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Research Article

Exploring antibiotic knowledge and dispensing behaviours in community pharmacy settings: a cross-sectional study

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ABSTRACT

Antibiotics (Ab's) are playing a major role in treating bacterial infections, but their misuse and overuse have led to antibiotic resistance (ABR), complicating the treatment strategy and increasing healthcare costs. Over 50% of antibiotics are obtained from the community pharmacies through over-the-counter (OTC) purchases, often without a prescription, emphasizing the important role of pharmacists in ensuring appropriate use of Ab's. This study points out key factors influencing the dispensing of antibiotics without proper prescriptions, especially for minor infections. It found that inadequate pharmacists' knowledge often leads the way to improper dispensing practices, accompanied by socio-demographic factors such as age, experience, and employment status. The study also focuses attention on the importance of pharmacists' educational qualifications in shaping their grasp of antibiotics. To address these issues, targeted educational interference, clear dispensing regulation, and policy reinforcement are crucial to assisting responsible antibiotic use.

Keywords:
Community pharmacist; Antibiotics; Knowledge and practice.

1. INTRODUCTION

Antibiotics are used for the treatment of bacterial infections. It produces the action by inhibiting the growth or destroying it. The too much use of Ab's and wrong use of Ab's leads to Ab's resistance (opposition). The treatment of microbial infection has become complicated due to the uncontrollable increase of ABR in the world. The increase in treatment complications, side effects, disablement, death, and other resources increase the cost of treatment, so we need to consider the threat of Ab's. Most outpatients consume the Ab's via OTC; more than 50% of the OTC Ab's are not prescribed by medical practitioners. So, community pharmacists need to be involved in the efficacious, safe, and secure use of Ab's.

Community pharmacies are privately owned pharmacies run by licensed pharmacists to provide and distribute prescribed medications[1]. Pharmacists play a important role in dispensing medicine, patient education, and counselling to improve patient lifestyles with other healthcare workers[2]. Since the year 2000, antibiotic use has increased by 36% worldwide. Many countries proposed legal guidelines for Ab's dispensing, but day by day community pharmacists ignore the guidelines and make them available without prescription for profit. WHO reported that 93% of the population self-medicated the Ab's themselves from a community pharmacy[3].Globally, 80% of the Ab's use accounts for community[4]. An improper knowledge of Ab's usage and disposal increases the threat of ABR.

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ABR means microorganisms (bacteria) do not respond to the use of antibiotics. Self-medication is one of the most common reasons for increasing ABR[5]. Sometimes single bacteria can create resistance for more than one Ab, which is known as multidrug resistance (MDR). Due to MDR, more than 96,000 deaths happen in South Asia[6]. All these factors dramatically increase the cost of treatment, length of admission to the hospital, condition of suffering from disease and death, and side effects. According to the report by the World Health Organization on ABR, only 33 countries out of 133 had action plans to combat ABR[7,8]. Worldwide, approximately 10 million deaths were caused by ABR[9]. Thus, community pharmacists have an important role in making sure the use of Ab's in the community. Pharmacists need to provide healthcare information and supervise Ab's dispensing to ensure rational use and give counseling about drug interaction, the importance of regularity in drug intake, ADR, the consequence of Ab's misuse and overuse, and the basics of Ab's resistance to the patient[2]. The ABR rate was decreased by the community pharmacist by dispensing the Ab's legal. 62% of Ab's was dispensed without prescription by community pharmacists globally[10]. The Ab's dispensing at community pharmacy was the effect of pharmacist attitudes, not so much understanding and consciousness about ABR[11]. In many developed and developing countries, the Ab's are dispensed against the law (without prescription)[12-14]. Similarly, dispensing at pharmacies or drug outlets does not meet the World Health Organization's (WHO) criteria for being rational[15]. So, there is a need for pharmacist attention to decrease the threats behind the Ab's by following the legal guidelines regarding Ab's.

Aims of the study

(i) To evaluate the understanding of antibiotics among community pharmacist and their practice of dispensing antibiotics without prescriptions. (ii) To identify potential factors influencing the behaviour of antibiotic dispensation.

