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A Study to Assess Knowledge, Attitude and Practice of Pharmacists on Rational use of Antibiotics and Reserved Antibiotics in Bengaluru

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Abstract: Antibiotics treat bacterial infections, crucial for saving lives but misuse leads to resistance. Resistance develops naturally but misuse accelerates it. Reserved antibiotics are last resort for multi-drug-resistant infections. Proper antibiotic use via culture tests reduces resistance, improves patient outcomes, and decreases hospital stays. Pharmacists need better understanding to curb misuse, enhance care, and combat resistance, preserving antibiotics' efficacy and saving lives. Hence the objective of this study was to find out the knowledge, attitude and practice of rational use of antibiotics and reserved antibiotics, to ascertain the prevalence of rational use of antibiotics and to assess the prevalence of rational use of reserved antibiotics. A cross-sectional observational questionnaire-based study was conducted for pharmacists in Bengaluru. The research enrolled 500 pharmacists from various pharmacies who satisfy the inclusion criteria. Consent was obtained from all enrolled pharmacist. A questionnaire was distributed to the study participants prior to creating awareness. Knowledge regarding antimicrobial dispensing was provided with the help of information leaflets. Only 9% of pharmacists had above-average knowledge about antibiotics, while 91% had below-average knowledge. 38% of pharmacists had an above-average attitude towards antibiotic use, while 62% had a below-average attitude. 30% of pharmacists reported above-average practices, while 44% reported below-average practices regarding antibiotic use. The, the prevalence of rational use of antibiotics was found to be 43% and irrational use of antibiotics was found to be 57%. The prevalence of rational use of reserved antibiotics was found to be 58% and irrational use of antibiotics was found to be 42%. The study among pharmacists in Bengaluru found that educational programs and training are required to improve knowledge, attitude, and practices towards rational antibiotic use. Implementing health educational programs can promote appropriate use of antibiotics, enhancing patient quality of life and reducing hospital stays.

Keywords: Antibiotics, Pharmacist, Reserved antibiotics, Multi-drug-resistant infections, Rational use.

Introduction

Globally, community pharmacies are integral to healthcare systems and play vital roles in medication-provision services (Kehrer, et al. 2013; Aziz, et al. 2018). In the last few decades, pharmacy practices have morphed towards putting more

emphasis on ensuring patient safety by offering effective treatment at a low cost (Hermansyah, et al. 2018), with a shift from merely dispensing medicines to clinical activities in modern community pharmacy practices (Panvelkar, et al. 2009).

Antibiotics are the most frequently prescribed group of drugs in our developing country like lndia. Overuse, irrational use and poor compliance with antibiotics has resulted in development of various adverse drug reactions and along with it, occurrence of drug resistant bacteria in community (Damisie, et al. 2019). Emergence of resistance of antibiotics is increased by overuse of antimicrobial prescriptions. Almost majority of the prescriptions are prescribed without proper prescription from consultants, physicians or doctors globally (Shehadeh, et al. 2012). In developing countries like India, condition is much more severe than other developed countries, because of availability of the over the counter drugs (OTC) and self-medication (Damisie, et al. 2019; Shehadeh, et al. 2012). Along with that, this scenario has increased much financial burden on health system of India (Damisie, et al. 2019). It is mainly because of lack of consultants, doctors concern about long term drug resistance with dispensing of antibiotics without proper prescription in majority of countries (Charani, et al. 2010). Despite with this dreadful conditions and enormous spread of drug resistance, the effective bulletin of information to consultants regarding antibiotic misuse remains questioned or challenging (Först, et al. 2017).

Therefore, this study was carried out with primary objective to assess the knowledge, attitude, and practice of pharmacists on rational use of antibiotics and reserved antibiotics in Bengaluru, to ascertain the prevalence of rational use of antibiotics and to assess the prevalence of rational use of reserved antibiotics. The secondary objective was to determine the various pharmacists' qualification and their level of understanding regarding the rational use of antibiotics.

Materials and Methods

A Cross Sectional questionnaire-based study was carried out in Bengaluru. Inclusion criteria was all the pharmacists working in retail pharmacy and willing to participate. An exclusion criterion was pharmacists who denied participating. The sample size for this study, calculated using Krejcie and Morgan Formula, is 370 (Shetti, et al. 2023; Alowfi, et al. 2023). A total of 515 pharmacists from Bengaluru who met the study criteria and consented for the study were enrolled. The study was conducted over a period of 6 months from March 2024 to August 2024. Ethical committee clearance was obtained from the Institutional Ethical committee (IEC) of Sagar Hospitals, Jayanagar Bengaluru. Sources of data were Google forms using self-designed questionnaire and interaction with the pharmacists using self-designed questionnaire.

Study Materials

Study materials used for the collection of data were Participant information sheet, Consent form, Questionnaire and Patient Information leaflet.

Study Procedure

Pharmacists' Enrolment

A community based prospective cross sectional observational study was conducted at pharmacies of Bengaluru. The study was conducted to 515 pharmacists who met the inclusion criteria. Patients who were unwilling to participate and who did not meet the inclusion criteria were excluded from the study (Belamarić, et al. 2023).

Method of collection of data / Study procedure

A cross sectional observational questionnaire-based study was conducted for pharmacists in Bengaluru using the self-designed questioners (annexure-3). The research enrolled pharmacists from various pharmacies who satisfied the inclusion criteria. Participant information sheet (annexure – 1) was provided with the pharmacists before taking the consent. Consent was obtained from all enrolled pharmacist using (annexure – 2). A questionnaire was distributed to the study participants prior to creating awareness. Knowledge regarding antimicrobial dispensing was provided with the help of information leaflets. The data collected was analyzed using appropriate statistical tests and reported. A Patient information leaflet (PIL) [annexure -4] was also provided to improve patient adherence and knowledge of the prescribed dug after proper validation and evaluation of the same (Chaw, et al. 2018).

