A Study to Appraise Knowledge, Attitude, Practice and Current Trends Concerning Antibiotic Use

Vijitha Raj V S[1], G Jasmine Joy Bell[2], Dr. Arya M S[3]

[1]Pharm D Student, Department of Pharmacy Practice, Ezhuthachan College of Pharmaceutical Sciences, Marayamuttom, Neyyattinkara, Thiruvananthapuram

[2]Associate Professor, Department of Pharmacology, Ezhuthachan College of Pharmaceutical Sciences, Marayamuttom, Neyyattinkara, Thiruvananthapuram

[3]Assistant Professor, Department of Pharmacy Practice, Ezhuthachan College of Pharmaceutical Sciences, Marayamuttom, Neyyattinkara, Thiruvananthapuram

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Abstract

The study was a cross-sectional observational study by using a self-administered questionnaire. The study was carried out for duration of 6 months within the community pharmacies of Thiruvananthapuram district of Kerala. In our study a total 120 community pharmacists were contacted and requested to fill out the questionnaire through the direct visit of each community pharmacy. Out of these respondents 71(60.2%) were females and 47(38.9%) were males. The age group 30-39 years constituted the highest proportion (39.8%). A total of 84 out of the 118 community pharmacist are never dispensed antibiotic without a prescription. Regarding the type of antibiotics the pharmacist would really dispensed to a patient suffering from suspected bacterial infection without a prescription. Penicillin (42.6%) was the most selected class antibiotic followed by Macrolides (29.2%) and Cephalosporin (17.3%). We found no statistical significance between age, sex, qualification and experience with knowledge, attitude and practice scores. Our study finding shows that community pharmacists of Thiruvananthapuram district of South Kerala majority have excellent scoring in knowledge and very good attitude and practice scoring. In our study there was no association was seen between knowledge, attitude and practice scoring with age, sex, qualification and year of experience and the main reason for dispensing antibiotics without prescription is that pharmacists have good awareness about antibiotic use. It was also found that lack of attitude scoring is due to lack of knowledge of community pharmacist antibiotic use and resistance and penicillin are most commonly dispensed antibiotics without prescription.

Keywords*: Antibiotics, Antibiotic resistance, Dispensing, Prescription.*

Introduction

According to WHO, "Antibiotics are medicines used to prevent and treat bacterial infections and antibiotic resistance occurs when bacteria change in response to the use of these medicines". [1] S.A Waksman defined an antibiotic as a chemical substance, made by microorganisms, which can forbid the growth and destroy bacteria. [2] In 1909 Paul Ehrlich discovered the first antibiotic which was a synthetic arsenic-based drug, Salvarsan, used in the treatment of syphilis.

In 1928 Alexander Fleming discovered penicillin. He observed that diffusible extract of Penicilliummolds have antibacterial activity against staphylococci. Penicillin was used only as a local antiseptic for many years as Fleming did not test the extract against animal models because the penicillin was very difficult to isolate and purify. Florey and Chain decode the structure of penicillin in 1939 and in 1940 they showed that penicillin was active against streptococcal infection in mice. Following this discovery, penicillin started to be used systemically as an antibiotic, which then herald the golden age of antibiotics. In 1945, Fleming, Chain, and Florey were dignified Nobel Prize in Physiology or Medicine for discovery of penicillin.

Antibiotic resistance occurs when bacteria change in response to the use of these medicines. Antibiotic resistance can occur naturally, but misuse of antibiotics in humans and animals will hasten the process. Antibiotic resistance leads to longer hospital stays and which decreases quality of life of patient. [3, 4] The pattern of antibiotic resistance seen in the animals depends upon the types and amounts of antibiotics given to the animals. The antibiotic resistance is transmitted from the animals to humans either directly by oral route via eating meat or consumption of contaminated food or water or from direct contact with the animals. [5, 6, 7]

Bacteria can achieve resistance by: (a) Intrinsic resistance to particular antibiotics, (b) Mutations in the chromosomal genes encoding drug targets (c) Activation of intrinsic low level resistance loci. Different mechanisms of gene transfer can mediate acquisition of resistance determinants. Different mechanisms of gene transfer lead to acquired resistance: transduction is mediated by bacteriophages, transformation involves the uptake of DNA and conjugation involves direct cell-to-cell contact for transfer of extra-chromosomal or chromosomal DNA [8, 9, 10].Antibiotic resistance is a global threat because the importance of antibiotics in human and animal health cannot be magnified[11, 12]. As bacteria develop resistance to antibiotics, we return to a time when animals and humans became infected and died from simple and treatable infections. Therefore, antibiotics are a cornerstone of modern medicine and public health[16, 17].

The administration of antibiotics to factory farmed animals is one of the primary causes of antibiotic resistance, prompting the World Health

Organization (WHO) to call it “one of the biggest threats to global health, food security, and development today”. [19] Kerala is the first state to strengthen efforts to control antibiotic resistance led by the World Health Organization. Community pharmacies are undergoing a transformation from its traditional function as a supplier of medicines towards a pivot health destination. Moreover, community pharmacies are the first point of contact to patients who have a minor illness and can encourage appropriate antibiotic use and awareness of resistance directly. So, it is essential to assess knowledge, attitude, practice concerning antibiotic resistance and use.