2. MATERIALS AND METHODS

2.1. Study Design

The study was designed and conducted as a cross-sectional study, and it was approved by the Institutional Ethical Committee with a proposal numberof 21/043. This study employed two data collection methods: (1) a structured questionnaire survey to assess pharmacists' self-reported knowledge and dispensing behaviours and (2) a simulated client study to observe real-world antibiotic dispensing practices.

2.2. Study Population

The study population consisted of community pharmacists selected from various community pharmacies in Coimbatore, India. This included all types of community pharmacies in the region, such as independent (privately owned) pharmacies, chain pharmacies, government-owned pharmacies, and generic medicine pharmacies (Pradhan Mantri Bhartiya Janaushadhi Kendra). A simple random sampling technique was employed to select the participants.

2.3. Study Duration

A cross-sectional study was conducted over a one-year period, from November 2020 to October 2021, using a structured questionnaire to survey community pharmacists and Simulated client study in the study region.

2.4. Study Location

The study was conducted in the community pharmacies in Peelamedu and its surrounding areas, Coimbatore, India

2.5. Sample Size and Justification

The sample size for questionnaire-based survey was determined based on the number of community pharmacies in Peelamedu and its surrounding areas in Coimbatore. An estimation conducted through both online and offline sources identified approximately 200 community pharmacies in this region. Using the RaoSoft sample size calculator, with a 5% margin of error, a 95% confidence interval, and a 50% response distribution, the required sample size was calculated to be $n = 132$.

A total of 51 pharmacies were included in the simulated client (SC) study. While 132 pharmacies agreed to participate in the self-reported survey, only 51 consented to be part of the SC study. Consent for the SC visits was obtained during an earlier phase of the research when respondents completed the self-reported survey at their pharmacies. Participants were fully informed about the study's purpose and assured of data confidentiality and anonymity. The SC visits took place within six months of obtaining consent and were conducted without prior notice.

2.6. Selection of Subjects

The subjects were selected for the study based upon the inclusion and exclusion criteria.:

Inclusion Criteria:

- All type of community pharmacy pharmacist in the peelamedu and its surrounding areas.
- Both male and female Pharmacist who can give consent was selected for the study.

Exclusion Criteria:

- Pharmacists unwilling to participate in this study.

2.7. Study Tool

The structured questionnaire used in this study was adapted from existing literature [16] and focused on assessing the knowledge, attitudes, and practices of community pharmacy staff regarding antibiotics. It was divided into three distinct sections.

i. Knowledge related to antibiotics (K1-K34)

Knowledge was assessed across four key domains: knowledge about antibiotics (K1-K3), awareness of antibiotic resistance (K4-K15), antibiotic use and misuse (K16-K29), and legal aspects of antibiotic dispensing (K30-K34). Each domain consisted of specific statements evaluated using three response options: "Yes," "No," and "Unsure." Knowledge about antibiotics was measured using three statements, with each correct response assigned a score of one. The total score for this domain ranged from 0 to 3. Similarly, knowledge of ABR (0 to 12), antibiotic use/misuse (0 to 14), and legal aspects of antibiotic dispensing (0 to 5) were scored based on correct responses. These scores were then used as predictors for antibiotic dispensing behaviour.

ii. Antibiotic Dispensing Practice (P1-P7)

Antibiotic dispensing behaviour was assessed using six statements, each rated on a five-point Likert scale: (1) Never, (2) Sometimes, (3) Half of the time, (4) Most of the time, and (5) Always. For interpretation, "Never" was considered separately, while all other responses were categorized as they dispense antibiotics. Additionally, self-reported antibiotic supply without a prescription in the past week was evaluated for acute sore throat, common cold, wound infections, urinary tract infections (UTI), and diarrhea. This was measured on a six-point Likert scale, where 1 = Never, 2 = 25% of instances, 3 = 50% of instances, 4 = 75% of instances, 5 = Always, and 6 = Don't know. For interpretation, "Never" and "Don't know" were considered separately, while all other responses were considered as they dispense antibiotic.

iii. Socio-Demographic Data

This section includes socio-demographic and professional characteristics, such as age, gender, geographical location, level of pharmacy education, years of experience in community pharmacy practice, employment type, employment status, pharmacy type, and the number of pharmacists and pharmacy assistants present at a given time.