Law she's Content Validity: The development of a Patient Information Leaflet (PIL) [annexure 4] involved a comprehensive approach, beginning with the use of Lawshe's Content Validity Ratio for expert assessment of the PIL's content. The content validity of the PIL was assessed by professors who evaluated the relevance of each item in the PIL. The content of the PIL was translated into the local language, Kannada with the help of a language expert (Rajopadhye, et al. 2022).

Readability test: The readability of the prepared leaflets were calculated using Flesch's Reading Ease (FRE) & Flesch-Kincaid Grade Level (FK-GL) online readability calculators to gauge how easy a piece of text is to understand. The FRE score ranges from (0-100) were a score <60% text is considered difficult to read. FK-GL computes the US grade level required to read the text (Ali, et al. 2019).

PIL design: Baker Able Leaflet Design (BALD) Index was adapted to assess the PIL's graphic design and visual appeal. This index was adapted to appropriate values and

adjustments were made to align with specific criteria or standards (Shetti, et al. 2023; Alowfi, et al. 2023).

Statistical methods

The methodology employed in this study involved utilizing various statistical tools in Microsoft excel to compile the data and SPSS version 27 was used to analyse the data and interpret the gathered data. Data frequency and percentage tables were employed to provide a descriptive overview. For univariate presentation, simple bar charts and pie charts were utilized, while multivariate presentations utilized cluster bar charts. To assess mean differences between rational and irrational use, paired samples Chi square test were applied. Mean differences between male and female participants were tested using two-independent samples Chi square test. Additionally, the analysis of variance test (ANOVA-test) was employed to examine mean differences across different age intervals. Throughout these analyses, a 5% significance level was assumed, and the tests were conducted with an 80% power level.

Results and Discussion

In this Prospective Cross-Sectional questionnaire-based study which was conducted for pharmacists over six months in Bengaluru, involved 515 pharmacists. The study aimed to assess the knowledge, attitude, and practice of pharmacists on rational use of antibiotics and to find the prevalence of rational use of antibiotics and reserved antibiotics based on the qualification, gender and age.

Socio-demographic details of study participants

A total of 515 Pharmacist were participated in this study. Females were in the majority, being 62% (n=318) of the total participants and 38% (n=197) were males (figure 1).

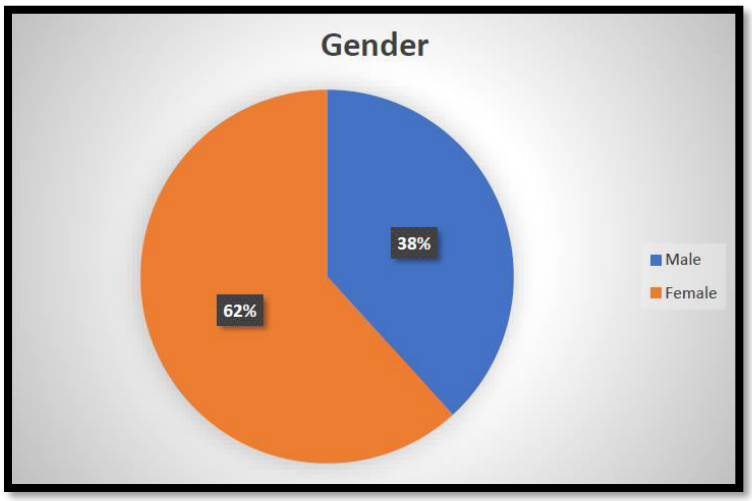

Figure 1. Distribution of subjects according to gender

According to age of participants, the majority 67.6% (n=348) were below the age of 30 years and 17.3% (n=89) were in the age group of 30-40, 11.1% (n=57) were in the age group of 40-50 and 4.1% (n=21) were in the age group of >50 (Figure 2).

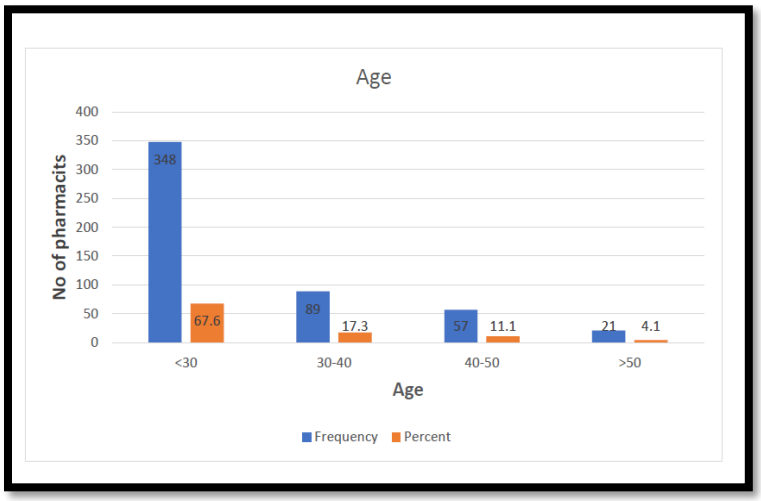

Figure 2. Distribution of subjects according to age group

The most common qualification was the Diploma in Pharmacy (D. Pharma), held by 40.4% of the pharmacists, equating to 208 individuals. This indicates that a significant portion of the workforce has foundational training in pharmacy. Following D. Pharma, the Bachelor of Pharmacy (B. Pharma) represented 13% of the respondents, or 67 pharmacists, suggesting a smaller segment of the population with a more advanced undergraduate degree. Meanwhile, 24.5% of the pharmacists, totaling 126 individuals, held a Master of Pharmacy (M. Pharma), indicating a notable presence of professionals with postgraduate education. The Doctor of Pharmacy (Pharm. D) qualification accounted for 21.2% of the sample, which corresponds to 109 pharmacists. This reflects a growing trend towards advanced clinical training in pharmacy practice. Lastly, the Post-Baccalaureate Doctor of Pharmacy (Pharm. D PB) was the least common qualification, representing just 1% of the pharmacists, or 5 individuals, suggesting that this pathway is not widely pursued in the surveyed population. Overall, the data illustrates a diverse range of educational qualifications among pharmacists, with a clear emphasis on foundational training and an increasing trend toward advanced degrees (Table 1).

