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Research Paper

An educational intervention on organizational impact evaluation of the knowledge, attitude, and practice of community on the use of antibiotics

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ABSTRACT

Background: Antibiotics remain one of the most frequently used treatments for infections. However, their widespread misuse has fueled the emergence of resistant bacteria, posing a serious threat to global health. Objective: This study aimed to assess the community's knowledge, attitudes, and practices (KAP) regarding antibiotic use and to determine the impact of structured educational interventions. Methodology: A prospective interventional study was conducted in a community setting in Bangalore after receiving ethical clearance from the Kshema Independent Ethics Committee. A validated 26-item questionnaire was developed, covering knowledge (10 items), attitudes (9 items), and practices (7 items). Responses were recorded using a five-point Likert scale. Participants received educational interventions through information leaflets and personalized one-on-one counselling. The same questionnaire was re-administered three months later, and pre- and post-intervention scores were compared using paired t-tests. Results: Prior to the intervention, participants demonstrated limited awareness and risky practices concerning antibiotic use. After the intervention, substantial improvements were observed across all KAP domains, with participants showing better understanding, healthier attitudes, and safer practices toward antibiotic consumption. Conclusion: Educational initiatives, particularly when delivered through leaflets and direct communication, significantly enhance public awareness and responsible use of antibiotics. Such interventions could play a crucial role in combating antibiotic resistance at the community level.

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1. INTRODUCTION

The antimicrobials and in particular the antibiotics are widely utilized to cure the bacterial infections by either killing the bacteria or suppressing the growth of bacteria. The antibiotic name came up out of the Greek words anti (against) and bios (life), or anti-life [1]. However, the issue of irrational usage of antibiotics has taken an international character. It is established that over 50 percent of the medications are abused and 50 percent of the patients do not adhere to the prescribed regimes. Misuse is also the overuse, underuse, self-medication and missing the whole course leading to poor health and waste of resources [2]. The principle of rational use in the report prepared by World Health Organization (WHO) refers to the notion that the right drugs must be administered to the patient with the right dosage, duration, and at the lowest cost to the patient and the society [3].

Among the Reasons why Antibiotics Should Not be Used Properly, Are:

- Self-prescription and easy access to over-the-counter medication
- Under-treatment due to the relieving the symptoms too soon or due to the cost
- Ignorance in regard to the time of taking antibiotics;
- Self-medication
- Prescriptions: unqualified practitioners
- Inadequateness in the enforcement of the drug laws [4].

They have caused incidences of antibiotic resistance where the bacteria have become resistant to previously effective drugs. One of the most challenging problems of the public health that have escalated the cost of treatment and health care is now the resistance [5]. The most common behaviours that lead to resistance are self-medication, the leftovers of antibiotics, sharing, changing treatments without consulting doctors and many others [6]. These are some of the steps that WHO proposes to combat this that include imposition of regulations, essential drug lists, clinical guidelines, educational reforms and excellent public awareness [7]. The untimely prescription of antibiotics is also becoming common and therefore, education of the population is key in India [8]. People have knowledge, attitudes and practices (KAP) that are worth understanding in order to derive effective interventions [9].

KAP surveys are using instruments that measure the knowledge of the population, their ideas and behaviour. They aid in creating the myths that are the ones that are preventing the use of drugs in a rational manner [10]. Face-to-face counselling and leaflet have shown the possibility of using education as a way of correction to misuse and encouraging good behaviour [11]. The aim of this research is to find out the knowledge, attitude and practice of the community regarding the use of antibiotics and the impact of educational intervention in order to assist in promoting the rational use of antibiotics and curbing their misuse [12].

2. RELATED WORK

The study by was a community-based investigation in Afghanistan about self-medication using antibiotics. Out of 385 participants, 73.2 percent of the overall population had self-medicated during the last year, 62.6 percent had concerns about self-medication, and 40.5 percent of the participants believed that this was a bad habit. Economic concerns, time and convenience were the major determining factors. The paper has emphasized how awareness and education programs can help encourage rational use of antibiotics [13]. The article by assessed the knowledge of self-medication and drug disposal among the

population using an online cross-sectional study of 1105 respondents. Findings indicated that 16 of them ceased antibiotics after feeling well, 12 bestowed antibiotics in relation to similar illnesses, 44-percent practiced poorly, and 60 per cent were poorly knowledgeable and negatively inclined. The research suggested educational efforts to solve the problem of antibiotic misuse and disposal [14]. In the article by, the authors evaluated the level of antibiotic use among healthcare workers in Niger State, Nigeria. Among 350 questionnaires, 313 were filled. Knowledge (75%), attitude (69%), practice (62%), and prescriptions (70%), and post-analysis scores (62.3%), (59.1%), and (37.4%), were all lower. It was concluded that antimicrobial stewardship and education play an important role in decreasing misuse

3. METHODOLOGY

Location of Study: Locality settings.
Study Period: Six months
Study Design: This is a prospective study that is interventional.

Study Criteria
Inclusion Criteria:
Volunteers over 18 years of age participated randomly.

Exclusion Criteria:
Paediatrics
Respondents not willing to take part in this study.

Method of Study

The consent to participate was given following the approval of the Institutional Ethics Committee and informed consent. Based on previous research on KAP studies on antibiotic use, a structured questionnaire was created and reviewed by experts to ensure the accuracy, relevance, readability, and clarity of the questions, and finally was piloted on a set of 20-30 respondents. The Lawshe method was used to evaluate content validity where the item was retained with a CVR (content validity ratio) of 0.7. The baseline KAP data were obtained using the validated tool. Educational intervention involved information leaflets and one to one communication. Re-administration of the same questionnaire was done at the end of intervention and three months. Paired t-tests were used to compare the pre- and post-intervention KAP scores and analyse the data.