Materials and methods

This study was a cross-sectional observational study using a self-administered questionnaire. Population in this study was community pharmacists working in Thiruvananthapuram district of Kerala. Data was collected from 120 community pharmacists, but only 118 responses were included in our study since 2 responses were incomplete. Participant must be a Community pharmacist who graduated in pharmacy diploma or degree (D Pharm, B Pharm, M Pharm and Pharm D and Hospital pharmacists and owners who have not graduated with a pharmacy diploma or degree were excluded from the study.

The questionnaire contains thirty- three questions. It was divided into five sections to assess the pharmacist’s knowledge, attitude and practice regarding antibiotic use and resistance among community pharmacists and current trends of antibiotic use. Demographics section was developed to describe characteristics of community pharmacists and confirm inclusion criteria of sampling. This section includes three main questions about personal background, education and professional experiences. This study assessed pharmacists’ knowledge in two topics, knowledge of antibiotic use and antibiotic resistance. This section includes 13 questions for the assessing knowledge of community pharmacists. Each of the statements in this section had yes, no, don’t know and sometimes response options. Attitudes section examined community pharmacists’ agreement with antibiotic use and resistance statements. Nine statements were included in this section. A 5-point Likert scale: 1 = strongly agree, 2 = agree, 3 = neither agree nor disagree, 4 = disagree and 5 = strongly disagree was used to assess the respondents’ attitudes towards antibiotic supply. Practice section aims to investigate pharmacists' current actions of antibiotic dispensing in pharmacies according to their knowledge and attitudes. In this section, 11 items were used to measure the practice of community pharmacists. These items had response options are always, never and sometimes. Current trends aim to explore the current situation of antibiotics provision in community pharmacy in Thiruvananthapuram. Completed surveys were coded, reviewed

for accuracy and entered into the Statistical Package for the Social Sciences (SPSS 13.0 and R Software 4.5.1).

Ethical consideration

Written informed consent was obtained and clearance for the study was obtained from the scientific and ethical committee constituted in Ezhuthachan College of Pharmaceutical Sciences, Marayamuttom, Neyyattinkara, Thiruvananthapuram under protocol number: 141/2021.

Results

A total 120 community pharmacists were contacted and requested to fill out the questionnaire through the direct visit of each community pharmacy. A total of 120 responses were collected, of which 118 responses were completed and used for analysis. Out of these respondents, 71 (60.2%) were females and 47 (38.9%) were males (Table 1)**.**

Item	**Frequency (n=118)**	**Percentage (%)**
Sex		
Male	47	39.8
Female	71	60.2
Age (in yrs)		
20-29	37	31.4
30-39	47	39.8
40-49	18	15.3
>50	16	13.6
Qualification		
D pharm	95	80.5
D pharm + B pharm	1	0.8
B pharm	21	17.8
Pharm D	1	0.8
Experience (in yrs)		
<5	43	36.4
5-10	33	28.0
11-15	13	11.0
>15	29	26.4

Table 1: Socio-demographic details

Knowledge in antibiotic use and resistance

Questionnaire	Yes n=118 (%)	No n=118(%)	Don't know n=118(%)
K1 : Dispensing antibiotics without a valid prescription legal in India	59(50.0)	56(47.5)	3(2.5)
K2 : Antibiotics are effective against viral disease	54(45.8)	61(51.7)	3(2.5)
K3: Do you ask patients about their previous medications before dispensing antibiotics?	102(86.4)	14(11.9)	2(1.7)
K4: Are different antibiotics needed based on different infectious conditions?	102(86.4)	10(8.5)	6(5.1)
K6 : Do you think it is necessary to advise the patients about the antibiotics usage and its course completion	115(97.5)	2(1.7)	1(0.8)
K7: Do you think that inappropriate use of antibiotics causes antibiotic resistance?	109(92.4)	4(3.4)	5(4.2)
K11: Do you think that antibiotics can be dispensed even without a prescription?	39(33.1)	77(65.3)	2(1.7)

Table 2.1: Knowledge in antibiotic use and resistance

Questionnaire	Yes n=118(%)	No n=118(%)	Sometimes n=118(%)
K5: Do you think that antibiotics are indicated to reduce pain and inflammation?	38(32.2)	63(53.4)	17(14.4)
K8: Do you suggest patients stop taking antibiotics if their symptoms subside?	35(29.7)	77(65.3)	6(5.1)
K9: Do you know about proper use of each antibiotic?	90(76.3)	5(4.2)	23(19.5)
K10: Do you know about Schedule H drugs?	114(96.6)	3(2.5)	1(0.8)
K13: Do you update your knowledge from research articles and antibiotic guidelines?	60(50.8)	22(18.6)	36(30.5)

Table 2.2: Knowledge in antibiotic use and resistance

Questionnaire.	Yes n=118(%)	No n=118(%)
K12: Do you know about antibiotic guidelines?	105(89.0)	13(11.0)

Table 2.3: Knowledge in antibiotic use and resistance

Out of 118 surveyed community pharmacists, 54.2% of pharmacists had excellent, 43.2 % had very good and 2.5% had good knowledge about antibiotic use and resistance (Figure 1). 20-29 year age group had excellent knowledge about antibiotic use and resistance. From the results it was clear that there was no correlation between age and knowledge; chi square value and p value were 5.6, 0.46 respectively. Females had excellent knowledge about antibiotic use and resistance. From the results it was clear that there was no correlation between sex and knowledge; chi square value and p value were 0.32 and 0.84 respectively. D Pharm graduates demonstrated an excellent knowledge score. From the results it was clear that there was no correlation between qualification and knowledge; chi square value and p value were 4.12 and 0.66 respectively. It was evident that community pharmacist with <5 years of experience had excellent knowledge scoring. The chi square value and p value were 0.56 & 0.36 respectively. So it can be interpreted that there was a no significant correlation between knowledge and experience.