Table 1. Distribution of subjects according to Qualifications

Qualifications	Frequency (515)	Percentage (%)
D. Pharma	208	40.4
B. Pharma	67	13
M. Pharma	126	24.5
Pharma D	109	21.2
Pharma (PB)	5	1
Total	515	100

Knowledge of Pharmacist on rational use of antibiotics

The result of knowledge assessments that were conducted with males and females is given in table 2. The above average knowledge of males and females was 8% (n=15) and 9% (n=29), respectively, while the below average knowledge of males and females was 92% (n=182) and 91% (n=289), respectively. Comparing females to males, the females had higher knowledge that was above average.

Table 2. The knowledge assessment done in various age groups

Gender	Knowledge		Total
	Below Average	Above Average	
Male	182	15	197
	92.40%	7.60%	100.00%
Female	289	29	318
	90.90%	9.10%	100.00%
Total	471	44	515
	91.50%	8.50%	100.00%

From the distribution of subjects according to knowledge based on age, the age < 30 had an above average knowledge of 9% (n=31) and below average knowledge of 91% (n=317) and age group between 30-40 had an above average knowledge of 11% (n=10) and below average knowledge of 89% (n=79) and age group between 40-50 years had an above average knowledge of 5% (n=3) and below average knowledge 95% (n=54) and age group more than 50 had an above average knowledge of 0% (n=0) and below average knowledge of 100% (n=21) (Figure 3). This finding highlights a concerning gap in knowledge among pharmacists, as the majority—91% (n=471)—scored below average. Implementing regular continuing education programs could help bridge this knowledge gap, ensuring that all pharmacists are equipped with the latest information and best practices in their field.

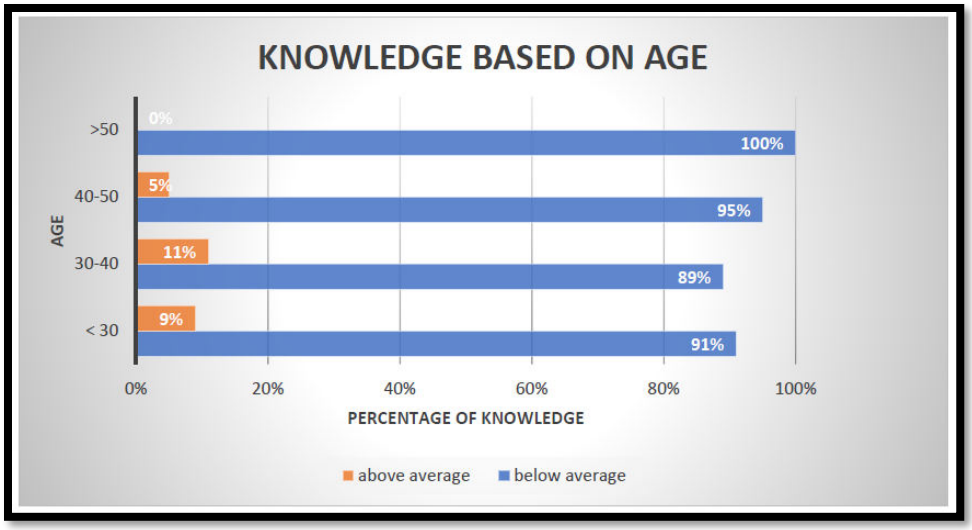

Figure 3. Knowledge assessment of antibiotic usage in various age groups

From the distribution of subjects according to knowledge based on Qualification, D. Pharma had an above average knowledge of 12% (n=25) and below average knowledge of 88% (n=183) and B. Pharma had an above average knowledge of 12% (n=8) and below average knowledge of 88% (n=59) and M. Pharma had an above average knowledge of 0% (n=0) and below average knowledge 100% (n=126) and Pharma. D had an above average knowledge of 10% (n=11) and below average knowledge of 90% (n=98) and Pharma. D (PB) had an above average knowledge of 0% (n=0) and below average knowledge of 100% (n=5 (Table 3).

Table 3. Knowledge assessment done among various qualifications

Qualification	Knowledge		Total
	Below Average	Above Average	
D.Pharma	183	25	208
	88.00%	12.00%	100.00 %
B. Pharma	59	8	67
	88.10%	11.90%	100.00 %
M.Pharma	126	0	126
	100.00%	0.00%	100.00 %
PharmaD	98	11	109
	89.90%	10.10%	100.00

			%
Pharma (PB)	5	0	5
	100.00%	0.00%	100.00 %
Total	471	44	515
	91.50%	8.50%	100.00 %

chi-square statistic = 16.777, p-value = 0.002

Attitude of Pharmacist on rational use of antibiotics

Out of 515 pharmacists, only 38% (n=193) had above average attitude out of all attitude questions remaining 62% (n = 322) had below average attitude out of all attitude questions (Table 4).

Table 4. The attitude assessment among study participants

Attitude	Frequency	Percent
Below Average	322	62.5
Above Average	193	37.5
Total	515	100.0

The attitude assessments that were conducted with males and females are shown in the table no 9 and graph no 9. The above average attitude of males and females was 44%(n=86) and 34%, (n=107) respectively, while the below average attitude of males and females was 56%(n=111) and 66%(n=211), respectively. Comparing females to males, the females had higher attitude that was above average (Figure 4).