4. RESULTS AND DISCUSSION

The study has been conducted for 6 months after obtaining ethical committee clearance from Kshema independent Ethics committee. In a total of 502 participants, validated questionnaires were distributed to assess their Knowledge, Attitude, and Practice regarding antibiotic use. [5], [15] the results of the study are as follows.

Table 1. Distribution of Participants Concerning Gender

Sr. No.	Gender	No of Participants	Percentage (%)
1	Male	245	48.8
2	Female	256	51
3	Prefer not to say	1	0.19

As indicated in Table 1 and Figure 1 The distribution exhibits almost equal representation of males (48.8) and females (51), thus gender balance in participation. Only 0.19 percent of the sample did not want to disclose gender.

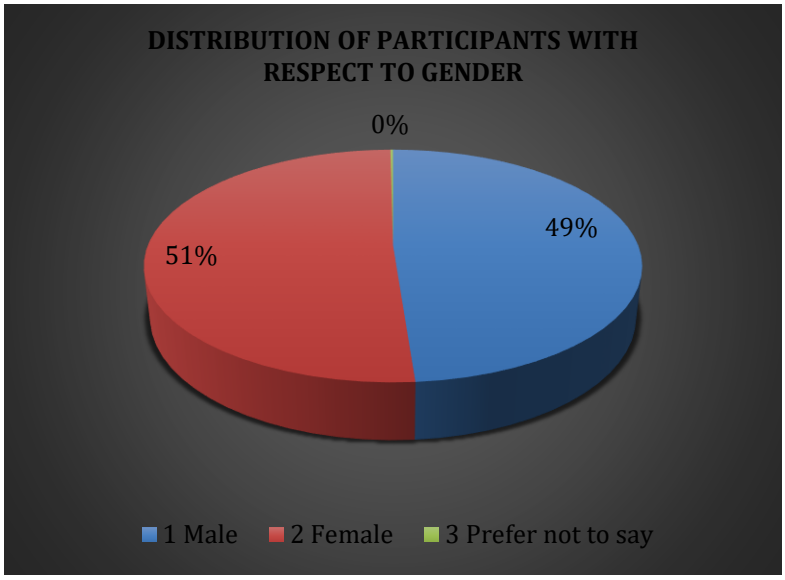

Figure 1. Distribution of Participants Concerning Gender

Table 2. Distribution of Participants Concerning Age

Sr. No.	Age in Years	No of Participants	Percentage (%)
1	18 – 25	363	72.3
2	25 – 30	82	16.3
3	30 – 40	33	6.6
4	40 – 50	19	3.8
5	>50	5	1

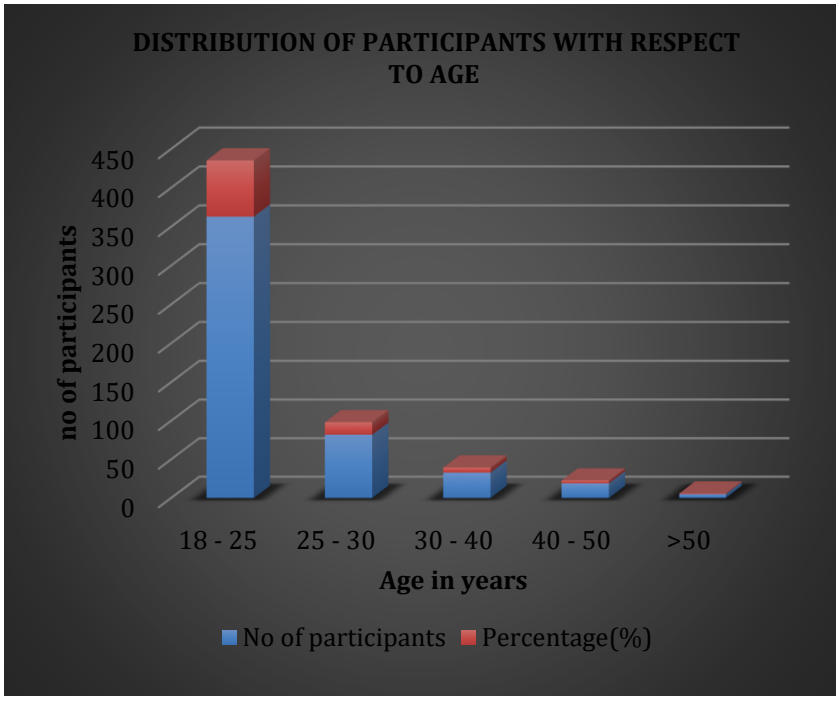

Figure 2. Distribution of Participants Concerning Age

The age range of most respondents was 18-25 years (72.3%), then 25-30 (16.3), as shown in Table 2 and Figure 2. The proportion of older participants (>40 years) was only 4.8, indicating that the participants were mostly members of the young population, which is commonly the primary target of a learning intervention.

Table 3. Content Validation Ratio Value

Contents	Variance	Coefficient of Variance	Cronbach's Alpha
KNOWLEDGE	67.7	414.7	1.045
ATTITUDE	32.5	197.5	1.043
PRACTICE	12.5	31.5	0.753

As reflected in Table 3 the Cronbach alpha values indicate high internal consistency in the knowledge (1.045) and attitude (1.043) section and fair reliability in the practice section (0.753). This proves that the questionnaire applied was statistically sound.

