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Research Article

Knowledge, Perceptions, and Practices of Community Pharmacy Professionals Regarding Antimicrobial Resistance Stewardship in Dessie Town: Mixed Method

Solomon Ahmed Mohammed*, Abebe Getie Faris, Abel Andualem, Bedlu Linger, Segenet Zewdie, Yeshambel Asmare and Kassahun Bogale

Department of Pharmacy, Wollo University, Ethiopia

**Address Correspondence to Solomon Ahmed Mohammed, ahmedsolomon21@gmail.com*

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Abstract

Background: The increased drug resistant bacterium leads to an upsurge in morbidity and mortality from bacterial infections. Antimicrobial resistance is a threat to public health. This study assessed the knowledge, perception, and practice of antimicrobial resistance stewardship (AMS) among community pharmacy professionals in Dessie town.

Methods: A community based explanatory sequential mixed method was employed from 03/06/2021 to 03/07/2021. The quantitative method employed a community based cross sectional study design and all registered professionals were included. Statistical package for social sciences version 20 used for descriptive and inferential statistics. Then, a phenomenological study design was for a qualitative study and content analysis was performed.

Result: More than half (67 (54.9%): 95% CI (47.6%-63%)), (72 (59%): 95% CI (50.9%-68%)), and (70 (57.4%): 95% CI (49.2%-64.8%)) of community pharmacy professionals had good knowledge, perception and practice on AMS respectively. Being males (AOR: 2.72, 95% CI (1.20-6.18)) and monthly income less than 5000 birrs (AOR: 0.21, 95% CI (0.05-0.88)) was associated with knowledge on AMS. Perception of AMS was associated with males (AOR: 2.36, 95% CI (1.04-5.34)). The practice of AMS was associated with male (AOR: 4.09, 95% CI (1.64-10.17)), degree educational level (AOR: 4.09, 95% CI (1.13-21.60)) and job experience less than one year (AOR: 14.75, 95% CI (1.52-142.98)). Key informants stated that inappropriate use of antibiotics resulted in depletion of normal flora and occurrence of a hypersensitivity reaction. Despite they did not participate in any AMS programs; the program must be practiced by all health professionals. They also stated the poor dispensing practice.

Conclusion: More than half of community pharmacy professionals had good knowledge, perception, and practice on AMS. Key informants had good knowledge and perception of AMS. However, they were not practicing rational use of antibiotics. Implementation of AMS programs in community pharmacies, interdisciplinary teamwork, and increased participation of pharmacy professionals in AMS awareness campaigns.

Keywords: Community pharmacist; Antibiotics; Antimicrobial resistance; Antimicrobial resistance stewardship

Abbreviations: Antimicrobial resistance stewardship (AMS); Adjusted Odds Ratio (AOR); Confidence Interval (CI); Crude Odds Ratio (COR); Interquartile Range (IQR)

Introduction

Antimicrobial agents have saved hundreds of millions of lives from infectious diseases. However, treatments are becoming ineffective against many infectious diseases due to the occurrence of antimicrobial resistant organisms [1]. Antimicrobial resistance is exacerbated by the inappro- priate use of antimicrobial agents [2,3]. According to the World Health Organization, antimicrobial resistant micro- organisms reduce the effectiveness of drugs and prolonged the duration of infection [4].

Despite antimicrobial resistance is a global public health problem, the issue worsens in Low and Middle Income Countries, as the incidence of infectious diseases is high compared to high income countries [4,5]. In Africa, antimicrobial resistance has already been documented to the pathogens that cause malaria, tuberculosis, typhoid, cholera, meningitis, gonorrhea, and dysentery [1]. Resistance was also observed in Ethiopia to most of the antibiotics mainly, penicillin G and cotrimoxazole, which are used to treat gram positive bacteria. Resistance is also documented to ampicillin, tetracycline, and cotrimoxazole which are used for gram negative bacterial infections [6].

Antimicrobial resistance has led to an increase in morbidity and mortality rates [2,3]. The problem is multifaceted as it encompasses medical, social, and anthropogenic spheres [7]. Moreover, antibiotic resistant infectious diseases lead to an increase in healthcare costs for hospitalizations, urges additional diagnostic investigations, and treatments [8,9]. The rising infection rates with resistance add to the costs of health care and compromise the quality of medical and surgical procedures provided [10]. The cost is catastrophic as it includes patients, healthcare providers, researchers, pharmaceutical organizations, healthcare businesses and, all policy makers [7].