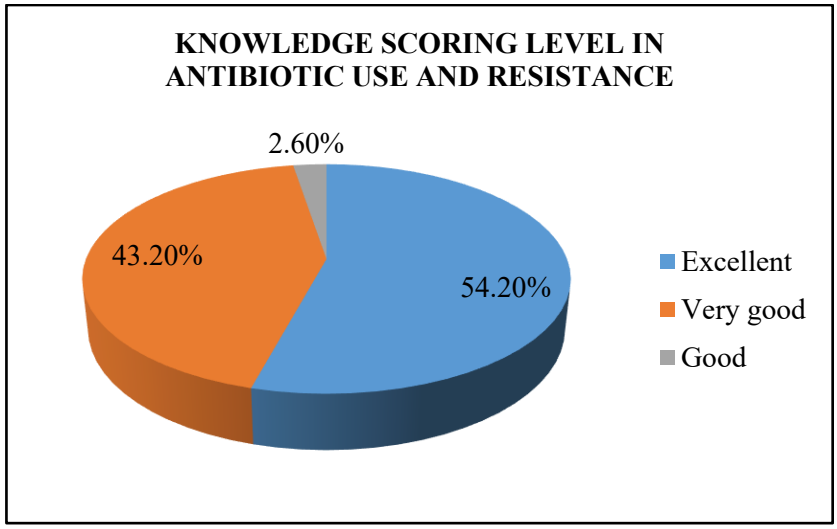

Figure 1: Knowledge scoring level in antibiotic use and resistance

Attitude in antibiotic use and resistance

Questionnaire	Strongly agree n=118 (%)	Agree n=118 (%)	Uncertain n=118 (%)	Disagree n=118 (%)	Strongly disagree n=118 (%)
A1: Antibiotic resistance is an important public health problem.	55 (46.6)	53 (44.9)	5 (4.2)	4 (3.4)	1 (0.8)
A2: It is necessary to control the dispensing of antibiotics without prescription.	49 (41.5)	50 (42.4)	2 (1.7)	15 (12.7)	2 (1.7)
A3: There are problems in dispensing antibiotics without prescription.	41 (34.7)	65 (55.1)	4 (3.4)	7 (5.9)	1 (0.8)
A4: It is possible to improve patient care and outcome through appropriate use of antibiotics.	42 (35.6)	62 (52.5)	7 (5.9)	4 (3.4)	3 (2.5)
A5: Costly antibiotics have few side effects and are more effective.	8 (6.8)	40 (33.9)	27 (22.9)	32 (27.1)	11 (9.3)
A6: Pharmacists have a responsibility to take a prominent role in antibiotic resistance and infection control programs in the health system.	46 (39.0)	66 (55.9)	2 (1.7)	32 (27.1)	11(9.3)
A7: Dispensing several antibiotics produces better results than a single antibiotic.	11(9.3)	36 (30.5)	16 (13.6)	45 (38.1)	10 (8.5)
A8: Refusing dispensing antibiotics without prescription will negatively affect sale and profit	13 (11.0)	41 (43.7)	8 (6.8)	39 (33.1)	17 (14.4)
A9: New antimicrobials are generated to resolve antibiotics resistance	5 (4.2)	66 (55.9)	5 (4.2)	26 (22.0)	16 (13.6)

issue.					

Table 3: Attitude in antibiotic use and resistance

About 34.7% of pharmacists had excellent, 55.9% had very good, 8.5% had good and 0.8% had poor knowledge about antibiotic use and resistance (Figure 2). Excellent attitude scoring is for the community pharmacist in the age group of 30-39yrs. There was no association seen between the attitude score with age of the respondent. The chi square value and p values were respectively 7.4, 0.60. From the result of distribution of sex against attitude scoring it was evident that excellent attitude scoring is for females. There was no association between the attitude Score with sex of the respondent. The chi square value is 1.11 and p value is 0.78. the result shows that excellent attitude scoring is for D pharm holders. There was no association between the attitude Score and qualification of the respondent. The chi square value is 11.12 and p value is 0.26. Excellent attitude scoring is for pharmacists with less than 5yrs of experience. There was no association between the attitude Score and experience of the respondent. The chi square value: 4.46 and p value: 0.88.