The Knowledge Questionnaire consisted of a five-point Likert scale; strongly disagree (1), disagree (2), neither (3), agree (4), and strongly agree (5). Attitude and Practice Questionnaire used: Never (1), Seldom (2), Sometimes (3), Often (4), Always (5). We had Cronbach Alpha of Practice of >0.71 (acceptable) and that of Knowledge and Attitude of >0.9 (excellent).

Table 4. Knowledge of Participants Regarding Antibiotics use before Intervention

Sr. No.	Questions	Antibiotics	Pain Killers	Fever Medicine	Allergy Medicine	I Do Not Use Any Medicine
1	Which drug do you take more frequently	73	133	119	41	136
SI. No.	**Questions**	**Strongly Disagree**	**Disagree**	**Neither Agree Nor Disagree**	**Agree**	**Strongly Agree**
1	Antibiotics are effective against bacteria	17	42	93	288	62
2	Antibiotics are effective against viral infection	68	121	95	181	37
3	Antibiotics can cause allergic reactions	31	73	145	202	51
4	Paracetamol is an Antibiotic	77	156	93	138	38
5	Antibiotics can be bought online	47	119	118	184	34
6	Excessive or inappropriate usage of antibiotics might cause antibiotic resistance.	21	94	126	182	79
7	If the bacteria developed a resistance to Antibiotics, it would be extremely challenging to treat the infection they cause	31	66	145	188	72
8	Antibiotics can be purchased from a pharmacy without a doctor's prescription	61	137	107	159	38
9	Antibiotics can kill good bacteria in the intestine	25	107	140	191	39

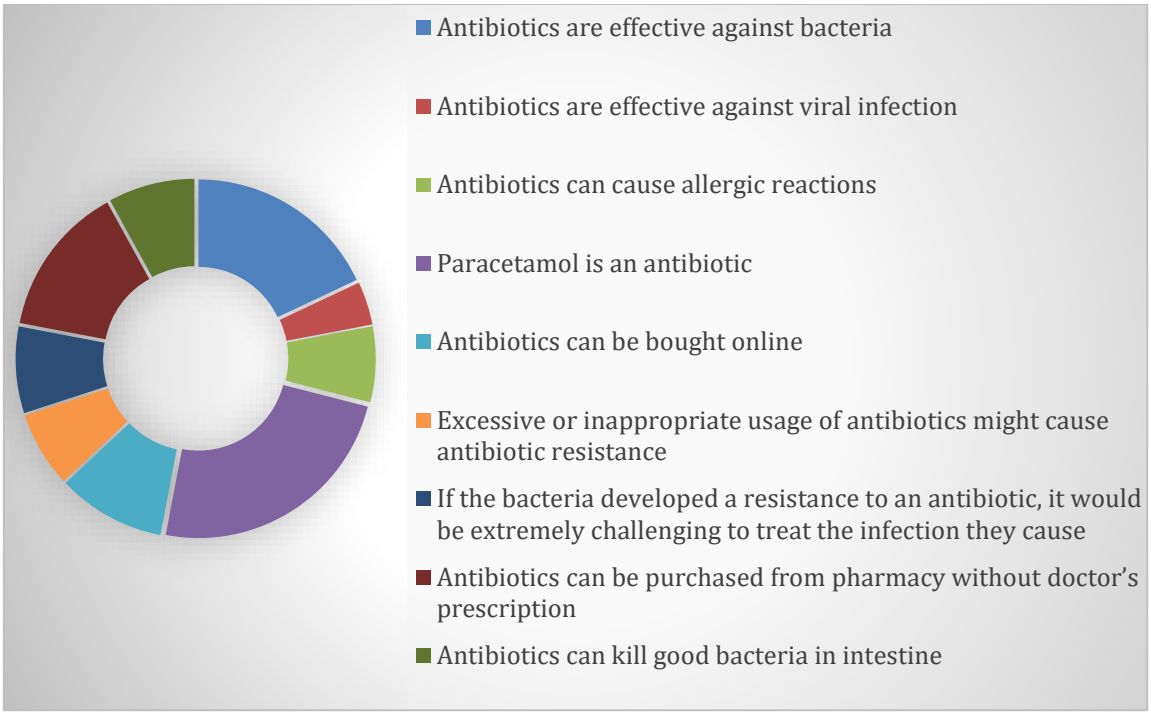

Figure 3. Knowledge of Participants Regarding Antibiotics Use before Intervention

As depicted in Table 4 and Figure 3 prior to the intervention, there were serious misconceptions among the participants. Misconceptions arose to the effect that antibiotics are used to treat viruses that paracetamol was an antibiotic and that antibiotics were available over the counter. A fair proportion was aware of antibiotic resistance, however, there was little awareness of the fact that good bacteria are susceptible to antibiotics.