Antimicrobial agents play a critical role in reducing the morbidity and mortality infections occurred due to communicable diseases. However, the emergence and spread of resistance to many of these agents hinder their effectiveness [11]. Antimicrobial resistance stewardship (AMS) is an application that promotes the correct use of antimicrobials, improves patient outcomes, inhibits microbial resistance, and decreases infections diffusion caused by multidrug resistant organisms [12,13]. An effective AMS program can reduce the irrational use of antimicrobials, and hence shorten the duration of hospitalization, reduce resistant infection rate, and cost of treatment [14].

To facilitate these coordinated interventions of AMS, all healthcare providers are encouraged to hold the responsibility of AMS in practice areas [15]. However, community pharmacists are the key healthcare providers for AMS programs due to their extended role in dispensing antimicrobials [16]. Being active members of the health care system, pharmacists should have leading roles in AMS to protect patients from developing resistance against antimicrobials and to establish a good health care system [5].

Globally, community pharmacists are in well placed positions to execute medication related to stewardship and medicine management [3]. They play an integral role in AMS programs in community settings as pharmacists are providing value added services beyond their traditional dispensing duties and being the most frequently seen health care professional and serves as the first point of contact for the majority of infections which leads to inappropriate use of antibiotics. Moreover, community pharmacists are offering services being liaised between patients and various service providers [5]. Few studies regarding the practice, knowledge, and perceptions of community pharmacists in AMS were done elsewhere in the globe but there is a scarcity of data in Ethiopia. The present study aimed to assess the knowledge, perception, and practices of community pharmacists towards AMS in Dessie town, Ethiopia.

Methodology

Study area and period

An explanatory sequential mixed method was used. A cross sectional study and phenomenological study design were employed to assess knowledge, perceptions, and practices of antimicrobial stewardship among community pharmacists at Dessie town.

Population

All pharmacy professionals working in community pharmacies of Dessie town during the study period were the source population while registered pharmacy professionals working in community pharmacies of Dessie town during the study period and who fulfilled the inclusion criteria were the study population.

Inclusion and exclusion criteria

Pharmacy professionals working in community pharmacies of Dessie town who were willing to participate in the study were included. Unregistered pharmacy professionals working in community pharmacies of Dessie town, pharmacy professionals working as a part timer and will not consent were excluded from the study.

Sample size determination and sampling technique

To have a maximum sample size, all registered pharmacy professionals working in community pharmacies of Dessie town were included. The saturation of information concerning emerging themes on antibiotics stewardship determined the sample size for the phenomenological study. Accordingly, 8 key informants were included. Key informants were selected purposively by the town drug regulatory.

Study variables

The dependent variables were knowledge, perceptions, and practice of pharmacy professionals on antibiotics stewardship, and independent variables were socio demographic characteristics of pharmacy professionals.

Data collection procedure and quality assurance

The data collection instrument [17,18] was pretested in 5% of the sample size at community pharmacies located in Kombolcha town. The principal component analysis was run to clean data. Knowledge, perceptions, and practice of pharmacy professionals on antimicrobial stewardship were assessed using a total of 7, 8, and 11 questions, respectively. Cronbach's alpha test was used to check the reliability of the questionnaire and a value of 80.5% was obtained. Four pharmacists who had no working relation to the community pharmacies used a self-administered questionnaire to collect the data under the supervision of the principal investigators. Data was immediately checked for completeness, accuracy, and consistency after collection and kept in a secured place for compilation and analysis.

The semi-structured interview guide was used for the phenomenological study. Initially, the instrument was prepared in English and then translated to Amharic, and finally back translated into the English language. The in depth interview was done by principal investigators for 7 minute-20 minutes. The interview was done in Amharic and all interviews were audio recorded. The researchers also separated themselves from the text by their understanding in a reflective way and transcribed verbatim. The principal investigators undertook the phenomenological study with an awareness of insider bias and professional relativity. They were also practiced non-judgment.