For simulated client study the data was collected by two simulated clients. The clients approached with the signs and symptoms (cases of suffering from a productive cough, runny nose with clear mucus, slight fever, occasional sneezing, sore throat and some loss of appetite) and provided consistent answers for queries raised by the dispensers & was sought whether antibiotic dispensed. In second incremental levels of demand were used to convince the drug retail outlet attendants to get an antibiotic without prescription. The simulated client's study was conducted in strict confidence and avoids disclosure of any malpractice of the dispensers to other parties. The names of the drug retail outlets and identifiers of the dispenser are kept confidential. Investigational information will only be disclosed at the aggregate level and all findings at a personal level will be kept confidential.

2.8 Statistical Analysis

All statistical analyses were performed using SPSS software version 26.0. Descriptive statistics were used to describe demographic characteristics. Odds ratios were used to determine the relationship between pharmacists' knowledge and dispensing practices, and regression analysis was used to analyze the relationship between pharmacists' knowledge and demographic variables.

3. RESULTS

3.1 Findings from the Questionnaire Survey

3.1.1 Socio-demographic and professional characteristics

In the study, 67.4% (*n*=89) of participants were male, while 32.6% (*n*=43) were female, indicating a higher number of male participants. Age distribution details are presented in the accompanying table. Among these 132 participants, a majority fell within the category of 21-30 years it was almost 66.6% of the participants. Two respondents in the study were aged 20 or younger, likely due to the inclusion of Diploma in Pharmacy

(D. Pharm) holders, who are permitted to practice at a younger age compared to degree holders. The pharmacists were categorized into five groups based on education level, with 57.6% holding a B. Pharm degreeand 24.2% possessing a D. Pharm. Additionally, 9.09% were Pharm. D graduates, and 1.51% had an M. Pharm degree and based on their employment status, 75% were employees, whereas 25% were pharmacy owners. Among 132 pharmacists, they were classified into five groups based on their experience. This study shows only 5.3% of the participants have more than 15 years' experience, 28% have comes under 2-5 years and remaining are less than two years of experience. In the terms of employment status, more than half of the participant 66.6% were employed as full-time, while the remaining 33.3% worked part-time **[Table 1].**

3.1.2 Self-reported Knowledge scores of pharmacists

The overall mean knowledge score ranged between 1–34 (score 0–24 average knowledge, score ≥25 good knowledge).In which, Knowledge about antibiotics (score 0–1 average knowledge, score ≥2 good knowledge), knowledge about ABR (score 0–8 average knowledge, score ≥9 good knowledge) knowledge about antibiotic use/ misuse (score 0–9 average knowledge, score ≥10 good knowledge) and knowledge about legal aspects of antibiotic use (score 0–3 average knowledge, score≥4 good knowledge) were categorized accordingly **[Table 2].**

3.1.3. Self-reported antibiotic dispensing practice.

As indicated in the table, the majority of pharmacists reported dispensing antibiotics without a prescription based on patient requests **[Table 3]**. Overall, more than 50% of the staff acknowledged dispensing antibiotics without prescriptions for various infections. The highest frequency of non-prescription dispensing was reported for wound infections (67.4% of respondents), followed by acute sore throat (59%) **[Table 4]**.

3.1.4. Impact of pharmacists' knowledge on antibiotic dispensing practice in general.

Pharmacists have greater knowledge about antibiotics, dispensed fewer antibiotics to adults with minor bacterial infections. Similarly, those with a better understanding of antibiotic resistance (ABR) were less likely to dispense antibiotics to adults. Pharmacists with higher knowledge regarding antibiotic misuse and legal aspects significantly reduced the dispensing of antibiotics for minor viral infections in adults. In major domains where antibiotics were dispensed without a prescription, pharmacists with advanced knowledge of legalrequirements dispensed noticeably fewer units **[Table 5]**. Conversely, the socio-demographic factors assessed showed no significant association with the pattern of antibiotics dispensed without a prescription.