Table 5. Attitude of Participants Regarding Antibiotics use before Intervention

Sr. No.	Questions	Never	Seldom	Sometimes	Often	Always
1	According to me, antibiotics should be taken only until we get a recovery	104	98	199	52	49
2	I believe that even if we feel better the antibiotics course should be finished	73	57	150	97	125
3	It is wise to take the antibiotics that have been recommended to family members and friends rather than visiting a doctor	171	75	149	66	41
4	I will take antibiotics in the hope that antibiotics can speed up the healing of my symptoms	81	84	175	103	59
5	Antibiotics are my first choice when I have cold and fever	140	86	130	81	65
6	Antibiotics should always be kept on hand in case they are needed in the future, in my opinion	103	69	179	95	56
7	If I have the same symptoms as I did in the past, will adhere to the most recent antibiotic prescription	118	91	163	81	49
8	Fever will be better relieved by taking antibiotics along with fever medicines.	79	68	181	118	56

9	I believe that taking antibiotics for colds, flu, and cough on my own is beneficial.	135	72	141	91	63

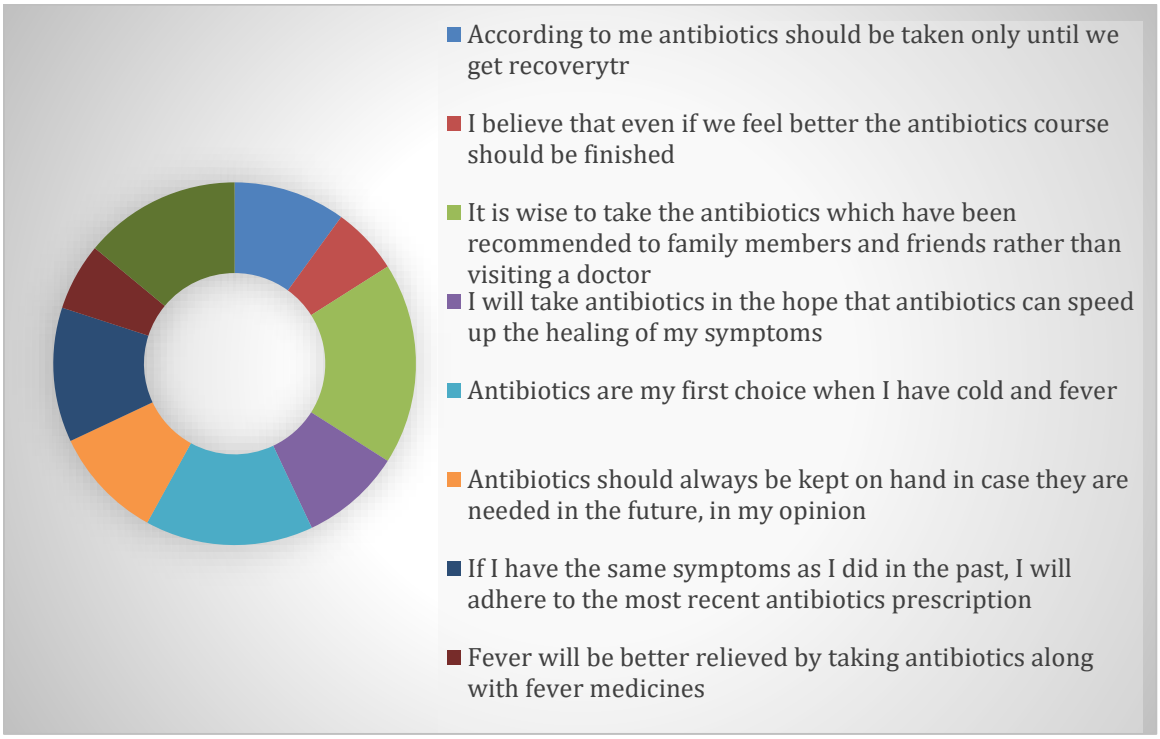

Figure 4. Attitude of Participants Regarding Antibiotics use before Intervention

As indicated in Table 5 and Figure 4 Attitudes reflected risky behaviours - many believed antibiotics should be stopped when feeling better, may be passed on among family/friends, and used to treat colds and flu. It was also acceptable that a significant number of the participants should keep antibiotics to be used later.

Table 6. Practice of Participants Regarding Antibiotics use before Intervention

Sr. No.	Questions	Never	Seldom	Sometimes	Often	Always
1	Do you consult your doctor before taking medication, even antibiotics?	79	112	144	51	116
2	Do you use any antibiotics left over from a previous prescription?	173	52	153	96	28
3	I bought Amoxicillin at the pharmacy without a doctor's prescription.	163	96	138	72	33
4	Will you follow the doctor's advice and appropriately take the antibiotics, never skipping a dose?	46	61	146	110	139
5	I take antibiotics to treat runny nose, cold, tired aches, rheumatic pain and flu.	105	71	158	103	65

6	Do you believe having at home, is necessary in case of an emergency?	70	71	170	93	98
		a minor issue	a major issue	negligible issue	not an issue	do not know
7	Knowledge about antibiotic resistance	88	144	105	94	71