Data processing and analysis: Statistical Package for Social Sciences version 20 was used for data entry and analysis. After bivariate logistic regression analyses, variables with a $P<.25$ were entered into the multivariate logistic regression and variables with a $p<0.05$ were taken as statistically significant. A 5 point Likert scale was employed to measure the knowledge, perceptions, and practice of pharmacy professionals on antimicrobial stewardship. On the scale, the scoring for knowledge and perceptions was 1 for strongly disagree, 2 for disagree, 3 for neutral, 4 for agree, and 5 for strongly agree. For practice questions, a score of 1 for never, 2 for rarely, 3 for occasionally, 4 for often, and 5 for

always was given. Reverse coding was done for negatively worded statements. The result was presented in the median, interquartile range, and percentage. The overall scoring was done based on the mean score. The level of knowledge, perceptions, and practice of pharmacy professionals on antimicrobial stewardship was dichotomized as "good or poor" based on the mean score.

The original transcripts were translated into English. The transcripts were coded line by line. The content analysis principle was employed manually and all transcripts were read several times to obtain their overall feelings. The presentation of qualitative findings was based on narrative strategy and key informants' level of education, sex, and work experience were used to elucidate their verbatim portray.

Operational definitions

Good knowledge: pharmacy professionals who score greater than or equal to the mean score.

Poor knowledge: pharmacy professionals who score less than the mean score.

Good perception: pharmacy professionals who score greater than or equal to the mean score.

Poor perception: pharmacy professionals who score less than the mean score.

Good practice: pharmacy professionals who score greater than or equal to the mean score.

Poor practice: pharmacy professionals who score less than the mean score.

Results

Socio demographic characteristics

The response rate of the study was 95.31%. Among 122 community pharmacy professionals, 67 (54.9%) were in the aged group of 18 Years-29 years with a mean age of 30 years, 77 (63.1%) were male, and 62 (50.8%) of the community pharmacy professionals were single. Moreover, 57 (46.7%) of the community pharmacy professionals were at degree level, and 43 (35.2%) of the community pharmacy professionals had job job experience between one and four with a mean experience of 2.7 years (Table 1).

Table 1: Socio-demographic characteristics of community pharmacy professionals at Dessie town, 2021 (n=122).

Variables		Frequency	Percent
Sex	Male	77	63.1
	Female	45	36.9
Age of respondents	18-29	67	54.9
	30-39	44	36.1
	40-49	9	7.4
	>50	2	1.6
Marital status	Single	62	50.8
	Martial	59	48.4
	Divorced	1	.8
Educational level	Diploma	53	43.4
	Degree	57	46.7
	MSc	12	9.8
Monthly average income	<5000 birr	52	42.6
	5001-10000 birr	53	43.4
	>10000 birr	17	13.9
Job experience	<1 Years	12	9.8
	1-4 Years	43	35.2
	5-9 Years	35	28.7
	>10 Years	32	26.2

Among 122 community pharmacy professionals, 42 (34.4%) of community pharmacy professionals strongly disagreed on the effectiveness of antibiotics against viral infections, 41 (38.5%) of community pharmacy professionals agreed that antibiotics are useful for bacterial infections, and 44 (36.1%) of community pharmacy professionals disagreed on antibiotics indication to reduce any kind of pain and inflammation. All 8 of key informants revealed that antibiotics are used to treat infections caused by microbes.

The key informant portrayed: "Antibiotics are used to treat all infections caused by microorganisms except a virus. Pain and inflammatory conditions improved upon taking antibiotics". (Pharmacist, Male, 8)

Table 2: Knowledge of community pharmacy professionals on AMS at Dessie town, 2021 (n=122).

variables	Strongly disagree	Disagree	Neutral	Agree	Strongly agree	Median / IQR
Effective against viral infections	42 (34.4%)	26 (21.3%)	6 (4.9%)	32 (26.2%)	16 (13.1%)	2 (1-4)
Useful for bacterial infections	12 (9.8%)	14 (11.5%)	21 (17.2%)	41 (38.5%)	28 (23%)	4 (3-4)
Indicated to reduce any kind of pain and inflammation.	26 (21.3%)	44 (36.1%)	12 (9.8%)	30 (24.6%)	10 (8.2%)	2 (2-4)
Kill "normal flora" present in our body.	15 (12.3%)	26 (21.3%)	14 (11.5%)	45 (36.9%)	22 (18%)	4 (2-4)
Cause secondary infections after killing normal flora present in ourbody.	12 (9.8%)	14 (11.5%)	29 (23.8%)	42 (34.4%)	25 (20.5%)	4 (3-4)