3.1.5. Impact of pharmacists' knowledge and socio-demographic factors on dispensing antibiotic past week for minor infections.

The study found no significant correlation between pharmacists' general knowledge of antibiotics and the common ailments examined. However, an increase in pharmacists' knowledge of antibiotic resistance was linked to a reduction in antibiotics dispensed for acute sore throat, the common cold, and urinary tract infections (UTIs). Notably, knowledge about the legal aspects of antibiotic use and the common cold showed a significant correlation, with a *p*-value of 0.005, indicating a reduction in antibiotics dispensed as legal knowledge improved **[Table 6]**.

Age and experience were linked to the dispensing patterns for the common cold; as age and experience increased, the number of antibiotics dispensed also increased. Part-time pharmacists dispensed fewer antibiotics for UTIs and diarrheal conditions compared to full-time workers **[Table 7]**.

3.1.6. Impact of pharmacist socio-demographic on antibiotics knowledge.

Pharmacists with higher educational qualifications and those employed as part-time workers demonstrated better knowledge about antibiotics, ABR, and the legal aspects of antibiotic use **[Table 8].**

3.2. Findings from the Simulated Client Study

A total of 51 community pharmacies were visited by simulated clients (SCs). Amoxicillin was the most frequently dispensed antibiotic. However, none of the pharmacists in these pharmacies inquired about drug allergy history or provided information on potential drug interactions when dispensing antibiotics for any simulated clinical scenario. When Azithromycin was specifically requested by name, many pharmacies initially required a prescription. However, with increased insistence, they eventually provided the antibiotic. The findings from this simulated client study indicate that dispensing antibiotics without a prescription is a common practice in many community pharmacies within the study region **[Table 9]**.

Table 1: Socio-demographic and professional characteristics.

Characteristics	**Frequency *n* (%)**
Gender	
Male	89 (67.4)
Female	43 (32.6)
Age group	
≤20	2(1.5)
21 -30	88 (66.6)
31-40	35 (26.5)
41-50	6 (4.5)
>50	1 (0.75)
Level of pharmacy education	
D.Pharmacy	32 (24.2)
B.Pharmacy	76 (57.6)
M.Pharmacy	10 (7.6)
Pharm.D	12 (9.09)
D.Pharm, B.Pharm	2 (1.51)
Employment type	
Owner	33 (25)
Employee	99 (75)
Experience	
≤1	51 (38.6)
2-5	37 (28.03)
6-10	25 (18.9)
11-15	11 (8.3)
>15	7 (5.3)
Missing Data	1 (0.75)
Employment status	
Full time	88 (66.67)
Part time	44 (33.3)

n – number

Table 2: Self-reported Knowledge scores of pharmacists

	Possible s core range	**Mean (± SD)**	**Good knowledge (*n*)**	**Average/ below average (*n*)**
Overall knowledge (*n* = 132)	0 - 34	20.79 (4.57)	33 (25)	99 (75)
Knowledge about Antibiotic (*n* = 132)	0 - 3	1.14 (0.63)	35 (26.5)	97 (73.5)
Knowledge about ABR (*n* = 132)	0 - 12	7.32 (2.19)	43 (32.6)	89 (69.4)
Knowledge about antibiotic use/ misuse (*n* = 132)	0 - 14	8.84 (2.44)	56 (42.4)	76 (57.6)
Knowledge about legal aspect of antibiotic use (*n* = 132)	0 - 5	3.47 (1.12)	68 (51.5)	64 (48.5)

n – number, SD- Standard deviation

Table 3: Self-reported antibiotic dispensing practice

Dispensing practice items	Frequency (%), *n* = 132	
	Never	Yes
Dispense antibiotics without a prescription on patient demand.	70 (53.03)	62 (46.9)
If I know the patient, I dispense antibiotics without a prescription on the patient's request.	34 (25.7)	98 (74.2)
I give antibiotics without prescription for adult patients with minor ailments caused by viral Infection.	96 (72.7)	36 (27.2)
Children who have viral infections, I dispense antibiotics without a prescription.	115 (87.1)	17 (12.8)
I give antibiotics without a prescription for adult patients with minor ailments caused by bacterial infections.	34 (25.7)	98 (74.2)
Children who have bacterial infections, I dispense antibiotics without a prescription.	61 (46.2)	71 (53.7)