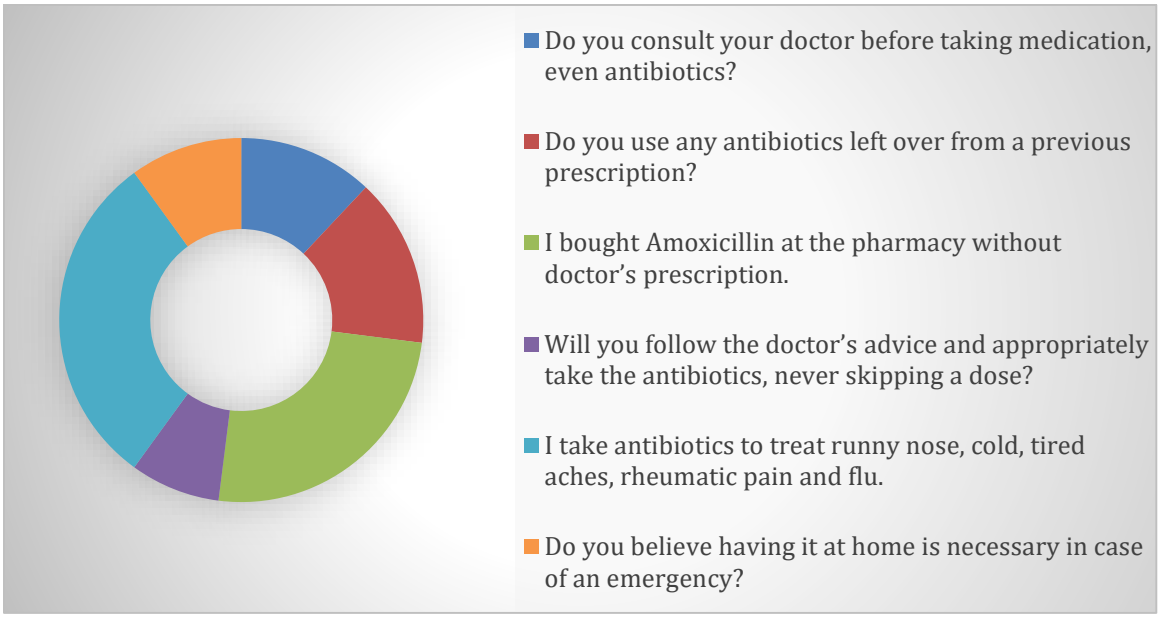

Figure 5. Practice of Participants Regarding Antibiotic Use before Intervention

Unsafe practices were common Table 6, Figure 5. Most of them were self-medicating, buying over the counter, or taking old medication. Others were medically prescribed, but irrational consumption was evident.

Table 7. Knowledge of Participants Regarding Antibiotics use after Intervention

Sr. No.	Questions	Antibiotics	Pain Killers	Fever Medicine	Allergy Medicine	I Do Not use Any Medicine
1	Which Drug do you take More Frequently?		126	105	35	118
		Strongly Disagree	Disagree	Neither Agree Nor Disagree	Agree	Strongly Agree
2	Antibiotics are Effective Against Bacteria	12	0	1	20	469
3	Antibiotics are Effective Against Viral Infection	471	19	0	1	11
4	Antibiotics can Cause Allergic Reactions	9	2	2	26	463
5	Paracetamol is an Antibiotic	408	88	1	2	3
6	Antibiotics can be Bought Online.	67	420	8	3	4

7	Excessive or Inappropriate Usage of Antibiotics Might Cause Antibiotic Resistance.	6	5	1	34	456
8	If the Bacteria Developed a Resistance to Antibiotics, it would be Extremely Challenging to Treat the Infection they Cause.	2	0	1	34	465
9	Antibiotics can Kill Good Bacteria in the Intestine.	0	0	1	26	475
10	Antibiotics can be Purchased from a Pharmacy without a Doctor's Prescription.	2	9	127	131	233