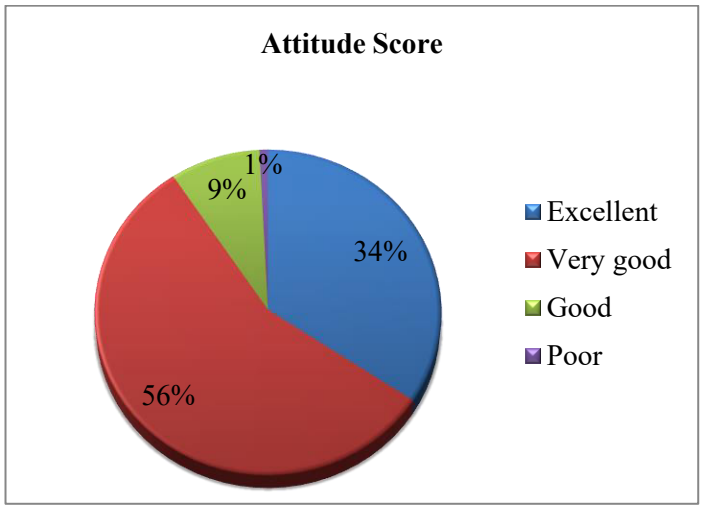

Figure 2: Attitude scoring level in antibiotic use and resistance

Practices in antibiotic use and resistance

Questionnaire	Always n=118 (%)	Never n=118 (%)	Sometimes n=118 (%)
P1: I dispense antibiotics to all age group even if they present without a prescription	9 (7.6)	85 (72.3)	24 (20.3)
P2:I ask the patient whether they are taking any other medication for the same complaint while dispensing antibiotics without prescription	72 (61.0)	23 (19.5)	23 (19.5)
P3: I ask the patient whether they are allergic to some medicines before dispensing.	95 (80.5)	5 (4.2)	18 (15.3)
P4: Before dispensing antibiotics I ask the patient about their symptoms of infection.	81 (68.6)	3 (2.5)	34 (28.8)
P5: Patient is given adequate awareness on the use of antibiotics and resistance related issues while dispensing.	70 (59.3)	7 (5.9)	41 (34.7)
P6: Antibiotics are screened with antibiotic guidelines before dispensing.	40 (33.9)	35 (29.7)	43 (36.4)
P7: Antibiotics are dispensed for duration longer than that prescribed by the physician upon request of the patient.	20 (16.9)	65 (55.1)	33 (28.0)
P8: I participate in antibiotic campaigns to promote optimal use of antibiotic	15 (12.7)	46 (40.0)	57 (48.3)
P9: I dispense antibiotics without prescription for geriatric and paediatric patients with severe infection	1 (0.8)	104 (88.1)	13 (11.0)

Table 4.1: Practice in antibiotic use and resistance

Questionnaire	Yes N=118 (%)	No N=118 (%)
P10: I refer paediatric, geriatric patients and pregnant women to specialist for proper treatment	114 (96.6)	4 (3.4)

Table 4.2: Practice in antibiotic use and resistance

P11:Reason for dispensing antibiotics without prescription	Frequency (n=118)	Percentage (%)
Pharmacists have good awareness about antibiotic use	49	29.0
Patients do not want to see a doctor unless the infection is serious	27	16.0
Increased sales and profit pressure from the owner	4	2.4
Patients cannot afford to consult a physician	26	15.4
Fear of losing a client/patient	9	5.3
Lack of awareness of pharmacist about rules, regulations and knowledge against dispensing antibiotics without prescription	39	23.1
No response	15	8.9

Table4.3: Practice in antibiotic use and resistance

Out of 118 surveyed community pharmacists, 32.2 % had excellent, 17.8 % had good, 39% had very good, 9.3 % had poor and only 1.7 % had a very poor score in practice (Figure 3).Community pharmacist in the age group of 30-39 had excellent practice scoring. This indicated that there was no significant correlation between practice and age; chi square value and p value were 7.4 and 0.60 respectively. Female pharmacist had an excellent practice scoring. There was no significant correlation between sex and practice. The chi square value and p value were 4.9 and 0.29 respectively. The D Pharm graduates had excellent practice scoring. This shows that there was no correlation between qualification and practice. Chi square value and p value were 10 and 0.61 respectively. Senior pharmacists were extensively experienced in community pharmacy practice setting. There was no correlation between experience and practice. Chi square value and p value were 10.54 and 0.57.

