antibiotics by the community, patients as well as by healthcare providers. As stated by the baseline survey conducted by food, medicine and healthcare administration and control authority of Ethiopia, about two-third of patients (70%) patients who visited outpatient clinics have had one or more antibiotics prescribed with a percentage of irrational prescribing close to 40%.

Inappropriate use of antibiotics can potentially lead to AMR and increase the necessity to use more expensive antibiotics to treat common and life-threatening infections. Annually, multi-drug resistant bacteria are estimated to claim the lives of more than 20,000 patients in North America, 25,000 patients in Europe and more than 90,000 patients in Southern Asia.

Antibiotics are considered among the most usually sold drug classes in the low-income countries. The most common sources of antibiotics in low-income countries were pharmacy (57%) and family member or neighbor. Investigations found that inappropriate use of antibiotics was associated with different factors: sex, engaged with a regular job, and satisfaction with healthcare services. Thus, to draw effective intervention requires exploration of factor associated with inappropriate antibiotic use in the community.

Abuse of antibiotics may lead to a wrong choice of medication. Unlike other aspects of self-care, it involves the use of drugs, which is having of doing good as well as suffering harm. Numerous studies reveal that there are risks, such as drug resistance, misdiagnosis, below or over dose of drugs, use of expired drugs, drug interactions, prolonged duration of use and poly-pharmacy risk associated with improper use of non-prescribed medicine medications.

Ethiopia has been implementing many interventions in order to tackle the problem, such as responsible use of antimicrobials, disease prevention and control, public surveillance proposing for antimicrobials use, guideline and enforcement were ongoing interventions. However, the extent of inappropriate use of antibiotics and the recent data were scarce in Sidama region, Ethiopia, particular in study area. Therefore, the aim of this study was to assess the magnitude of inappropriate use of antibiotics, its reasons and contributing factors among communities of Yirgalem town, Sidama region, Ethiopia.

**Methods**

**Study area and period**

Yirgalem town is one of the urban settings in Sidama regional state, Ethiopia, which found at 322 km and 47 km apart from Hawassa and Addis Ababa City, respectively. It has two sub-cities, Arada and Fillewuha. The Yirgalem town has 6 kebeles with a total population of 79,506 of 9218 households in the town. The town has 1 health center, 12 community pharmacies, 6 medium clinics, 1 Family Guidance Association of Ethiopia (FGAE) clinic and 6 health posts with 10 health extension workers. The study was conducted from 1 March to 30 March 2019.

**Study design and sample size determination**

A community-based cross-sectional study was conducted. The sample size was determined using single population proportion formula making an allowance for the following assumptions: 95% confidence level, proportion of 0.359, margin of error 5%, design effect 2 and estimated non-response rate of 10%. Accordingly, total sample size calculated was 582.

**Sampling procedure and study population**

A multistage sampling procedure was used to classify study subjects. Four kebeles (smallest administrative units of Ethiopia) were by randomly selected from six kebeles in the town. After that, the number of households to be selected from every selected kebele proportionally allocated based on the total number of households in the kebele. List of households was obtained from each kebele health post. Sampling frame was developed for each chosen kebele independently based on result of census. Then, calculated sample size was proportionally allocated to all selected kebeles based on its overall number of eligible households as well as finally study subjects were selected using simple random sampling procedure. Designed for every kebele, successive door-to-door interview was used to find appropriate study participant until the requested sample size was achieved. For fear that when there were two or extra eligible households, chance method was applied to select one of them. Source Population was all those over 18 years old with history of antibiotics use in the last 1 year, in Yirgalem town, Southern Ethiopia. Randomly selected individuals who satisfied inclusion criteria were considered as Study Population. The individuals whose ages over 18 years and had history of antibiotics use in last 1 year were included in the study as study participants and reside at least for 6 months in the selected kebeles have been included.
Data collection tool and procedure