Can cause allergic reactions.	17 (13.9%)	17 (13.9%)	13 (10.7%)	36 (29.5%)	39 (32%)	4 (2-5)
Misuse of antibiotics can lead toa loss of sensitivity to a specificpathogen.	16 (13.1%)	18 (14.8%)	16 (13.1%)	40 (32.8%)	32 (26.2%)	4 (2-5)
If symptoms improve before the fullcourse of therapy is completed, you can stop taking it.	46 (37.7%)	28 (23%)	18 (14.8%)	18 (14.8%)	12 (9.8%)	2 (1-3)

45 (36.9%) of community pharmacy professionals agreed that antibiotics can kill "normal flora" present in our body, 42 (34.4%) of community pharmacy professionals agreed that antibiotics can cause secondary infections after killing normal flora, 39 (32%) community pharmacy professionals strongly agreed on antibiotics can cause allergic reactions, and 46 (37.7%) community pharmacy professionals disagreed stopping of taking a full course of antibiotic therapy before improvement of symptoms (Table 2). More than half (67 (54.9%): 95% confidence interval (CI) (47.6%-63%)) of community pharmacy professionals had good knowledge of AMS.

This finding was further substantiated by 36 years old female pharmacist: "Long term and higher dose use of antibiotics will reduce the level of normal flora in our body. Hence, the patient is more vulnerable to develop secondary infections". (Pharmacist, Female, 5)

Concerning the occurrence of hypersensitivity reactions, one of the key informants explained that: "The type of antibiotics and the genetics of patients determine the occurrence of allergy. Multiple uses of broad spectrum antibiotics increase the occurrence of a hypersensitivity reaction". (Druggist, Male, 6)

All key informants (8) mentioned that the patient should not stop the medications even if the symptoms disappear. It is substantiated by one of the key informants: "Even though the patient had symptomatic improvement, patients should take the full course of antibiotic therapy to eradicate microorganisms. Improper use of antibiotics will result in the reoccurrence of infection, an increase in the cost of therapy, and the emergence of antimicrobial resistance". (Pharmacist, Male, 10)

IQR: Interquartile range

47 (38.5%) of the community pharmacy professionals agreed that AMS programs can improve patient care, 54 (44.3%) of community pharmacy professionals agreed on AMS program incorporation at the community pharmacy level, and 53 (43.4%) of community pharmacy professionals agreed on the provision of adequate training on antimicrobial use to community pharmacists. Nearly one third (34.4%) of community pharmacy professionals strongly disagreed on prescribing physicians are the only professionals who need to understand antimicrobial stewardship (Table 3). More than half (72 (59%): 95% CI (50.9%-68%)) of community pharmacy professionals had a good perception of AMS.

Table 3: Perception of community pharmacy professionals towards AMS at Dessie town, 2021 (n=122).

Variable	Strongly disagree	Disagree	Neutral	Agree	Strongly agree	Median /IQR
AMS programs improve patient care	10 (8.2%)	11 (9.0%)	26 (21.3%)	47 (38.5%)	28 (23%)	4 (3-4)
AMS should be incorporated at the community-pharmacy level.	7 (5.7%)	19 (15.6%)	22 (18%)	54 (44.3%)	20 (16.4%)	4 (3-4)
AMS programs reduce problems of antimicrobialresistance.	5 (4.1%)	19 (15.6%)	23 (18.9%)	44 (36.1%)	31 (25.4%)	4 (3-5)
Adequate training on antimicrobial use should beprovided to community pharmacists.	2 (1.6%)	13 (10.7%)	22 (18%)	53 (43.4%)	32 (26.2%)	4 (3-5)
Relevant conferences, workshops, and other educational activity are required to be attended bycommunity pharmacists to enhance understandingof antimicrobial stewardship.	7 (5.7%)	10 (8.2%)	23 (18.9%)	53 (43.4%)	29 (23.8%)	4 (3-4)
Individual efforts at antimicrobial stewardshiphave minimal impact on the antimicrobial- resistance problem	12 (9.8%)	20 (16.4%)	40 (32.8%)	40 (32.8%)	10 (8.2%)	3 (2-4)
I think that prescribing physicians are the only professionals who need to understandantimicrobial stewardship.	42 (34.4%)	28 (23%)	15 (12.3%)	24 (19.7%)	13 (10.7)	2 (1-4)
Pharmacists have a responsibility to take a prominent role in antimicrobial stewardship andinfection-control programs in the health system.	2 (2.5%)	16 (13.1%)	19 (15.6%)	42 (34.4%)	42 (34.4%)	4 (3-5)