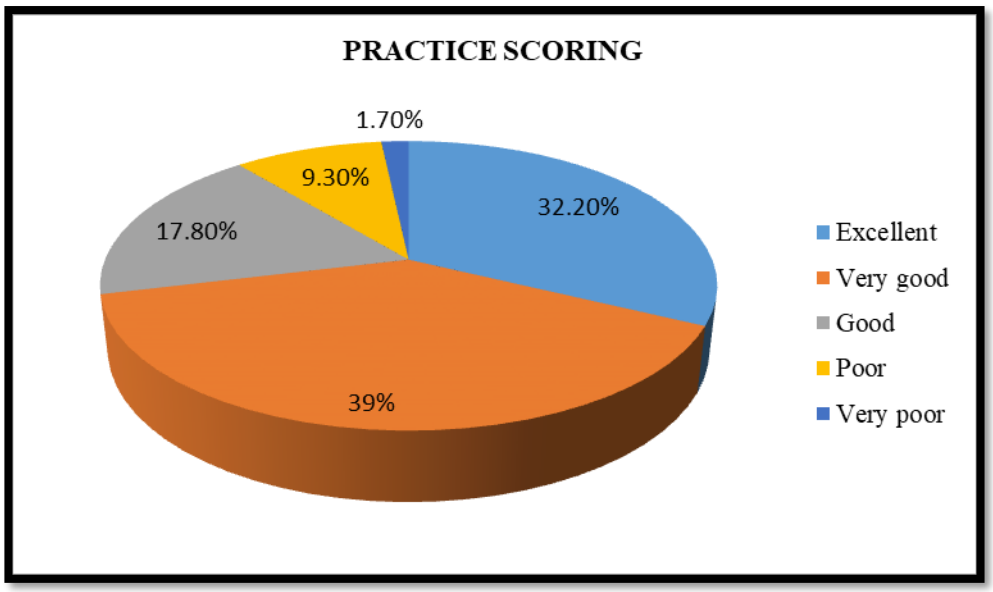

Figure 3: Practice scoring in antibiotic use and resistance

Current trends

Questions related to antibiotic dispensed without prescription were included to explore current trends of antibiotic provision in community pharmacy. The participants confirmed the number of antibiotics dispensed per day; age group commonly dispensed with antibiotics and commonly dispensed antibiotic dosage form without prescription. Mostly<25 antibiotics were dispensed by community pharmacy per day. The disease for which antibiotics commonly dispensed without valid prescription was sore throat (25.5%) followed by fever (17.9%), cough (12.8%), running nose (11.1%), dental pain (10.20%), acute diarrhoea (9.4%) and other conditions such as UTI (1.7%) (Figure 4). Only a few respondents (1.2%) were not dispensing antibiotics without a valid prescription. The age group for which antibiotics commonly dispensed without valid prescription were adults (86.4%) followed by geriatric (5.1%).The antibiotic dosage form commonly dispensed without valid prescription was oral (62.8%) followed by topical (24.3%), eye drops (3.5%) and ear drops (0.7%) (Figure 5). Penicillin antibiotics (42.60%) were most commonly dispensed followed by Macrolides (29.20%), Cephalosporin (17.30%), Tetracycline (5.9%) and Quinolones (3.5%) without valid prescription (Figure 6).