Prepared questionnaire modified from related literatures was used once some modification to construct it consistent with the objective of the study and conceptual framework. Data were collected using interviewer administered a structured and pretested questionnaire with the purpose of containing socio-demographic, personal and health service-related factors, of the study subjects. Data were collected by four data collectors who have diploma in pharmacy technician and had previous experience of data collection. One BSc nurse was recruited as supervisor. To guarantee data quality, properly designed data collection tool was developed in English after revising related literatures and translated in to local language (Sidaamu Afoo) and back to English by language experts to check its consistency. Four data collectors and one supervisor who can read and speak local language fluently were trained for 2 days by principal investigator before starting actual data collection. Training was given on general objective of the study, contents of the tool, how to approach the study participants and keep their confidentiality. Before starting actual data collection, the tool was pretested on 5% (29 individuals) of the sample in Aleta wendo kebele which was out of the selected kebeles. Collected data were checked for completeness and consistency by supervisors and principal investigator at the end of each day. To ease non-response rate, appropriate time was used to for frequent visits when the respondents were unavailable. Double data entry was applied to minimize data entry error. Dependent variable was inappropriate use of antibiotics and independent variables were socio-demographic, personal and health service-related factors.

Data analysis

After carrying out data collection, the data were cleaned, coded and entered into Epidata version 3.1. Exported to Statistical Package for Social Science (SPSS) version 20 and checked for missing values before analysis. Descriptive analysis was completed for all predictor variables. Cross tabulation was also performed to see the distribution of different variables in relation to outcome variable. Multicollinearity among independent variables was checked. The goodness-of-fit of the model was also checked by the Hosmer–Lemeshow goodness of model fit. Bivariate analysis was done for all independent variables with outcome variable and variables that were associated with outcome variable at p-value ≤ 0.25 were considered as candidates for multivariate logistic regression and finally entered into multivariate logistic regression model to control possible confounders and get final model. Backward stepwise logistic regression was used to classify variables which had the major contribution to the model. Adjusted odds ratio (AOR) with 95% confidence interval (CI) was calculated to determine the presence and strength of association among predictors and outcome variables. p-value < 0.05 was used to consider significant variables. Outcome was described by texts, tables and figures.

Operational definition

Inappropriate use of antibiotics: it is defined as the use of antibiotics for self-medication and/or medication of family members (family medication) without prescription from health professionals, receiving antibiotics from anybody else and/or use of leftover drugs and/or use of prescribed antibiotics for any purpose other than prescribed for.

Without prescription use of antibiotics: it is based inappropriate antimicrobial use for treatment of common infections without consulting a medical practitioner and any medical supervision would be considered as use of antibiotics without prescription.

Waiting time: the length of time from when the patient entered the outpatient clinic/department to the time the patient actually leaves the outpatient department (OPD) (fast=less than 1 h, moderate=1–2 h and delayed=more than 2 h) was considered as long waiting time.

Results

Socio-demographic and economic factors

From five hundred eighty-two study participants planned for interview, about 568 respondents were interviewed making a response rate of 97.5%. The mean (standard deviation) age of participants and the mean (standard deviation) of family size were (34.07 ± 10.69) years and 3.8 (± 1.46) size, respectively. Over half of the respondents were females 315 (55.5%), protestant followers 340 (59.8%), attended secondary education 184 (32.4%), married 353 (61.1%) and majority 348 (61.3) of the respondents were from Sidama ethnicity group (Table 1).

Place of receiving modern healthcare services and types of antibiotics used

Majority of respondents, 455 (80.2%) reported that they got healthcare service from public health facility and 62 (10.9%) from private clinic. The mean (standard deviation) waiting time of participants at OPD was 90.80 ± 48.75 min. Amoxicillin 115 (53.4%) was the most commonly utilized antibiotics followed by metronidazole 64 (29.8%) and doxycycline 12 (5.6%). Respondents who reported having taken antibiotics were then asked if they had obtained them (or a prescription for them) from a doctor or nurse on the occasion
when they last received them. Overall, the vast majority of respondents 353 (62.1%) reported that they got their antibiotics (or a prescription for them) from a doctor or nurse. Also the majority of respondents got advice from a doctor, nurse or pharmacist 353 (62.1%) on how to take treatments (Table 2).