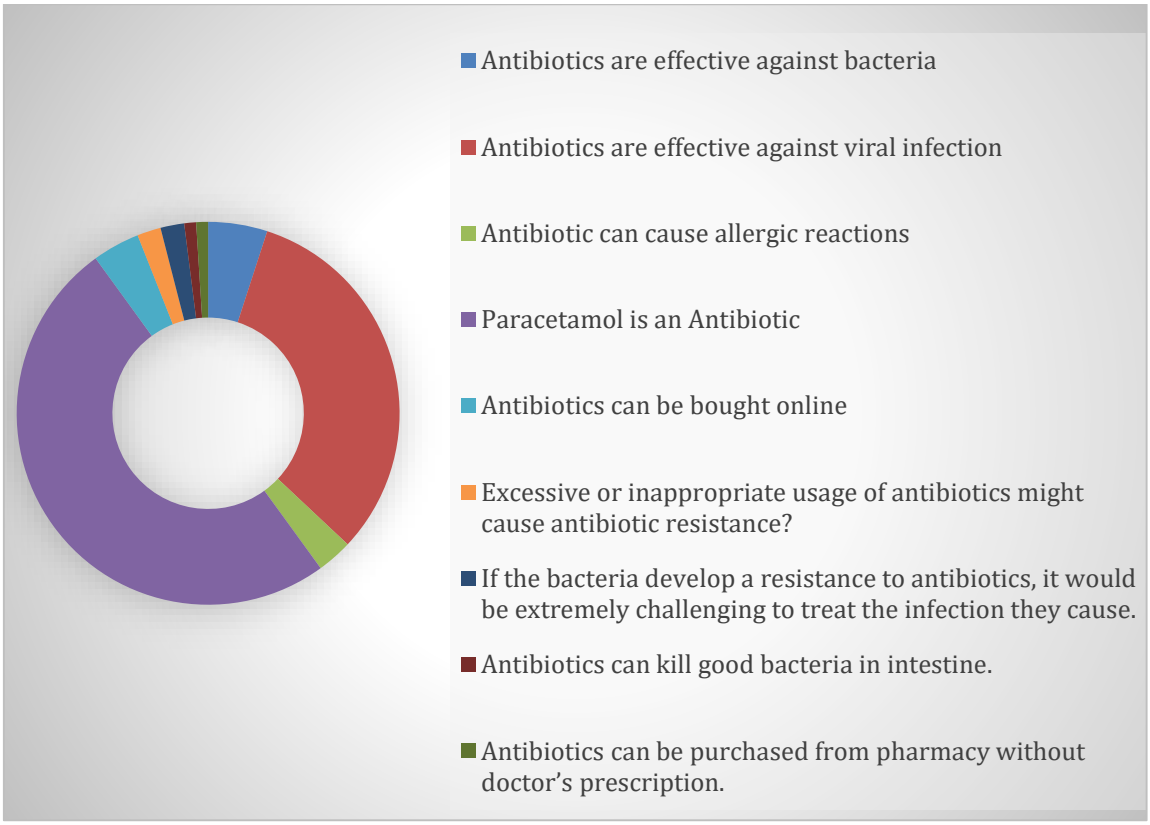

Figure 6. Knowledge of Participants Regarding Antibiotic use after Intervention

Educational program led to increased knowledge Table 7, Figure 6 Almost all the respondents singled out antibiotics as effective only against bacteria, resistance risk, and prescription. Misunderstanding regarding paracetamol and viruses was reduced.

Table 8. Attitude of Participants Regarding Antibiotics use after Intervention

Sr. No.	Questions	Never	Seldom	Sometimes	Often	Always
1	According to me, antibiotics should be taken only until we get a recovery	492	3	5	0	2

2	I believe that even if we feel better the antibiotics course should be finished	7	0	73	5	417
3	It is wise to take the antibiotics that have been recommended to family members and friends rather than visiting a doctor	487	5	6	1	3
4	I will take antibiotics in the hope that antibiotics can speed up the healing of my symptoms.	8	0	57	0	437
5	Antibiotics are my first choice when I have a cold and fever.	493	5	2	0	2
6	Antibiotics should always be kept on hand in case they are needed in the future, in my opinion.	490	4	4	0	4
7	If I have the same symptoms as I did in the past, will adhere to the most recent antibiotics prescriptions.	469	6	26	0	1
8	Fever will be better relived by taking antibiotics along with fever medicines.	17	2	468	4	11
9	I believed that taking antibiotics for cold, flu and cough on my own is beneficial	479	0	81	0	5

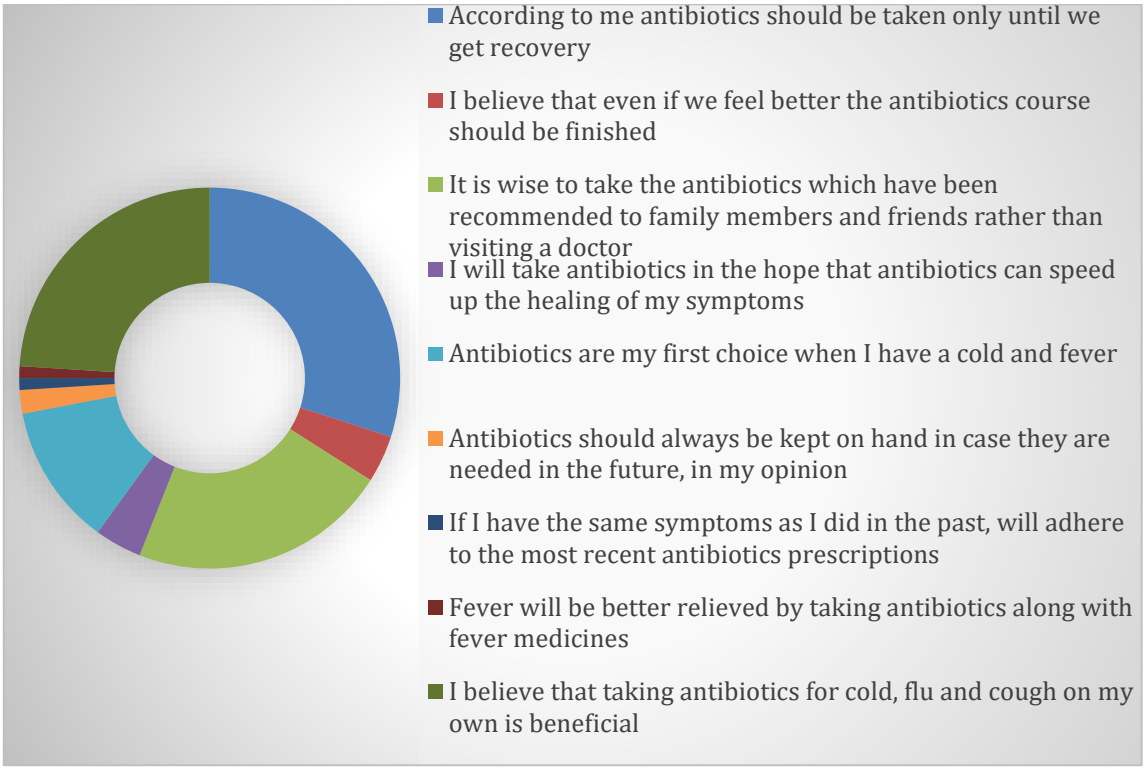

Figure 7. Attitude of Participants Regarding Antibiotic Use after Intervention

There was an improvement in the attitude Table 8, Figure 7. Almost all the respondents accepted to take antibiotic courses, not to self-medicate, and not to store antibiotics. Misconception of treating cold/flu reduced.