Table 4: Proportion of dispensed antibiotics without a prescription in the last week for following minor infections

	Frequency (%), *n* = 132		
	Never (0%)	Yes	Don't know
Acute sore throat	33 (25)	78 (59)	21 (16)
Common cold and cough	27 (20.4)	74 (56.06)	31 (23.4)
Wound infection	27 (20.4)	89 (67.4)	16 (12.1)
Urinary tract infections	45 (34.09)	73 (55.3)	14 (10.6)
Diarrhea	51 (38.6)	41 (31.06)	40 (30.3)

Table 5: Impact of pharmacists' knowledge on antibiotic dispensing practice in general.

Predictors	Dispensing antibiotic without a prescription OR (95% CI) *p*					
	On patient's direct request	On known patient's direct request	For adult with minor viral infection	For children with minor viral infections	For adult with minor bacterial infections	For children with minor bacterial infections
Knowledge about AB	0.79 (0.36-1.73) 0.56	1.0 (0.41-2.42) 0.99	0.35 (0.12-1) 0.0505	0.83 (0.25-2.75) 0.76	0.38 (0.16-0.89) 0.027 *	0.54 (0.25-1.19) 0.13
Knowledge about ABR	0.4 (0.225-1.01) 0.055)	0.50 (0.22-1.13) 0.98	0.12 (0.03-0.44) 0.0012 **	0.24 (0.05-1.10) 0.067	0.36 (0.10-0.81) 0.013 *	0.64 (0.31-1.34) 0.245
Knowledge about antibiotic use/ misuse	0.51 (0.25-1.03) 0.0626	0.47 (0.21-1.05) 0.067	0.28 (0.11-0.69) 0.0054 **	0.37 (0.11-1.21) 0.101	0.661 (0.30-1.44) 0.301	0.67 (0.33-1.35) 0.271
Knowledge about legal aspect of antibiotic use	0.25 (0.12-0.51) 0.0002 ***	0.33 (0.14-0.78) 0.0115 *	0.171 (0.07-0.41) 0.0001 ***	0.24 (0.07-0.79) 0.019 *	0.40 (0.17-0.92) 0.031 *	0.26 (0.12-0.54) 0.0003 ***

p value
*** <0.001
** <0.01
* <0.05

Table 6: Impact of pharmacists' knowledge on dispensing antibiotic past week for minor infections.

Predictors	Dispensing antibiotic without a prescription OR (95% CI) *p*				
	Acute sore throat	**Common cold**	**Wound infections**	**UTI**	**Diarrhea**
Knowledge about AB	1.28 (0.48-3.40) 0.61	0.60 (0.21-1.73) 0.35	0.77 (0.29-2.02) 0.61	2.49 (0.97-6.42) 0.057	1.50 (0.58-3.88) 0.39
Knowledge about ABR	0.29 (0.12-0.70) 0.006 **	0.20 (0.07-0.56) 0.002 **	1.96 (0.71-5.36) 0.18	4.47 (1.76-11.33) 0.001 **	1.68 (0.68-4.12) 0.25
Knowledge about antibiotic use/ misuse	0.61 (0.26-1.38) 0.23	0.48 (0.17-1.19) 0.11	1.24 (0.51-2.97) 0.62	1.01 (0.47-2.14) 0.97	1.50 (0.65-3.43) 0.33
Knowledge about legal aspect of antibiotic use	0.77 (0.34-1.76) 0.54	0.256 (0.09-0.66) 0.005 **	1.95 (0.81-4.68) 0.13	1.09 (0.52-2.30) 0.80	0.78 (0.34-1.78) 0.55

p value
*** <0.001
** <0.01
* <0.05

Table 7: Impact of pharmacist's socio-demographic on dispensing antibiotic past week for minor infections. R^2, *p*