### Reasons for inappropriate antibiotics use about study participants and where people obtained the antibiotics

Almost all respondents obtained the antibiotics they last took from a medical stall or pharmacy (92.8%) and main reason(s) for indulging in self-medication with antibiotics long delays in health facility 99 (46.1%), cost-cutting 13 (6%), busy day’s program 90 (41.8%) and previous experience of medical treatment of the same symptoms 13 (6%). The majority of respondents somebody advised 63 (29.4%) about self-medication and proposed by neighbor 25 (39.7). More than half 295 (51.9%) of the respondents were experienced with similar symptom in the past 1 year (Table 3).

### Common complaints of respondents they had antibiotics utilized

Cough/common cold 218 (38.4%), fever 192 (33.8%) and acute diarrhea 74 (13.0%) were the three most common disease conditions for which antibiotics had been taken (Figure 1).

### Status of study participants about what they did consider when selecting antibiotics and when to stop taking antibiotics

Respondents were then asked what they did consider when selecting antibiotics: the majority of respondents responded that price of antibiotics (40.9%) and how they knew the

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### Table 1. Socio-demographic characteristics of the respondents, Yirgalem town, Sidama regional state, Ethiopia, 2019.

| Variables and categories | Frequency | Percentage |
|--------------------------|-----------|------------|
| (N = 568)                |           |            |
| **Age in years**         |           |            |
| 18–24                    | 103       | 18.0       |
| 25–34                    | 227       | 40.0       |
| 35–44                    | 119       | 21.0       |
| Above 44                 | 119       | 21.0       |
| **Sex**                  |           |            |
| Male                     | 253       | 44.5       |
| Female                   | 315       | 55.5       |
| **Marital status**       |           |            |
| Single                   | 182       | 32.1       |
| Married                  | 353       | 62.1       |
| Others\(^a\)             | 33        | 5.8        |
| **Religion status**      |           |            |
| Protestant               | 340       | 59.8       |
| Muslim                   | 155       | 27.3       |
| Orthodox                 | 73        | 12.9       |
| **Educational status**   |           |            |
| Unable to read and write | 8         | 1.5        |
| Able to read and write   | 61        | 10.7       |
| Primary education        | 179       | 31.5       |
| Secondary education      | 184       | 32.4       |
| Tertiary education       | 136       | 23.9       |
| **Ethnicity**            |           |            |
| Sidama                   | 348       | 61.3       |
| Oromo                    | 62        | 10.9       |
| Amhara                   | 78        | 13.7       |
| Gurage                   | 67        | 11.8       |
| Others\(^b\)             | 13        | 2.3        |
| **Occupation**           |           |            |
| Unemployed               | 186       | 32.7       |
| Employed                 | 382       | 67.3       |
| **Family size**          |           |            |
| 1–2 families             | 87        | 15.3       |
| 3–5 families             | 389       | 68.5       |
| >5 families              | 92        | 16.2       |

\(^a\)Divorced and separated.  
\(^b\)Silte and Wolaita.
dosage was enquired from the seller (85.1%). More than two-third (42.2%) of the respondents reported that they sometimes change the dosage of antibiotics deliberately and they change the dosage of antibiotics for improving conditions (23%).

Respondents were then asked when they thought they should stop taking antibiotics once they had begun treatment: when they feel better, or when they have taken all the antibiotics as directed. The majority of respondents answered that they should be taken as directed (47.8%). Most of respondents 168 (78.2%) somewhat concerned that might have taken counterfeit antibiotics. Nearly one-fifth of the respondents 115 (20.2%) responded that they had discontinued the use of antibiotics once their symptoms disappeared. The majority of respondents 319 (56%) think about antibiotics for self healthcare responded that not acceptable practice.

**Magnitude of inappropriate use of antibiotics**

Regarding characteristics of the respondents related to inappropriate use of antibiotics, about 215 (37.9%) of the total study participants have used inappropriate antibiotics.