Table 9. Practice of Participants Regarding Antibiotics use after Intervention

Sr. No.	Questions	Never	Seldom	Sometimes	Often	Always
1	Do you consult your doctor before taking any medication, even antibiotics.	3	1	466	6	26
2	Do you use any antibiotics left over from a previous prescription?	497	1	2	0	2
3	I bought Amoxicillin at the pharmacy without doctor's prescription.	6	0	469	3	24
4	Will you follow the doctor's advice and appropriately take the antibiotics, never skipping a dose?	2	0	22	3	475
5	I take antibiotics to treat runny nose, cold, tired aches, rheumatic pain and flu.	488	6	1	0	7
6	Do you believe having some antibiotics at home, is necessary in case of an emergency?	494	6	2	0	0
		a minor issue	a major issue	a negligible issue	not an issue	do not know
7	Knowledge about antibiotics resistance	4	1	475	5	17

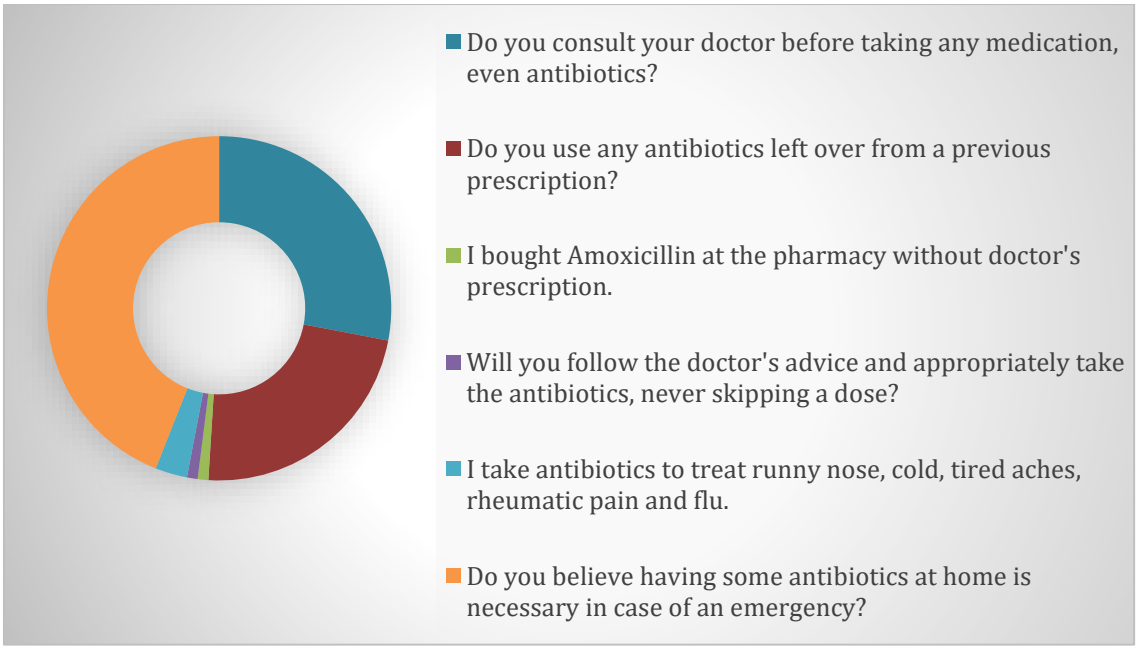

Figure 8. Practice of Participants Regarding Antibiotics use after Intervention

The practice also improved significantly as indicated in
Table 9 and Figure 8 The majority of respondents said they would seek medical advice prior to taking antibiotics, never took any leftover or non-prescribed antibiotics and made the commitment of taking full

courses. A very small percentage of them were still engaging in risky behaviour which showed high behaviour change.

Table 10. Statistical Data (Paired 'T' Test)

Knowledge	**Before Intervention**		**After Intervention**		**T**	**Sig**
	MEAN	SD	MEAN	SD		
Which drug do you take more frequently?	0.092	0.083	0.416	0.074	65.165	<0.0001
Antibiotics are effective against bacteria	0.028	0.216	0.877	0.41	0.021	<0.0001
Antibiotics are effective against viral infection	0.105	0.109	0.132	0.412	0.019	0.1561
Antibiotics can cause allergic reactions	0.037	0.141	0.878	0.404	44.035	<0.0001
Paracetamol is an Antibiotic	0.141	0.094	0.148	0.35	0.432	0.6653
Antibiotics can be brought online	0.089	0.121	0.289	0.359	11.828	<0.0001
Excessive or inappropriate usage of antibiotics might cause antibiotic resistance.	0.023	0.118	0.875	0.396	46.198	<0.0001
If the bacteria developed a resistance to Antibiotics, it would be extremely challenging to treat the infection they cause.	0.023	0.127	0.888	0.406	45.558	<0.0001
Antibiotics can be purchased from a pharmacy without a doctor's prescription.	0.115	0.138	0.894	0.417	39.736	<0.0001
Antibiotics can kill good bacteria in the intestine.	0.06	0.756	0.738	0.192	19.475	<0.0001
Attitude	Before intervention		After intervention		T	sig
	MEAN	SD	MEAN	SD		
According to me, antibiotics should be taken only until we get a recovery	0.436	0.12	0.23	0.436	10.206	<0.0001
I believe that even if we feel better the antibiotics course should be finished	0.316	0.075	0.489	0.357	10.625	<0.0001
It is wise to take the antibiotics which have been recommended to family members and friends rather than visiting a doctor	0.481	0.112	0.227	0.43	12.807	<0.0001
I will take antibiotics in the hope that antibiotics can speed up the healing of my symptoms.	0.384	0.088	0.505	0.377	7.0029	<0.0001
Antibiotics are my first choice when I have a cold and fever.	0.475	0.065	0.232	0.437	12.323	<0.0001
Antibiotics should always be kept in on hand in case they are	0.4011	0.095	0.228	0.433	8.743	<0.0001