For the promotion of appropriate use of drugs, AMS should be incorporated at the community pharmacy level. This was supported by one of the key informants: "AMS program improves rational use of antibiotics. Thus, the program must be practiced in all community pharmacies". (Pharmacist, Female, 4) The majority of key informants believed that AMS is the responsibility of all health care providers. Individual efforts in combating microbial resistance will not be continued. This was further substantiated by one of the key informants: "All health professionals have a role in AMS. However, pharmacy professionals should play pivotal role prevention of antimicrobial resistance. Individual efforts of pharmacists against antimicrobial resistance are not sustainable as professionals might be tired off. Teamwork is better to reduce antimicrobial resistance". (Pharmacist, Male, 7) (Table 4).

Table 4: Practices of community pharmacy professionals regarding AMS at Dessie town, 2021 (n=122)

Variables	Never	Rarely	Occasionally	Often	Always	Median / IQR
I dispense antimicrobial on prescription with complete clinicalinformation.	15 (12.3%)	16 (13.1%)	22 (18%)	42 (34.4%)	27 (22.1%)	4 (2-4)
I dispense antimicrobials without a prescription	35 (28.7%)	28 (23%)	27 (22.1%)	17 (13.9%)	15 (12.3%)	2 (1-4)
I dispense antimicrobials for durations longer than prescribed bythe physician on patient request.	41 (33.6%)	27 (22.1%)	24 (19.7%)	18 (14.8%)	12 (9.8%)	2 (1-3.25)
I screen antimicrobial prescriptionsin accordance with local guidelinesbefore dispensing	12 (9.8%)	23 (18.9%)	34 (27.9%)	30 (24.6%)	23 (18.9%)	3 (2-4)
I collaborate with other health professionals on infection controland antimicrobial stewardship	10 (8.2%)	17 (13.9%)	30 (24.6%)	46 (37.7%)	19 (15.6%)	4 (3-4)
I communicate with prescribers if I am unsure about the appropriatenessof an antibiotic prescription	10 (8.2%)	4 (3.3%)	35 (28.7%)	38 (31.1%)	35 (28.7%)	4 (3-5)
I have sought additional clinical information (eg, drug interaction, adverse drug reactions, and allergy)before deciding to dispense the antibiotic prescribed.	12 (9.8%)	18 (14.8%)	31 (25.4%)	37 (30.3%)	24 (19.7%)	3.5 (2.75-4)
I take part in antimicrobial-awareness campaigns to promote the optimal use of antimicrobials.	13 (10.7%)	16 (13.1%)	36 (29.5%)	43 (35.2%)	14 (11.5%)	3 (3-4)
I educate patients on the use of antimicrobials and resistance-relatedissues	10 (8.2%)	11 (9%)	37 (30.3%)	48 (39.3%)	16 (13.1%)	4 (3-4)
I make efforts to prevent or reduce the transmission of infections withinthe community	12 (9.8%)	17 (13.9%)	32 (26.2%)	46 (37.7%)	15 (12.3%)	3.5 (3-4)
I ask patients about their knowledge of prescribed antimicrobials and theirusage.	19 (15.6%)	16 (13.1%)	29 (23.8%)	38 (31.1%)	20 (16.4%)	3 (2-4)

Multivariate logistic regression analysis revealed that the knowledge of community pharmacy professionals on AMS was associated with sex and monthly income. Males had 2.72 times (AOR: 2.72, 95% CI (1.20-6.18)) good knowledge than females on AMS. Community pharmacy professionals with a monthly income of fewer than 5000 birrs had 79% less (AOR: 0.21, 95% CI (0.05-0.88)) knowledge than those greater than 10000 birrs. The perception of community pharmacy professionals on AMS was associated with the sex of professionals. Males had 2.36 times (AOR: 2.36, 95% CI (1.04-5.34)) good perception than females on AMS. The practices of community pharmacy professionals regarding AMS were related to sex, educational level, and job experience. Male community pharmacy professionals had 4.09 times (AOR: 4.09, 95% CI (1.64-10.17)) good AMS practice than females. Community pharmacy professionals with degree educational level had 4.95 times (AOR: 4.09, 95% CI (1.13-21.60)) good AMS practice than MSC

level pharmacists. Community pharmacy professionals with job experience of less than one year had 14.75 times (AOR: 14.75, 95% CI (1.52-142.98)) good AMS practice than those with greater than 10 years of experience (Table 5).