**Factors associated with inappropriate antibiotics use**

In bivariate analysis, age, sex, marital status, family size, employment status, place of healthcare service, waiting time at health facility and experienced with similar symptom (disease) were associated with inappropriate antibiotics use. In multivariate logistic regression analysis, age, sex, family size, employment status, place of healthcare service, waiting time at health facility and experienced with similar symptom (disease) were significantly associated with inappropriate antibiotics use (Table 4).

Concerning of socio-demographic, respondents who found in the age group of 25–34 years were 2.89 times ((AOR) = 2.89, 95% CI (1.43, 5.84)) more likely use inappropriate antibiotics than respondents those in the age group of 18–24 years. Respondents those who being male were 1.90 times (AOR = 1.90, 95% CI (1.20, 3.02)) more likely use inappropriate antibiotics than respondents those

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**Table 3. Antibiotics use characteristics of respondents and where people obtained the antibiotics Yirgalem town, Sidama regional state, Ethiopia, 2019.**

| Variables (N=568) | Frequency | Percentage |
|-------------------|-----------|------------|
| **Source of the antibiotics** |           |            |
| Medical store or pharmacy | 527 | 92.8 |
| Stall or hawker | 24 | 4.2 |
| Friend or family member | 10 | 1.8 |
| Saved up from a previous time | 7 | 1.2 |
| **Advised by somebody to use self-medication** | | |
| Yes | 63 | 29.4 |
| No | 152 | 70.6 |
| **Advice about self-medication from:** | | |
| A relative | 17 | 27.0 |
| Colleague | 21 | 33.3 |
| Neighbor | 25 | 39.7 |
| **Ever experienced similar disease/symptoms** | | |
| Yes | 295 | 51.9 |
| No | 273 | 48.1 |
| **Main reason(s) for self-medication** | | |
| Long delays in health facility | 99 | 46.1 |
| Cost-cutting | 13 | 6 |
| Busy day’s program | 90 | 41.8 |
| Previous experience of the same symptoms | 13 | 6 |

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**Figure 1.** Common complaints of respondents for which antibiotics had been taken in community of Yirgalem town, Sidama regional state, Ethiopia, 2019.
who being female. Respondents those who being employed were 3.45 times (AOR = 3.45, 95% CI (1.98, 6.02)) more likely use inappropriate antibiotics than respondents those who being unemployed. Respondents those who have got healthcare services from private clinic were 2.54 times (AOR = 2.54, 95% CI (1.20, 5.36)) more likely to practice inappropriate use of antibiotics than those who have got healthcare service from public health institute. Respondents those who have family size above five were 8.92 times (AOR = 8.92, 95% CI (3.56, 22.38)) more likely to practiced inappropriate use of antibiotics than those who have had family size 1–2. Furthermore, those who have experienced with similar symptom/disease were 3.02 times (AOR = 3.02, 95% CI (1.89, 4.83)) more likely to practiced inappropriate use of antibiotics than those who were not experienced with similar symptom/disease. Respondents those who have reported waiting time at OPD above 2 h were 4.87 times (AOR = 4.87, 95% CI (2.17–10.91)) more likely use inappropriate antibiotics than those with reported waiting time at OPD time less than 1 h.

### Discussion

Inappropriate use of antibiotics was worse in many low-income countries including Ethiopia. The growing of AMR is the main cause of morbidity and mortality from previously treatable infections. This study has attempted to identify the magnitude of inappropriate use of antibiotics and associated factors among communities of Yirgalem town, in Sidama region, Ethiopia. Accordingly, the magnitude of inappropriate use of antibiotics in the past 1 year was to be found 37.9% (95% CI (34.0, 41.5)). This finding is consistent with similar