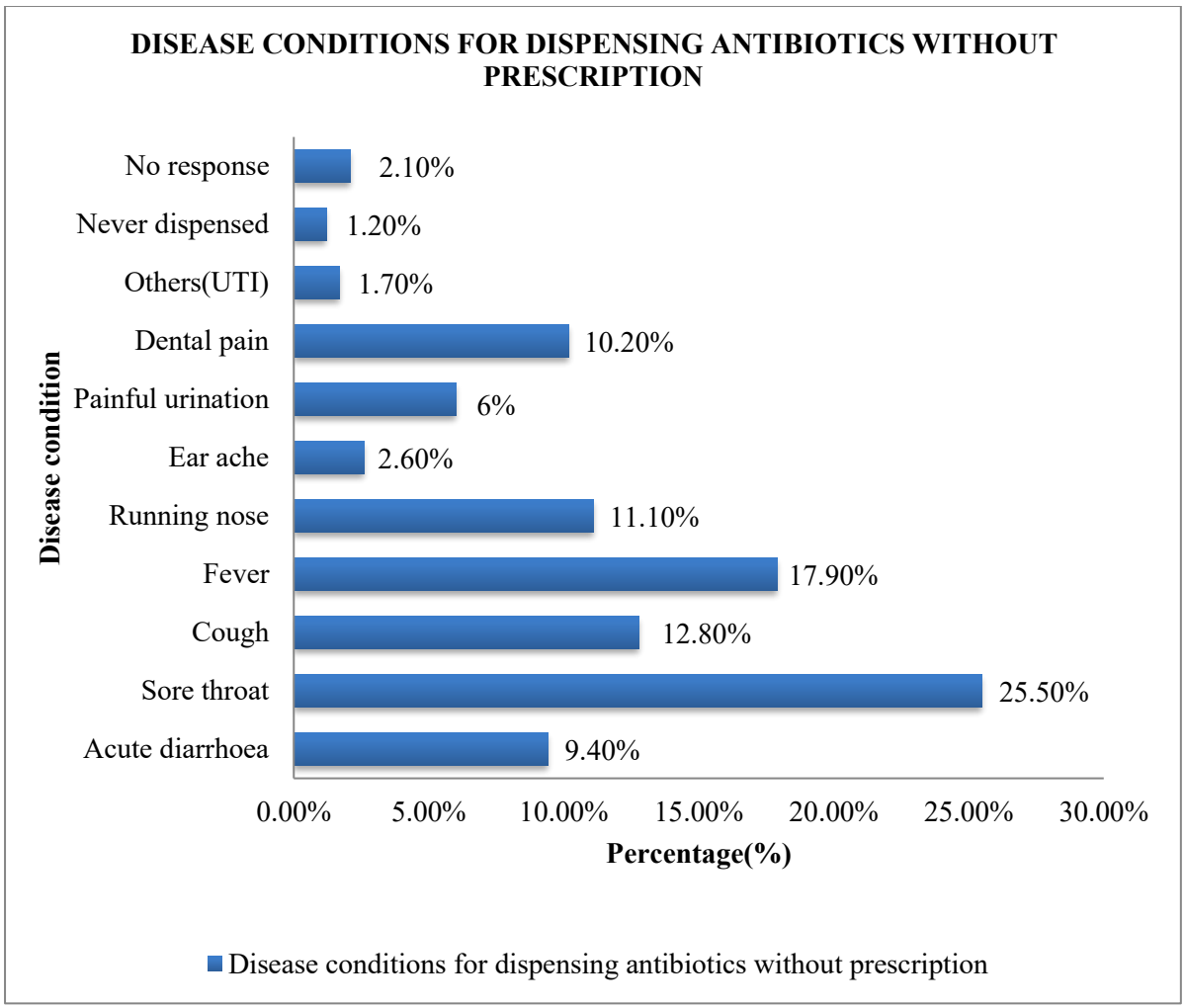

Figure 4: Disease condition for dispensing antibiotics without prescription

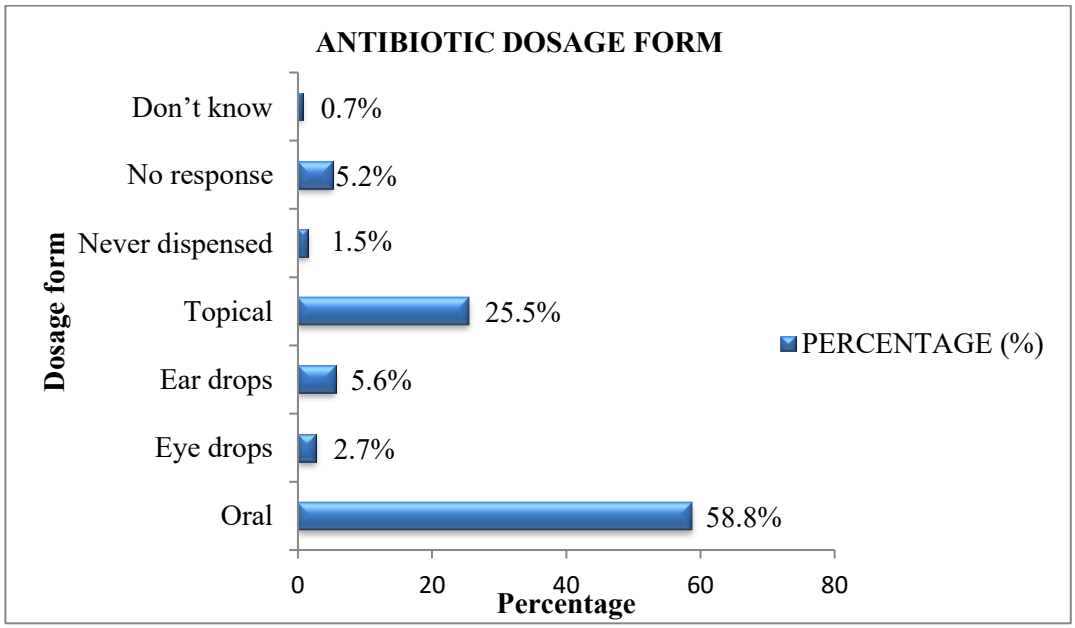

Figure 5: Commonly dispensed antibiotic dosage form

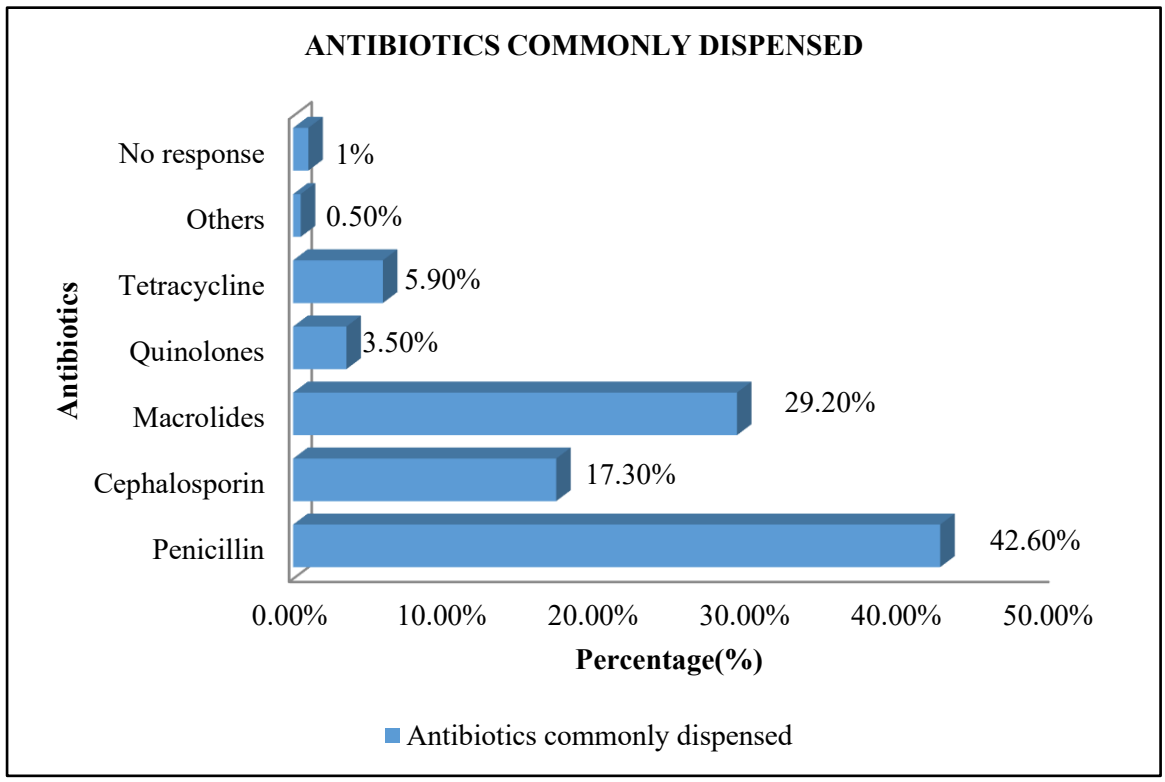

Figure 6: Commonly dispensed antibiotics

Discussion

Antibiotic resistance was a major threat to public health. The aim of our study was to assess the knowledge, attitude, practice and current trends of antibiotic use and resistance among community pharmacists. This research was conducted by providing a self-administrated questionnaire to community pharmacists of Thiruvananthapuram district of South Kerala. The main findings indicated that community pharmacists had a good knowledge, attitude, and practice regarding antibiotic use and resistance. Our study included a higher proportion of female respondents (60.2%), similar to the study of *Mario Gajdacs et al.*, [16]. In our study, majority of respondents were D Pharm graduates and D Pharm was the least qualification for working as a registered pharmacist, which was contrary to the study of *Baraka P. Poyonga et al.*, [17] which showed that B Pharm was the least qualification for working as a registered pharmacist. Most of the respondents in our study were newly graduated pharmacist (D Pharm), which was similar to the study of *Baraka P.Poyonga et al.*, [17]. In our study, it was found that 54.2% of community pharmacist had excellent knowledge on antibiotic use and resistance which was not related to sex and qualification, contrast results were found in other studies *Anant Nepal et al.*, [18].In our study 92.4% of the participants were aware that inappropriate use of antibiotic could promote antibiotic resistance and 53.4% participants thought that antibiotic cannot reduce pain and

inflammation, these findings were in agreement with study from Eastern Nepal, *Nikita Goswami et al.*, [19]. Our study suggest that around one third of respondents dispense antibiotic without prescription, this findings were similar to the study of *Nikita Goswami et al.