Table 5: Factors associated with knowledge, perception, and practice of community pharmacy professionals on AMS, (n=122).

Variables		Poor	Good	COR (95%CI)	AOR (95%CI)	P-value
Sex[a]	Male	27	50	3.05 (1.42-6.54)	2.72 (1.20-6.18)	0.01
	Female	28	17	1	1	
Monthly incomea	<5000	29	23	0.17 (0.04-0.66)	0.21 (0.05-0.88)	0.03
	5000-10000	23	30	0.28 (0.07-1.08)	0.26 (0.06-1.05)	0.05
	>10000	3	14	1	1	
Sex[b]	Male	24	53	3.02 (1.40-6.48)	2.36 (1.04-5.34)	0.03
	Female	26	19	1	1	
Job experience[b]	Less than 1	5	7	0.46 (0.11-1.89)	0.52 (0.12-2.17)	0.37
	01-Apr	24	19	0.26 (0.09-0.71)	0.36 (0.12-1.05)	0.06
	05-Sep	13	22	0.56 (0.19-1.61)	0.59 (0.20-1.72)	0.33
	Greater than10	8	24	1	1	
Sex[c]	Male	25	52	3.12 (1.45-6.69)	4.09 (1.64-10.17)	0.02
	Female	27	18	1	1	
Educational level[c]	Diploma	23	30	3.91 (0.95-16.10)	4.43 (0.95-20.53)	0.05
	Degree	20	37	5.55 (1.34-22.85)	4.95 (1.13-21.60)	0.03
	MSc	9	3	1	1	
Job experience[c]	Less than 1	1	11	12.46 (1.43-108.27)	14.75 (1.52-142.98)	0.02
	01-Apr	21	22	1.18 (0.47-2.98)	1.81 (0.60-5.45)	0.29
	05-Sep	13	22	1.91 (0.72-5.08)	2.12 (0.73-6.16)	0.16
	Greater than10	17	15	1	1	

AOR=adjusted odds ratio, COR=crude odds ratio, CI=-Confidence interval

[a]Factors associated with knowledge on AMS

[b]Factors associated with perception on AMS

[c]Factors associated with practice on AMS

Discussuion

This study assessed the knowledge, perception, and practices of community pharmacists towards AMS in Dessie town, Ethiopia with acceptable internal consistency. The present study revealed that more than half (67 (54.9%): 95% CI (47.6%-63%)) of community pharmacy professionals had good knowledge of AMS. The proportion of community pharmacists who had good knowledge was lower than in Pakistan where 80% agreed or strongly agreed that they had sufficient knowledge on how to use antibiotics rationally [18]. The findings of the survey in Italy demonstrated that pharmacists' knowledge regarding the overuse of antibiotics as the main cause of antibiotic resistance is lacking [19]. Another study in Pakistan also reported the limited knowledge of community pharmacists about AMS [20]. The qualitative study also identified a minor knowledge gap among key informants. A systematic review showed that community pharmacists had little understanding in dispensing antibiotics, managing infections, and providing patient care [21]. The difference might be due to the differences in the study area. This inadequate knowledge could be attributed to a lack of information being disseminated to the public [19]. Different appropriate actions that would help to improve their knowledge should be taken to rationalize future antimicrobial use.

The present study reported that more than half (72 (59%): 95% CI (50.9%-68%)) of community pharmacy professionals had a good perception of AMS. A study in Pakistan reported some gaps in perceptions of community pharmacists regarding AMS [18]. While another study from Pakistan revealed positive perceptions of community pharmacists on AMS [17]. Key informants also portrayed the importance of AMS in reducing antimicrobial resistance and the leading role of community pharmacy professionals. The behavior of patients and the social environment might contribute to irrational antimicrobial use and subsequent development of resistance [20]. Educational training and communication initiatives on antibiotic use and antibiotic resistance must be incorporated into their activity and that they could play an important role [19].

70 (57.4%): 95% CI (49.2%-64.8%) of community phar-

macy professionals in this study had a good practice on AMS. The practices of community pharmacists regarding AMS programs in Pakistan are poor [18], where more than half of community pharmacists (59.9%) often/always dispense antimicrobials without a prescription [17].