needed in the future, in my opinion.						
If I have the same symptoms as I did in the past, will adhere to the most recent antibiotics prescription.	0.433	0.085	0.214	0.41	11.718	<0.0001
Fever will be better relived by taking antibiotics along with fever medicines.	0.372	0.101	0.115	0.409	13.668	<0.0001
I believe that taking antibiotics for cold, flu and cough on my own is beneficial.	0.423	0.071	0.217	0.421	10.81	<0.0001
Practice	Before intervention		After intervention		t	Sig
	MEAN	SD	MEAN	SD		
Do you consult your doctor before taking any medication, even antibiotics.	0.259	0.071	0.606	0.407	18.818	<0.0001
Do you use any antibiotics left over from a previous prescription?	0.363	0.124	1.021	0.441	32.182	<0.0001
I bought Amoxicillin at the pharmacy without doctor's prescription.	0.378	0.103	0.611	0.41	12.349	<0.0001
Will you follow the doctor's advice and appropriately take the antibiotics, never skipping a dose?	0.172	0.09	0.248	0.417	3.991	<0.0001
I take antibiotics to treat runny nose, cold tired aches rheumatic pain and flu.	0.284	0.073	0.012	0.431	13.94	<0.0001
Do you believe having some antibiotics at home, is necessary in case of an emergency?	0.234	0.081	1.022	0.438	39.637	<0.0001
would you consider antibiotic resistance to be	0.299	0.054	0.614	0.417	16.784	<0.0001

As show in Table 10 the t test results were significant ($p < 0.0001$) biting almost all KAP parameters before and after intervention and proved that the program was able to enhance knowledge, attitudes, and safe use of antibiotics. Accordingly, the hypothesis is as follows: Significant differences in before and after intervention in participants knowledge, Attitude and practice.

Discussion

This study included 502 participants (245 men, 256 women) over six months. The findings differed from Vandana Avinash Badar, [16]. Using a validated KAP questionnaire, community knowledge, attitude, and practice toward antibiotics were assessed.

Knowledge

- 26.7% were not on any medication, while 26.5% frequently used painkillers [17].
- 69.4% knew antibiotics act against bacteria, but 43.5% wrongly believed they treat viral infections.

- 50.1% assumed antibiotics can be bought online; 34.9% thought paracetamol is an antibiotic.
- 48.4% were unaware of resistance due to misuse, and 54.2% did not know antibiotics kill beneficial gut bacteria.
- 51.1% acknowledged OTC availability without prescription, reflecting poor awareness.

Attitude

- 39.4% believed antibiotics should be taken until recovery [17].
- 45.8% felt the course should not be stopped early [18].
- 29.5% accepted antibiotics from relatives/friends [19].
- 34.7% thought antibiotics speed recovery; 28.8% held similar misconceptions [20].
- 31.5% used antibiotics for colds, coughs, or flu [21]. Overall, attitudes were suboptimal.

Practice:

- 66.7% never consulted doctors before medication [22].
- 24.7% reused leftover antibiotics [23].
- 21.2% did not follow prescriptions properly [24].
- Most recognized antibiotic resistance as a problem [25].

Intervention Outcomes

Educational leaflets and counselling improved KAP scores significantly. Participants better understood antibiotic misuse (e.g., paracetamol misclassification, use for colds), adverse effects, and resistance. They sought medical advice, adhered to prescriptions, and completed courses.

Comparable studies support these findings. For example, Haw Wassily reported 83.3% awareness of antibiotics, while a Pakistan survey showed 13.9% did not complete treatment, 4.4% altered doses without consultation, and 41.3% reused leftover antibiotics. Additionally, 61.8% requested antibiotics from physicians lower than in our study.

5. CONCLUSION

This study demonstrates the crucial role of clinical pharmacists in promoting rational antibiotic use and reducing resistance through patient education. At baseline, participants showed poor knowledge and practices regarding antibiotics. Educational interventions with leaflets and one-to-one counselling significantly improved KAP scores ($p<0.0001$). Clinical pharmacist-led education is therefore an effective approach to enhance awareness and minimize inappropriate antibiotic use, addressing a global concern.

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Author Contribution Statement

Name of Author	C	M	So	Va	Fo	I	R	D	O	E	Vi	Su	P	Fu
Sumaiya Taj J	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓
Radha Sambhaji Gayakawad	✓	✓	✓	✓		✓	✓		✓	✓	✓	✓	✓	✓
S. Sangeetha	✓						✓			✓		✓		✓
Shobha Rani R H	✓	✓		✓	✓				✓	✓				

C : **C**onceptualization	I : **I**nvestigation	Vi : **Vi**sualization
M : **M**ethodology	R : **R**esources	Su : **Su**pervision
So : **So**ftware	D : **D**ata Curation	P : **P**roject administration
Va : **Va**lidation	O : Writing - **O**riginal Draft	Fu : **Fu**nding acquisition
Fo : **Fo**rmal analysis	E : Writing - Review & **E**diting	

Conflict of Interest Statement

All authors declare no conflict of interest.

Informed Consent

No formal informed consent was obtained as this was a community-based project; participation was voluntary and only those who were interested were included in the study.

Ethical Approval

The study was conducted in compliance with the ethical principles outlined in the declaration of Kshema Independent Ethics Committee and approved by the relevant institutional authorities.

Data Availability

The data that support the findings of the study were available from the corresponding author upon reasonable request.

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