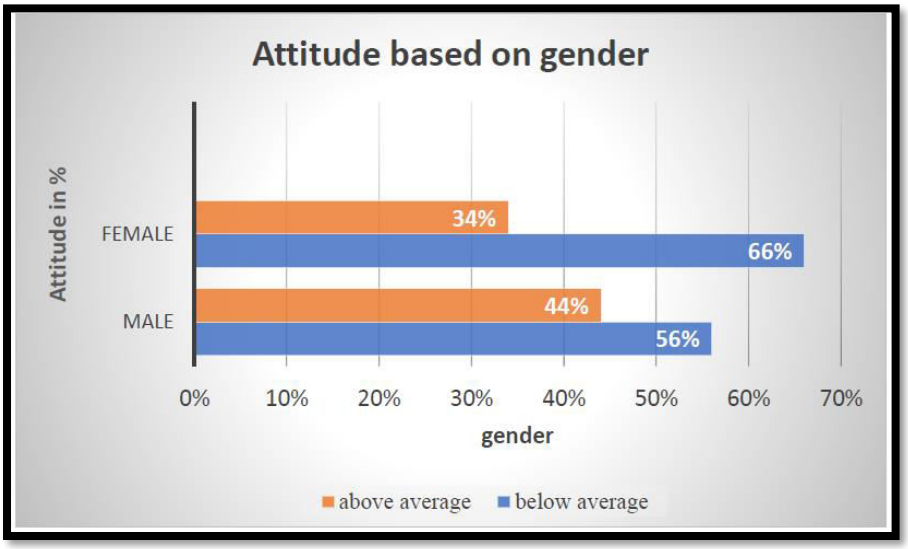

Figure 4. The attitude assessment done among male and female

From the distribution of subjects according to attitude based on age, the age < 30 had an above average attitude of 37% (n=130) and below average attitude of 63%(n=218) and age group between 30-40 had an above average attitude of 17%(n=15) and below average attitude of 83% (n=74) and age group between 40-50 years had an above average attitude of 61% (n=35) and below average attitude 39%(n=22) and age group more than 50 had an above average attitude of 62% (n=13) and below average attitude of 38%(n=8) (Figure 5).

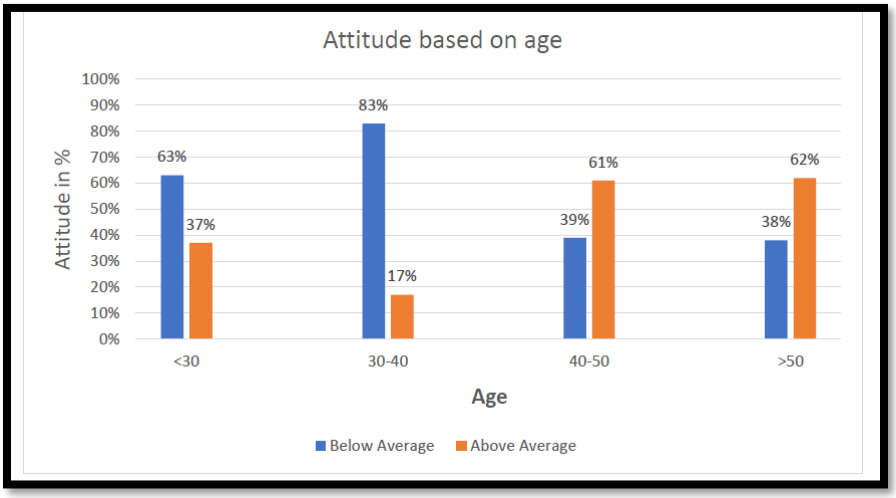

Figure 5. The attitude assessment done among participants at different age intervals

From the distribution of subjects according to attitude based on Qualification, D. Pharma had an above average attitude of 33% (n=68) and below average attitude of 67% (n=140) and B. Pharma had an above average attitude of 42%(n=28) and below average attitude of 58% (n=39) and M. Pharma had an above average attitude of 50%(n=63) and below average attitude 50% (n=63) and Pharma. D had an above average attitude of 31% (n=34) and below average attitude of 69% (n=75) and Pharma. D (PB) had an above average attitude of 0% (n=0) and below average attitude of 100% (n=5) (Table 5).

Table 5. The attitude assessment done among different qualifications

Qualification	Attitude		Total
	Below Average	Above Average	
D.Pharma	140	68	208
	67.30%	32.70%	100.00%
B. Pharma	39	28	67
	58.20%	41.80%	100.00%
M.Pharma	63	63	126
	50.00%	50.00%	100.00%
PharmaD	75	34	109
	68.80%	31.20%	100.00%
Pharma(PB)	5	0	5
	100.00%	0.00%	100.00%
Total	322	193	515
	62.50%	37.50%	100.00%

chi-square statistic = 17.341, p-value = 0.003

The findings suggest that while a minority of pharmacists may possess a positive or proactive outlook regarding their professional responsibilities and practices, the majority may have attitudes that could hinder their effectiveness in patient care and professional interactions. Such below-average attitudes might impact their engagement with patients, collaboration with healthcare teams, and adherence to best practices. The prevalence of below-average attitudes highlights the necessity for interventions aimed at improving the professional mindset of pharmacists. Strategies could include workshops, mentorship programs, and team-building exercises designed to foster a more positive and collaborative environment. By addressing these attitudes, the overall quality of pharmaceutical care could be enhanced, ultimately benefiting patient outcomes and public health.

Practice of Pharmacist on rational use of antibiotics

Out of 515 pharmacists, 30% (n=156) had above average practice out of all practice questions and 26% (n=131) had average practice out of all practice questions

remaining 44% (n = 228) had below average practice out of all practice questions (Figure 6).