The qualitative study also identified minor practice gaps among key informants. Being a developing country, many cases of antimicrobial resistance might be due to irrational use. Such irrational dispensing might be the result of a thirst for financial incentives and business orientations [22,23]. Thus, better education is required on antibiotic use and on the risks of antibiotic resistance to improve their practice [19].

Our findings suggest that most pharmacists agreed that AMS programs in community pharmacies would help to reduce the inappropriate use of antibiotics. Pharmacists in Pakistan have a positive practice toward antimicrobial stewardship [5]. The AMS program was pinpointed by key informants for reducing the progress of antimicrobial resistance. The implementation of AMS programs is essential in community pharmacists to promote appropriate antimicrobial use as the majority of antimicrobials are being prescribed and dispensed in the community [21]. Furthermore, the AMS program is dedicated to regulating antimicrobials usage to prevent resistance to antimicrobials and hence to reduce the burden on the health care system [24]. Strong physician community pharmacist collaboration is a fundamental strategy to develop sustainable AMS interventions in the community [25]. However, pharmacists play a vital role in combating and preventing infectious diseases [24]. Proper implementation of AMS will optimize the treatment of infections and reduce adverse events associated with antibiotic use [5]. The program also reduces the costs associated with managing infections [26].

Males had 2.72 times (AOR: 2.72, 95% CI (1.20-6.18)) good knowledge than females on AMS. In Italy, males were more likely to know that the overuse of antibiotics causes antibiotic resistance (19). In this study, male community pharmacy professionals had 4.09 times (AOR: 4.09, 95% CI (1.64-10.17)) good AMS practice than females. A study done in Pakistan revealed that male sex (OR 0.204, 95% CI 0.104−0.4) was associated with poor practices regarding AMS [18].

Community pharmacy professionals with job experience of less than one year had 14.75 times (AOR: 14.75, 95% CI (1.52-142.98)) good AMS practice than those with greater than 10 years of experience. In Italy, those who have been practicing for a higher number of years were more likely to have better practice [19] and less than a year of experience (OR 0.197, 95% CI 0.083−0.468) was associated with poor practices regarding AMS [18]. As the experience of community professionals increased, they might be tired off and give up on service provision.

This current study encountered the following limitations. First, the cross-sectional nature of the study design did not enable the establishment of the direction of cause and effect relationships. Second, despite self-administered questionnaire was used to collect the data; some of them might have provided socially desirable responses. Given these limitations, this study pinpointed useful information about the need for more antibiotic education in community pharmacy settings; strong awareness creation, urgent implementation, and follow up of AMS programs and therefore, the findings may be representative of the entire community pharmacy professionals in the country.

Conclusion

More than half of community pharmacy professionals had good knowledge, perception, and practice on AMS. The knowledge of community pharmacy professionals on AMS was associated with sex and monthly income. The perception of community pharmacy professionals on AMS was associated with the sex of professionals. The practices of community pharmacy professionals regarding AMS were related to sex, educational level, and job experience. Key informants stated that long term and higher dose use of antibiotics will reduce the level of normal flora and increase the occurrence of a hypersensitivity reaction. Despite the AMS program improves rational use of antibiotics and the program must be practiced in all health professionals, the majority did not participate in any AMS programs. They also stated the irrational dispensing practice. The problem of antimicrobial resistance can be improved by the implementation of AMS programs in community pharmacists, interdisciplinary teamwork, and increased participation of pharmacy professionals in AMS awareness campaigns.

Ethical Consideration

Ethical approval was secured from the Ethics Review Committee of the Department of Pharmacy, College of Medicine and Health Sciences, Wollo University (WU Phar/196/13). Written informed consent was obtained prior to initiating the data. Documentation of the informed consent began by providing information regarding the objective of the study and sample selection. Then, the study participants' comprehension was assessed using the consent document. The research was conducted after obtaining signature of study participants in the consent requisition form approved by the Ethics Review Committee of the Department of Pharmacy, College of Medicine and Health Sciences, Wollo University. Confidentiality of the data was maintained throughout the study.

Consent for Publication

None

Availability of Data and Materials

The datasets are available from the corresponding author upon reasonable request.

Funding

None

Competing Interest

The authors declare that they have no potential competing

interests.

Author's Contribution

All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis, and interpretation, or in all these areas; took part in drafting, revising, or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

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