### Table 4

| Variables | Inappropriate | Crude OR (95% CI) | Adjusted OR (95% CI) |
|-----------|---------------|-------------------|----------------------|
| Age groups in years | | | |
| 18–24 | 18 | 85 | 1 | 1 |
| 25–34 | 120 | 107 | 5.29 (2.99–9.37) | 2.89 (1.43, 5.84)* |
| 35–44 | 64 | 55 | 5.49 (2.94–10.24) | 1.97 (0.84, 4.61) |
| Above 44 | 13 | 106 | 0.57 (0.26–1.24) | 0.20 (0.07, 1.55) |
| Sex | | | |
| Female | 82 | 233 | 1 | 1 |
| Male | 133 | 120 | 3.14 (2.21–4.48) | 1.90 (1.20, 3.02)* |
| Marital status | | | |
| Single | 60 | 122 | 1 | 1 |
| Married | 150 | 203 | 1.50 (1.03–2.18) | 1.60 (0.90, 2.84) |
| Others | 5 | 28 | 0.36 (0.13–0.98) | 1.23 (0.36, 4.24) |
| Occupation status | | | |
| Unemployed | 29 | 157 | 1 | 1 |
| Employed | 186 | 196 | 5.13 (3.29–8.01) | 3.45 (1.98, 6.02)** |
| Family size | | | |
| 1–2 families | 10 | 77 | 1 | 1 |
| 3–5 families | 155 | 234 | 5.10 (2.56–10.16) | 4.87 (0.86, 10.91) |
| >5 families | 50 | 42 | 9.16 (4.21–19.9) | 8.92 (3.56, 22.38)** |
| Waiting time at outpatient department | | | |
| <1 h | 25 | 87 | 1 | 1 |
| 1–2 h | 144 | 231 | 2.16 (1.32–3.54) | 2.34 (0.76, 4.41) |
| >2 h | 46 | 35 | 4.57 (2.44–8.54) | 4.87 (2.17, 10.91)** |
| Place of healthcare use | | | |
| Public health institute | 147 | 308 | 1 | 1 |
| Private pharmacy | 5 | 8 | 1.31 (0.42–4.07) | 1.39 (0.35, 5.42) |
| Private clinics | 38 | 24 | 3.31 (1.91–5.73) | 2.54 (1.20, 5.36)* |
| NGO | 25 | 13 | 4.02 (2.00–8.10) | 2.08 (0.82, 5.24) |
| Experienced with similar symptom | | | |
| No | 59 | 214 | 1 | 1 |
| Yes | 156 | 139 | 4.07 (2.81–5.88) | 3.02 (1.89, 4.83)* |

OR: odds ratio; NGO: non-governmental organization; CI: confidence interval.

*p < 0.05; **p < 0.01.
studies done in Ethiopia and Cameroon. However, this finding was higher than the findings of similar studies previously done in Ethiopia. This difference might be due to improvement in health service delivery, difference in study period as well as socio-economic status of the study participants. However, this finding found to be lower when compared with study done in Jordan, Northern Uganda, Tanzania and Kenya. This difference could be due to in this study context, the majority of study participants received healthcare service from public health facility; this makes them to practice appropriate antibiotics.

This study revealed that individuals who have middle age groups were 2.89 times (AOR = 2.89, 95% CI (1.43, 5.84)) more likely use inappropriate antibiotics than the older age groups. Studies done elsewhere indicated that the youngest age groups were higher users of antibiotics inappropriately than the older age groups which are similar with the result of this study. This age-related difference in inappropriate use of antibiotics may be due to the extent of experience acquired in living within the community. The other possible reason is that the youth is especially exposed to the media and the increased advertising of pharmaceuticals which poses a larger threat to the young population.

Employed respondents were 3.45 times (AOR = 3.45, 95% CI (1.98, 6.02)) more likely use inappropriate antibiotics than respondents those who being unemployed, in this study, which is similar to other studies. The possible explanation could be due to lack of time to visit healthcare facilities during working hours, which may enforce to obtain antibiotics without prescription. The other possible reason could be having pocket money that might encourage them to buy antibiotics when they perceive sign and symptoms of health problems.