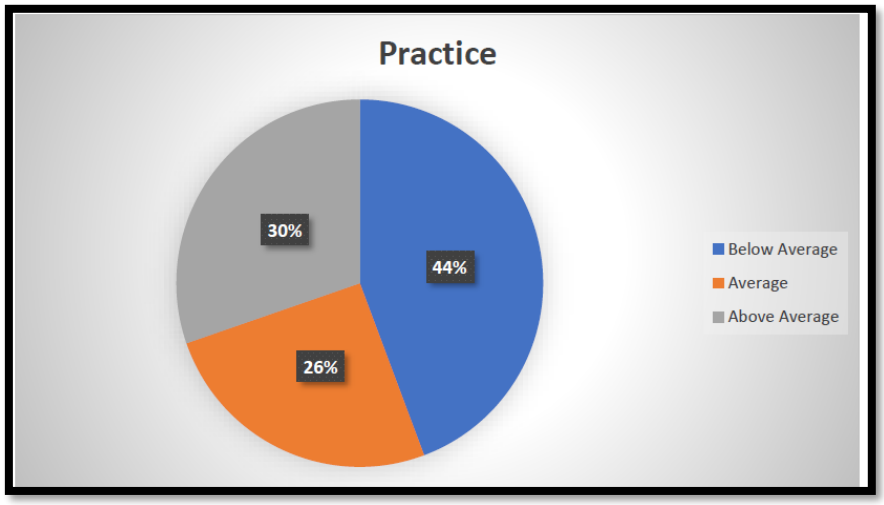

Figure 6. The practice assessment among study participants

The Practice assessments that were conducted with males and females are shown in the table no 13 and graph no 13. The above average Practice of males and females was 27% (n=54) and 32%(n=102), respectively, while the average Practice of males and females was 22%(n=43) and 28% (n=88) respectively, while the below average Practice of males and females was 51%(n=100) and 40%(n=128), respectively. Comparing females to males, the females had higher Practice that was above average (Figure 7).

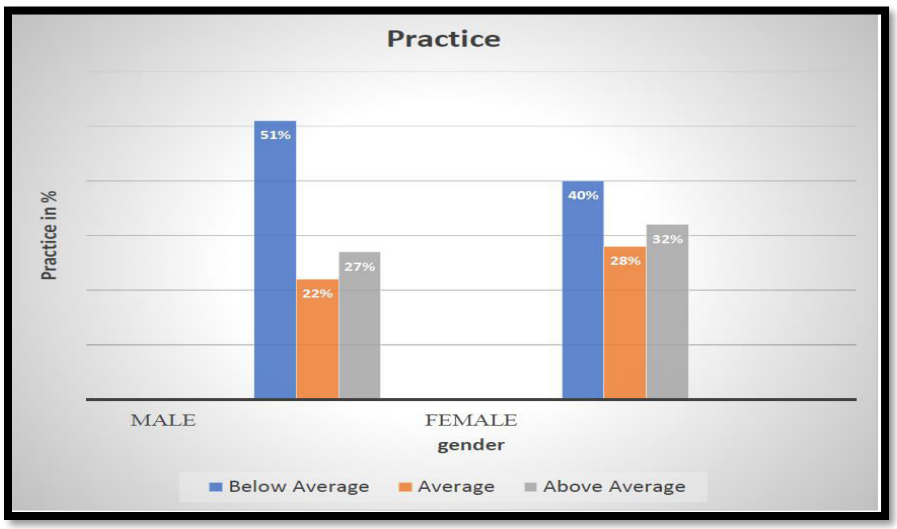

Figure 7. The practice assessment done among male and female participants

From the distribution of subjects according to practice based on age, the age < 30 had an above average practice of 25% (n=86) and average practice of 24% (n=83)

below average practice of 51%(n=179) and age group between 30-40 had an above average practice of 51% (n=45) and average practice of 19% (n=17) below average practice of 30% (n=27) and age group between 40-50 years had an above average practice of 40% (n=23) and average practice of 32%(n=18) below average practice 28% (n=16) and age group more than 50 had an above average practice of 9% (n=2) and average practice of 62% (n=13) below average knowledge of 29% (n=6) (Figure 8).

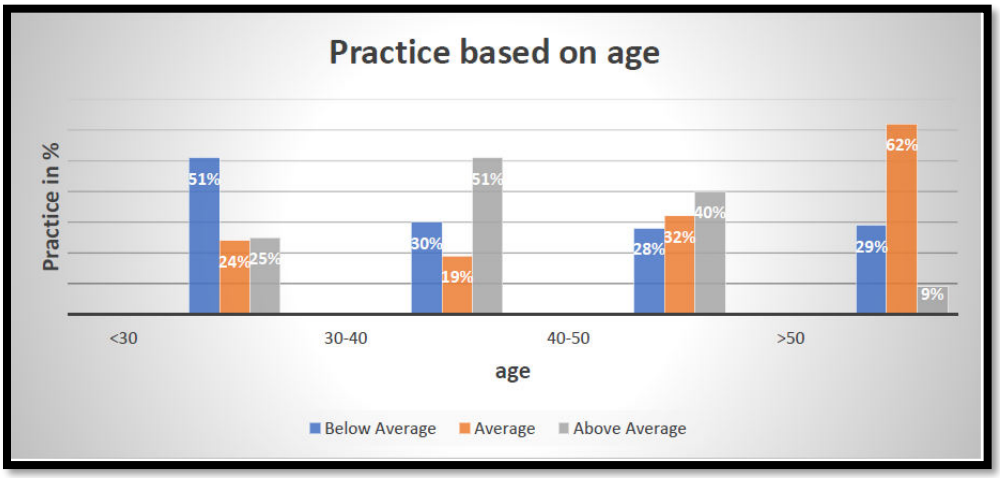

Figure 8. The practice assessment done among different age groups

From the distribution of subjects according to practice based on Qualification, D. Pharma had an above average practice of 40% (n=84) and average practice of 41% (n=85) below average practice of 19% (n=39) and B. Pharma had an above average practice of 49% (n=33) and average practice of 15% (n=10) below average practice of 36% (n=24) and M. Pharma had an above average practice of 9% (n=12) and average practice of 16% (n=20) below average practice 75% (n=94) and Pharma. D had an above average practice of 22% (n=24) and average practice of 15% (n=16) below average practice of 63% (n=69) and Pharma. D (PB) had an above average practice of 60% (n=3) and below average practice of 40% (n=2) (Table 6).