Demographic details	Dispensing antibiotic without a prescription in last week. R^2, *p*				
	Acute sore throat	**Common cold**	**Wound infections**	**UTI**	**Diarrhea**
Age	0.0002 0.8599	0.0300 0.0468 *	0.0022 0.5852	0.0132 0.1892	0.0084 0.2948
Experience	0.0013 0.681	0.0588 0.0050 **	0.0041 0.4635	0.0215 0.0930	0.0110 0.2304
Employment status (Full/part time)	0.0102 0.2485	0.0045 0.4415	0.0012 0.6910	0.0345 0.0327 *	0.0812 0.0009 **

p value
*** <0.001
** <0.01
* <0.05

Table 8: Impact of pharmacist socio-demographic on antibiotics knowledge. R^2, *p*

Demographic details	Overall knowledge about AB's	Knowledge about AB	Knowledge about ABR	Knowledge about use/misuse of AB	Knowledge about legal aspects of AB
Education	0.0961 0.0003 ***	0.0087 0.2876	0.0924 0.0004 ***	0.0820 0.0009 ***	9.7013 0.9110
Employment status (Full/part time)	0.0613 0.0043 **	0.0206 0.1013	0.0715 0.0020 **	0.0365 0.0287 *	0.0001 0.8934

p value
*** <0.001
** <0.01
* <0.05

Table 9: Sale of antibiotics without a prescription under different levels of demand

Levels of demand (statement)	*n* (%) of pharmacies dispensing	
	Antibiotic given *n*(%)	Refuses to dispense *n*(%)
Can you give me some drugs to alleviate the symptoms?	39 (76.5)	12 (23.5)
I would like some amoxicillin or Azithromycin	Amoxicillin - 8 (15.7) Azithromycin - 4 (7.8)	Nil

4. DISCUSSION

This study explored antibiotic knowledge and dispensing behaviours of antibiotics without a prescription in community pharmacy settings and identifies the possible factors (knowledge, professional and demographic Characteristics) impacting antibiotics dispensing. The study, demonstrated that pharmacists have poor knowledge about antibiotics, its use and resistance. Only 10.6% (*n*=14) pharmacist correctly defined the term antibiotics and 6.8% (*n*=9) of pharmacist had a good knowledge about ABs. This poor knowledge was reflected with a large proportion of participants providing antibiotics to patients on request, and inappropriately in situations where patients may have had viral infections. The study findings also demonstrated that pharmacists who know about the legal requirements for supplying antibiotics and who were knowledgeable about ABR and the use/ misuse of antibiotics, were less likely to dispense antibiotics without a prescription.

In this study male respondents were more compared to female respondents. This is similar to the study conducted by ShukryZawahir*et.al*, in 2018 in which more than half of respondent were male. Our findings regarding poor knowledge about antibiotics were similar to findings from other studies conducted in LMICs. ShukryZawahir*et.al*, found that the pharmacist had poor knowledge about antibiotics[16]. Similarly, another study conducted in Indian rural pharmacies found that half of the employees could correctly define antibiotics and two-thirds of them had not heard about the term ABR[17]. Thus, limited knowledge about antibiotics, their use/ misuse, as well as ABR could be a large factor influencing illegal and inappropriate supply of antibiotics without prescription to patients with minor infections presenting at community pharmacies.

Antibiotics without prescriptions were more readily dispensed to the patients who were known to the pharmacist. These findings were consistent with similar studies conducted by Ansari M [3] and Waseem H et.al,[9]. Pharmacists who had better knowledge about ABR, and legal aspect of ABs were less likely to dispense ABs for patients with viral and bacterial infections without a prescription. These findings were similar to the study conducted by ShukryZawahir*et.al*[16] and Apisarnthanarak*et.al*,[19].

The study concluded that most of the ABs dispensed without prescription was proceeded by Common cold, followed by Acute sore throat. This was similar to study conducted by Poyongo B *et.al*. The study found that dispensing of ABs without prescription for UTI (72%), diarrhoea (33%) and cold (25%) was significantly more[7]. Also, another study by Abubakar U *et.al,* in 2019, found that around 83% of pharmacists dispense ABs without prescription for UTI and 20% for cold[10]. Therefore, in addition to continuous education for pharmacists, revising the curricula of pharmacy programs and strict enforcement of antibiotic dispensing related regulations in the country should be established.