Individual male were 1.90 times (AOR = 1.90, 95% CI (1.20, 3.02)) more likely use inappropriate antibiotics than respondents those who being female, which is similar to other studies. This finding is contrary to other studies done in Egypt and in Tanzania. This difference may be due to in this study context, males have a better health seeking behavior compared to females. Also this can be attributed to the fact that males are more private to health needs than females.

In this study, those respondents who previously received healthcare services from private clinic were 2.54 times (AOR = 2.54, 95% CI (1.20, 5.36)) more likely to practice inappropriate antibiotics compared to those who received healthcare from public health facilities. This finding is in line with study conducted in Central zone of Tigray, Northern Ethiopia. The above finding might be related with longer waiting time in health facilities effect on perception of respondents for consulting physicians for every health complaints.

In this study, perceived delayed waiting time in healthcare facilities was 4.87 times (AOR = 4.87, 95% CI (2.17–10.91)) documented as a risk factor for practicing of inappropriate antibiotics use compared to perceived fast waiting time. Even though less literature available on the relationship between treatment-seeking behavior and self-medication or self-care in the populations of developing countries.

In this study, experienced with similar symptom/disease were 3.02 times (AOR = 3.02, 95% CI (1.89, 4.83)) more likely practiced inappropriate antibiotic compared to none experienced with similar symptom/disease. Studies in Wuhan in China and Jimma zone in South West Ethiopia revealed that reasons for self-medication were previous experience with similar symptom. The possible explanation could be due to communities’ past experience and expectations level appeared to influence non-prescription medication practices.

In this study, family size with above five was 8.92 times (AOR = 8.92, 95% CI (3.56, 22.38)) more likely practiced inappropriate antibiotic compared to family size 1–2. This was contrary to a study which had no a significant association with inappropriate antibiotics use in Ethiopia. The possible explanation could be due to economic status of family makes them to practice inappropriate antibiotics.

**Limitation**

The limitation of this study was the use of a cross-sectional design could not able to establish cause and effect relationship between factors and outcome variable. In addition, the study design could not examine the change of inappropriate use of antibiotics in the communities over time. The identification of the actual antibiotic taken may not have been accurately recalled. Respondents recall bias may a problem for participants to memorize events in responding for questions like for which complaints antibiotics had been taken.

**Conclusion**

The magnitude of inappropriate antibiotics was found to be high in the study area. The factors associated with inappropriate antibiotics use were age, male sex, employed, receiving healthcare services from private clinic, family size, waiting time in healthcare facilities and previous experienced with similar symptom. Public healthcare providers should shorten the waiting time during service for those patients who visit the OPD in order to leave the OPD within standard hour. Private clinics should advise not to dispense antibiotics over the counter, and health education on risk of inappropriate antibiotics. Health education should be given for those employers busy by day programs. In Yirgalem town, Health Office should encourage interventions like proper licensing and reducing access in obtaining antibiotics without prescription. Community pharmacies to ensure no antibiotics are sold over the counter without prescription. Health education interventions on inappropriate antibiotics practices should target people of all communities at large.
For further research, more research is required to be done to establish prevalence for inappropriate antibiotics use among children less than 18 years and to assess public knowledge and perception on self-medication with antibiotics.

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Author contributions
Az.D. involved in conception, designing, analyzing the data, interpreting the result and preparing the article. Ar.D. and A.E. participated in preparation and critically revised the manuscript. All authors read and approved the final manuscript.

Declaration of conflicting interests
The author(s) declared no potential conflicts of interest with respect to the research, authorship and/or publication of this article.

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Informed consent
Verbal informed consent was obtained from all subjects before the study and this method of obtaining informed consent was approved by our Institutional Review Board/Ethics Committee and reason for obtained verbal consent from participants was a literacy problem.

ORCID iDs
Azmach Dache https://orcid.org/0000-0002-5961-6905
Aregahegn Dona https://orcid.org/0000-0001-5418-6662

Availability of data and materials
The finding of this study is generated from the data collected and analyzed based on stated methods and materials. The original data supporting this finding are available from the corresponding author on reasonable request.

Supplemental material
Supplemental material for this article is available online.

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