Table 6. The practice assessment done among different qualifications

Qualification	Practice			Total
	Below Average	Average	Above Average	
D. Pharma	39	85	84	208
	18.80%	40.90%	40.40%	100.00%
B. Pharma	24	10	33	67
	35.80%	14.90%	49.30%	100.00%
M. Pharma	94	20	12	126

	74.60%	15.90%	9.50%	100.00%
PharmaD	69	16	24	109
	63.30%	14.70%	22.00%	100.00%
Pharma(PB)	2	0	3	5
	40.00%	0.00%	60.00%	100.00%
Total	228	131	156	515
	44.30%	25.40%	30.30%	100.00%

chi-square statistic = 136.750, p-value = 0.000

This portion highlights a concern regarding the level of practice competency among nearly half of the participants, indicating that these pharmacists may need further training or support to enhance their skills and knowledge. Overall, these results reflect a distribution of practice competence among pharmacists, with a notable need for improvement among those categorized as below average. Addressing these gaps in practice could be vital for enhancing the overall quality of pharmaceutical care.

There is significant difference of practice observed among gender, age and also among different qualifications.

Prevalence of Rational use of Antibiotics

Out of 515 pharmacists, the prevalence of rational use of antibiotics was found to be 43% (n=221) and irrational use of antibiotics was found to be 57% (n=294) (Table 7).

Table 7. The prevalence of rational use of antibiotics

Rational use of antibiotics	**Frequency**	**Percentage**
Rational use	221	43%
Irrational use	294	57%
Total	515	100

Out of 515 pharmacists, the no of OTC medication dispensing <50 daily is 313 and the no of OTC medication dispensing 50-100 daily is 181 and the no of OTC medication dispensing >100 daily is 21 (Table 8).

Table 8. The number of OTC dispensing occurring in the pharmacy

No. of OTC Antibiotics	**No of pharmacist**
<50	313
50-100	181
>100	21

The assessment on irrational use of antibiotics that were conducted with males and females are shown in the table no 16 and graph no 16. The <50 OTC dispensing of males and females was 94% (n=186) and 88%(n=280), respectively, while the 50-100 OTC dispensing of males and females was 6%(n=11) and 11% (n=36) respectively, while the >100 OTC dispensing of males and females was 0%(n=0) and 1%(n=2), respectively. Comparing females to males, the females had higher irrational use (Table 9).

Table 9. Non-prescription antibiotic dispensing encounters happening in the everyday among male and female

Gender	How many non-prescription antibiotics dispensing encounters happen in a day?			Total
	<50	50-100	>100	
Male	186	11	0	197
	94.40%	5.60%	0.00%	100.00%
Female	280	36	2	318
	88.10%	11.30%	0.60%	100.00%
Total	466	47	2	515
	90.50%	9.10%	0.40%	100.00%

chi-square statistic = 6.171, p-value = 0.046

From the distribution of subjects according to irrational use of antibiotics based on age, the age < 30 had an <50 OTC dispensing of 89% (n=311) and 50-100 OTC dispensing of 10% (n=35) >100 of 1%(n=2) and age group between 30-40 had an <50 OTC dispensing of 99% (n=88) and 50-100 OTC dispensing of 1% (n=1) >100 OTC dispensing of 0% (n=0) and age group between 40-50 years had an <50 OTC dispensing of 100% (n=57) and 50-100 OTC dispensing of 0%(n=0) >100 OTC dispensing is 0% (n=0) and age group more than 50 had <50 OTC dispensing of 48% (n=10) 50-100 OTC dispensing of 52% (n=11) >100 OTC dispensing of 0% (n=0) (Table 10).

Table 10. Non-prescription antibiotic dispensing encounters happening in the everyday among in various age intervals

Age	How many non-prescription antibiotics dispensing encounters happen in a day?			Total
	<50	50-100	>100	
	311	35	2	348

<30	89.40%	10.10%	0.60%	100.00%
30-40	88	1	0	89
	98.90%	1.10%	0.00%	100.00%
40-50	57	0	0	57
	100.00%	0.00%	0.00%	100.00%
>50	10	11	0	21
	47.60%	52.40%	0.00%	100.00%
Total	466	47	2	515
	90.50%	9.10%	0.40%	100.00%

chi-square statistic = 61.366, p-value = 0.000

From the distribution of subjects according to irrational use of antibiotics based on Qualification, D. Pharma had an <50 OTC dispensing of 90% (n=188) and 50-100 OTC dispensing of 10% (n=20) >100 OTC dispensing of 0% (n=0) and B. Pharma had an <50 OTC dispensing of 100% (n=67) and 50-100 OTC dispensing of 0% (n=0) >100 OTC dispensing of 0% (n=0) and M. Pharma had an <50 OTC dispensing of 83% (n=105) and 50-100 OTC dispensing of 16% (n=20) >100 OTC dispensing 1% (n=1) and Pharma. D had an <50 OTC dispensing of 94% (n=103) and 50-100 OTC dispensing of 5% (n=5) >100 OTC dispensing of 1% (n=1) and Pharma. D (PB) had an <50 OTC dispensing of 60% (n=3) and 50-100 OTC dispensing of 40% (n=2)>100 OTC dispensing of 0% (n=0) (Table 11).