*, [19] and one third were unaware about inappropriate antibiotic dispensing could promote antibiotic resistance. Most of the participants (42.2%) responded that it is necessary to control the dispensing of antibiotic without prescription, contrast results were seen in study of *Pengcho Li et al.,* [20]. More than 50% of participants responded that there are problem in dispensing antibiotic without prescription, similar results were seen in study of *Pengcho Li et al*[20]. About 39.1% participants disagreed that dispensing several antibiotic produce better results than a single antibiotic, which were similar to the study of *Pengcho Li et al*[20]. Majority of participants (43.7%) agreed that refusing dispensing antibiotics without prescription will negatively affect sale and profit; the results were similar to the study of *Muhammad Umair Khan et al*[21]. Majority of the participants (72.3%) never dispense antibiotics to any age group without prescription. 61% of the participants ask the patient whether they are taking any other medication for the same complaint while dispensing antibiotics without prescription, this result is similar to the study conducted *Mohammed Abdul Hadi etal*[22]. 80.5 percent of the participants ask the patient whether they are allergic to some medicines before dispensing, this result is similar to the study conducted by *Nikita Goswami etal*[19]. 55.1 % of the participants never dispense antibiotics for duration longer than that is prescribed by physician upon request of the patient; this result is similar to the study conducted by *Dilrub Nazirnetal*[23]. The most common reason for dispensing antibiotics without prescription is that pharmacist have good awareness on antibiotic use (29%), this result is in disagreement with the study conducted by *Muhammad Abdul Hadi etal*[22]. Total number of antibiotics dispensed per day <25(89.0 %),most commonly dispensed antibiotic (45.7 %) without prescription is penicillin and most of the participants dispense oral antibiotic without prescription (63.6%), these results were similar to the study of *Muhammad Abdul Hadi et al* [22] .

Limitation

We used a self-administered questionnaire in order to collect data, which in turn depends on recall and cognitive abilities of participants. This could result in response bias. Some of the community pharmacists randomly responded to the questionnaire due to their busy schedule, this could result in response bias. Since we obtained the simple random sampling technique we were able to collect response only from 102 community pharmacies out of 412 community pharmacies in Thiruvananthapuram Corporation so that findings may not be generalizable.