The level of pharmacy education had a significantly positive relationship with the pharmacist knowledge about ABs. In India, pharmacy education includes three main qualifications: Diploma in Pharmacy (D. Pharm), a two-year program for community pharmacy practice; Bachelor of Pharmacy (B. Pharm), a four-year undergraduate degree covering pharmaceutical sciences; and Master of Pharmacy (M. Pharm), a postgraduate degree specializing in advanced fields. These distinctions help in understanding pharmacists' educational backgrounds in this study. This study coincided with study conducted by Waseem H et.al,[9]. The study concluded that the demographic characteristics, such as Gender, age, education, experience and employment type and status were not significantly associated with non-prescription antibiotic dispensing practice. These findings were consistent with similar studies conducted to evaluate the inappropriate dispensing practice, by ShukryZawahir*et.al*,[16]. The aged and experienced pharmacist was more likely to dispense ABs without prescription. This was similar to the study conducted by Ansari M[18]. Pharmacists employed in pharmacies as part time workers had better knowledge about ABs, ABR and legal aspects about Abs, they comparatively dispensed lesser units of ABs for both UTI and diarrheal conditions than full time workers.

Simulated client method is an effective method of deriving valid measures of healthcare provider's actual practices, which are challenging to achieve through any other method. Findings from simulated client study concluded that majority of the pharmacy dispense

antibiotics without prescription. Around 78% of the pharmacist dispense Amoxicillin tablet without prescription. The results coincided with that of the study conducted by Bin Abdulhak. A *et.al*,[20] and Poyongo B *et.al*,[7]. Indian regulations prohibit dispensing antibiotics without a prescription, this study reveals that pharmacists continue to do so. This unlawful and inappropriate practice is linked to limited awareness of the legal and clinical aspects of antibiotics. There is a critical need to enhance the fundamental knowledge of community pharmacy staff regarding antibiotics, antibiotic resistance, and appropriate usage. The findings highlight significant gaps in pharmacists' knowledge and dispensing behaviours, underscoring the need for targeted awareness programs to promote rational antibiotic use.

5. CONCLUSION

It is vitally important for the government to recognize Antibiotic Resistance (ABR) as a significant public health concern. There should be carrying out the policies and regulations aimed to ensuring proper approach, reducing the public's unnecessary demands on health professionals, and curtailing the misuse of antibiotics. Empirical data can aid in crafting educational and behavioral interventions, creating effective dispensing guidelines, and reinforcing policies, all of which are vital steps in addressing this public health challenge. It's crucial for the government to rigorously enforce the laws surrounding the supply of antibiotics. In addition, it's essential to establish and adopt standards for the proper provision and distribution of antibiotics.

Limitations of the Study

- Like all self-reported public surveys, the findings' reliability largely depends on respondents' honesty and understanding.
- Random sampling may introduce selection bias.
- As the study was conducted in a specific local community, its findings may not be generalizable to the entire country or a broader region.
- The survey's 15–20-minute completion time may have led to response fatigue.

Abbreviation

Ab's	Antibiotics
ABR	Antibiotic Resistance
OTC	Over-The-Counter
MDR	Multidrug Resistance
ADRs	Adverse Drug Reactions
AMR	Antimicrobial Resistance
UTI	Urinary Tract Infection
WHO	World Health Organization
SCs	Simulated Clients

6. ACKNOWLEDGEMENTS

Authors' contributions

Karan Selvaraju and Deepthi C Denny planned and designed the project; Karan Selvaraju conducted the project and prepared a draft of the manuscript, Thiruvenkadam M and Grace Shaji Chittilappilly critically revised the manuscript. All authors have reviewed and approved the final version of the manuscript for submission.

Conflict of interest

None to declare

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Ethics approval

Before the initiation of the study, ethical approval was obtained from the Institutional Ethical Committee (proposal number 21/043).

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