Table 11. Non-prescription antibiotic dispensing encounters happening in the everyday in various qualifications

Qualification	**How many non-prescription antibiotics dispensing encounters happen in a day?**			**Total**
	<50	**50-100**	**>100**	
D.Pharma	188	20	0	208
	90.40%	9.60%	0.00%	100.00%
B. Pharma	67	0	0	67
	100.00%	0.00%	0.00%	100.00%
M.Pharma	105	20	1	126
	83.30%	15.90%	0.80%	100.00%
PharmaD	103	5	1	109
	94.50%	4.60%	0.90%	100.00%
Pharma (PB)	3	2	0	5
	60.00%	40.00%	0.00%	100.00%
Total	466	47	2	515

	90.50%	9.10%	0.40%	100.00%

chi-square statistic = 24.633, p-value = 0.002

The findings suggest a significant need for continued education and training on proper antibiotic stewardship among pharmacists. Enhanced awareness campaigns and adherence to guidelines (e.g., WHO's AWaRe framework) could help minimize irrational antibiotic use. Future interventions should focus on bridging the knowledge gap and promoting optimal antibiotic prescribing practices. This study highlights the urgent need for improved antibiotic stewardship among pharmacists to ensure responsible and effective use of these life-saving medications.

Prevalence of Rational use of Reserved Antibiotics

Out of 515 pharmacists, the prevalence of rational use of reserved antibiotics was found to be 58% (n=99) and irrational use of antibiotics was found to be 42% (n=216) (Figure 9).

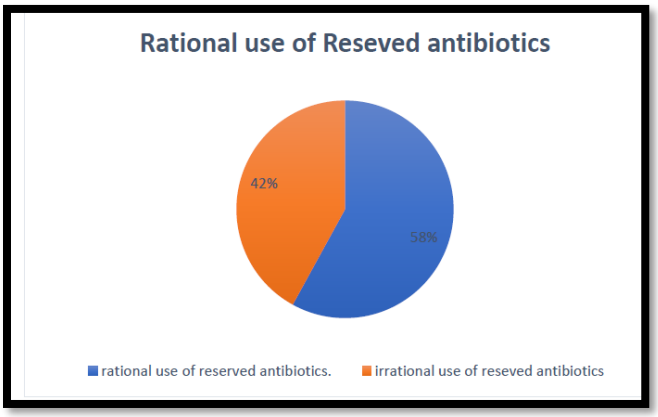

Figure 9. The prevalence of rational use of reserved antibiotics

The findings underscore the need for enhanced stewardship and stricter adherence to guidelines (e.g., WHO's AWaRe framework) for reserved antibiotics. Targeted education and training on proper usage and monitoring are crucial for pharmacists. Regulatory measures and prescription monitoring programs should be reinforced to prevent misuse. To maintain the efficacy of reserved antibiotics, it's essential to address the irrational use among pharmacists through targeted interventions and adherence to established guidelines.

Out of 515 pharmacists, the dispensing of combination therapy of antibiotics was found to be 84% (n=433) and the not dispensing of combination therapy of antibiotic was found to be 16% (n=82) (Figure 10).

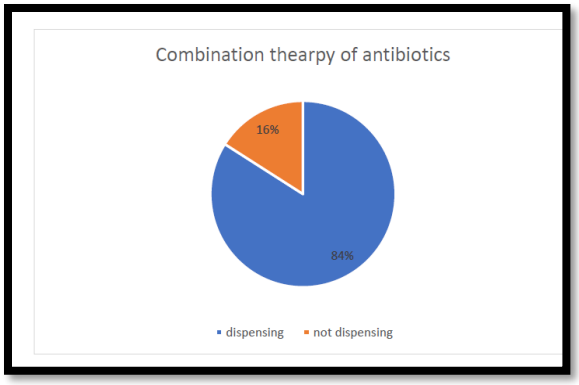

Figure 10. The details on dispensing of combinational therapy of antibiotics

The assessment on combinational therapy of antibiotics that were conducted with males and females are shown in the table no 23 and graph no 23. The dispensing of combination of antibiotics of males and females was 88% (n=173) and 74%(n=236), respectively, while the not dispensing of combination therapy of males and females was 7%(n=14) and 21% (n=68) respectively, while they may be dispensing of combination of antibiotics of males and females was 5%(n=10) and 5%(n=14), respectively (Figure 11).

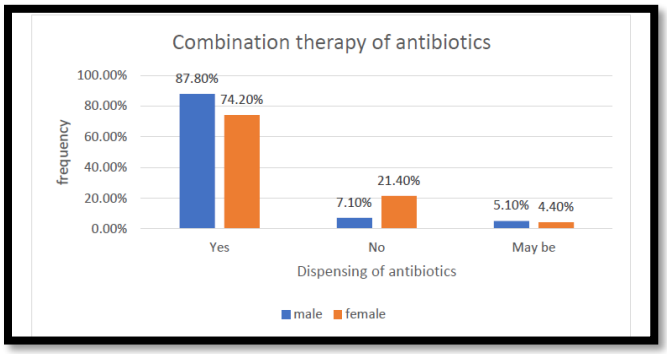

Figure 11. The details on dispensing of combinational therapy of antibiotics among male and female

From the distribution of subjects according to dispensing of combination therapy of antibiotics based on age, the age < 30 had an dispensing of combination therapy of antibiotics of 78%(n=273) and not dispensing of combination therapy of antibiotics of 18% (n=64) may be dispensing of combination therapy of antibiotics of 4%(n=11) and age group between 30-40 had an dispensing of combination therapy of antibiotics of 79% (n=70) and not dispensing of combination therapy of antibiotics of 7% (n=6) may be dispensing of combination therapy of antibiotics of 14% (n=13) and age group between 40-50 years had an dispensing of combination therapy of antibiotics of 79% (n=45) and not dispensing of combination therapy of antibiotics of 21%(n=12) may be dispensing of combination therapy of antibiotics is 0% (n=0) and

age group more than 50 had dispensing of combination therapy of antibiotics of 100% (n=21) not dispensing of combination therapy of antibiotics of 0% (n=0) may be dispensing of combination therapy of antibiotics of 0% (n=0) (Table 12).