Conclusion

In this study involving 118 community pharmacists at Thiruvananthapuram district of South Kerala, majority have excellent scoring in knowledge and very good attitude and practice scoring. In our study there was no association was seen between knowledge, attitude and practice scoring with age, sex, qualification and year of experience. The main reason for dispensing antibiotics without prescription was that pharmacists have good awareness about antibiotic use and resistance. It was also found that lack of attitude scoring is due to lack of the knowledge of community pharmacist regarding antibiotic use and resistance and penicillin is the most commonly dispensed antibiotics without prescription. Some fraction of community pharmacists are still dispensing antibiotics such as Penicillin, Macrolides, and Cephalosporin without prescription and a small percentage is always attending antibiotic campaigns to promote optimal use of antibiotics. So there is a need to promote their participation and the regulatory authorities should strictly monitor and take actions in case of violating legal obligations from the part of community pharmacist.

Bibliography

S A Waksman. What is an antibiotic or an antibiotic substance? Mycologia. Sep-Oct 1947; 39(5):565-569.

Silver L.L. Rational Approaches to Antibacterial Discovery: Pre-Genomic Directed and Phenotypic Screening. In: Dougherty T., Pucci M. (eds) (2012) Antibiotic Discovery and Development. Springer, Boston, MA.

Blair J, Webber M, Baylay A, Ogbolu D, Piddock L. Molecular mechanisms of antibiotic resistance. Nat Rev Microbial. 2015; 13:42-51.

Rajni Sing, S. Smitha and urinder P. Singh. The Role of Nanotechnology in Combating Multi-Drug Resistant Bacteria. Journal of Nano science and Nanotechnology. 2014; 14:1 - 12.

Wanda C Reygaer. An overview of the antimicrobial resistance mechanisms of bacteria. AIMS Microbiology. 20184; (3): 482–501.

N. D. Friedman, E. Temkin and Y. Carmeli. The negative impact of antibiotic resistance. Clinical Microbiology and Infectious Diseases. 2016; 22: 416–422.

Sara E. Cosgrove and Yehuda Carmeli. The Impact of Antimicrobial Resistance on Health and Economic Outcomes, Clinical Infectious Diseases. 2003; 36:1433–1437.

Teresa M, Barbosa Stuart and B. Levy. The impact of antibiotic use on resistance development and persistence. Drug Resistance Updates .2000; 303–311.

Viroj Tangcharoensathien, Sunicha Chanvatik and Angkana Sommanustweec. Complex determinants of inappropriate use of antibiotics. Bulletin of the World Health Organization. 2018; 96:141-144.

Morgan D J, Okeke IN, Laxminarayan R, Perencevich EN and Weisenberg S. Non-prescription antimicrobial use worldwide. Lancet Infect Dis. 2011 Sep; 11 (9):692–701.

Infection prevention and control. WHO's infection and prevention & control department.

Guidelines on core components of infection protection and control programmes the National and Acute Health Care Facility Level. 2016; (ISBN 978-4-154992-9).

Mário Gajdács, Edit Paulik and Andrea Szabó. Knowledge, Attitude and Practice of Community Pharmacists Regarding Antibiotic Use and Infectious Diseases: A Cross-Sectional Survey in Hungary (KAPPhA-HU); Antibiotics (Basel). 2020 Feb; 9(2): 41.

Baraka P Poyongo and Raphael Zozimus Sangeda Pharmacists' knowledge attitude and practice regarding the dispensing of antibiotics without prescription in Tanzania: an explorative cross sectional study.

Anant Nepal, Delia Hendrie, Suzanne Robinson & Linda A. Selvey ; Knowledge, attitudes and practices relating to antibiotic use among community members of the Rupandehi District in Nepal,2019 BMC Public Health volume 19 ;1558 1-12.

Nikita Goswami, Prasanna Dahal, Shakti Shrestha, Bhuvan KC, and Shyam Kumar Mallik; Community Pharmacy Personnel Understanding of Antibiotic Dispensing in Eastern Nepal; Risk ManagHealthc Policy. 2020; 13: 1513–1522.

PengchaoLi Muhammad Majid Aziz, Fatima Haider, Muhammad FawadRasool, Furqan Khurshid Hashmi, SadiaBahsir, , Mingyue Zhao, Thamir M. Alshammaryand Yu Fang, Dispensing of Non-Prescribed Antibiotics from Community Pharmacies of Pakistan: A Cross-Sectional Survey of Pharmacy Staff's Opinion; Antibiotics. 2021, 10, 482.

Muhammad Umair Khan , Hassali MAA, Ahmad A, Elkalmi RM, Zaidi STR, Dhingra S. Perceptions and practices of community pharmacists towards antimicrobial stewardship in the State of Selangor, Malaysia. PLoS ONE. 2016; 11:e0149623.

Muhammad Abdul Hadi, Nedaa Ali Karami, Anhar S. Al-Muwalid, Areej Al-Otabi, Eshtyaq Al-Subahi, Asmaa Bamomen, Mahmoud M.A. Mohamed, Mahmoud E. Elrggal, Community pharmacists' knowledge, attitude, and practices towards dispensing antibiotics without prescription (DAwP): a cross-sectional survey in Makkah Province, Saudi Arabia, 2016;47:95-100.

Dilruba Nasrin , Peter J Collignon, Leslee Roberts, Eileen J Wilson, Louis S Pilotto, Robert M Douglas; Effect of beta lactam antibiotic use in children on

pneumococcal resistance to penicillin: prospective cohort study; BMJ 2002 Jan 5;324(7328):28-30.