Table 12. Dispensing of combinational therapy of antibiotics among in various age intervals

Age	Do you know about combination therapy of antibiotics?			Total
	Dispensing	Not Dispensing	May be dispensing	
<30	273	64	11	348
	78.40%	18.40%	3.20%	100.00%
30-40	70	6	13	89
	78.70%	6.70%	14.60%	100.00%
40-50	45	12	0	57
	78.90%	21.10%	0.00%	100.00%
>50	21	0	0	21
	100.00%	0.00%	0.00%	100.00%
Total	409	82	24	515
	79.40%	15.90%	4.70%	100.00%

chi-square statistic = 35.706, p-value = 0.000

From the distribution of subjects according to dispensing of combination therapy of antibiotics based on Qualification, D. Pharma had an dispensing of combination therapy of antibiotics of 69% (n=144) and not dispensing of combination therapy of antibiotics of 19% (n=40) may be dispensing of combination therapy of antibiotics of 12% (n=24) and B. Pharma had an dispensing of combination therapy of antibiotics of 76% (n=51) and not dispensing of combination therapy of antibiotics of 24% (n=16) may be dispensing of combination therapy of antibiotics of 0% (n=0) and M. Pharma had an dispensing of combination therapy of antibiotics of 87% (n=109) and not dispensing of combination therapy of antibiotics of 13% (n=17) may be dispensing of combination therapy of antibiotics 0% (n=0) and Pharma. D had a dispensing of combination therapy of antibiotics of 92% (n=100) and not dispensing of combination therapy of antibiotics of 8% (n=9) may be dispensing of combination therapy of antibiotics of 0% (n=0) and Pharma. D (PB) had a dispensing of combination therapy of antibiotics of 100%(n=0) and dispensing of combination therapy of antibiotics of 0% (n=0) may be dispensing of combination therapy of antibiotics of 0% (n=0) (Table 13)

Table 13. Dispensing of combinational therapy of antibiotics among in various qualifications

Qualification	Do you know about combination therapy of antibiotics?			Total
	Yes	No	May be	
D. Pharma	144	40	24	208
	69.20%	19.20%	11.50%	100.00%
B. Pharma	51	16	0	67
	76.10%	23.90%	0.00%	100.00%
M.Pharma	109	17	0	126
	86.50%	13.50%	0.00%	100.00%
PharmaD	100	9	0	109
	91.70%	8.30%	0.00%	100.00%
Pharma(PB)	5	0	0	5
	100.00%	0.00%	0.00%	100.00%
Total	409	82	24	515
	79.40%	15.90%	4.70%	100.00%

chi-square statistic = 50.763, p-value = 0.000

Participant Information Leaflet (PIL)-Annexure III:

The results shows that the frequency and percentage of the items on the participant information leaflet agreed by the experts for the evaluation of the content validity according to Lawshe's scale. CVI scores of item no. 5 was below 0.8 and hence were excluded form PIL.

Table 14. Panel of Expert Agreement on the items of the PIL

No. of Items	Items	No. in Agreement	Content Validity Index
1	What are Antibiotics?	8	1
2	What are Reserved Antibiotics?	8	1
3	Rational use of Antibiotics	8	1
4	Impact of rational use of Antibiotics	8	1
5	Commonly used Antibiotics	6	0.75

Table 15 represents the Baker able leaflet design (BALD) method used to assess the layout and design characteristics of the Information Leaflet. BALD index was 24 for English version, and 22 for Kannada version.

Table 15. Design Characteristics of the Participant Information Leaflet (PIL)

Design Characteristics	Values	
	English Version	Kannada Version
Lines 50-89mm long	1	1
Separation between lines	2	2
Lines Unjustified	1	1
Serif typeface	2	0
Type size	3	3
First line intended	1	1
Title lowercase	0	0
Italics	2	2
Positive advice	2	2
Headings standout	2	2
Numbers all Arabic	0	0
Boxed texts	1	1
Pictures	2	2
Number of colours	2	2
Whitespace	0	0
Paper quality	3	3
Total	24	22

Table 16 represents the readability scores assessed using online readability calculator FRE and FK-GL. The best FRE score was above 18.01 and FK-GL score was 16.02.

Table 16. Information Leaflet Readability Test Score (Final Version)

Readability Tests	Sentences	Words	Syllables	Score	Grade
Flesch Reading-ease (FRE)	14	313	622	18.01	Graduate
Flesch-Kincaid Grade level (FK-GL)	14	313	622	16.02	College Graduate

Conclusion

Antibiotics are potent drugs that play a crucial role in treating bacterial infections in humans and animals. However, the growing threat of antibiotic resistance compromises their effectiveness, making it challenging or impossible to treat resistant illnesses. The Global Antimicrobial Resistance and Use Surveillance System (GLASS) report highlights the alarming rates of resistance to common bacterial infections, emphasizing the need for responsible antibiotic use.

In this Prospective Cross-Sectional questionnaire-based study which was conducted for pharmacists at Bengaluru concludes that Appropriate health educational programs should be implemented to increase the level of preventive practices, knowledge, and attitude toward rational use of antibiotics and reserved antibiotics among pharmacist. By conducting educational programs and by training them appropriately we can create awareness and improve rational use of antibiotics and reserved antibiotics which in turn improve the patient quality of life and reduce the hospital stay. The information leaflet played a crucial role in improving the practices, knowledge, and attitude toward rational use of antibiotics and reserved antibiotics among pharmacist which in turn helps in promotion of rational use of antibiotics and reserved antibiotics. However, the study will be extended with future directions like enlarging the sample size which could lead to more precise and reliable result, carrying out the research in rural Bengaluru, increasing pharmacists' awareness, including patients in the study, including other medical professionals and students in the research.

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Conflicts of Interest: The authors declare no conflicts of interest.

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