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Original Research Article

Assessment of knowledge and awareness of antibiotic use and antimicrobial resistance among the general population: a cross-sectional study in Pathanamthitta district, Kerala

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ABSTRACT

Background: Antimicrobial resistance (AMR) is a mounting global health threat predominantly driven by inappropriate antibiotic use. Purpose of the study was to determine the existing knowledge and awareness of the individuals about antibiotic usage and AMR and how an educational intervention is effective in increasing the level of knowledge.

Methods: This cross-sectional study was conducted among 500 adults aged between 18 and 60 in Pathanamthitta district, Kerala. A structured questionnaire adapted from WHO guidelines was used to assess knowledge. Baseline knowledge was evaluated, followed by an educational intervention and immediate post-intervention reassessment.

Results: Initial results revealed moderate understanding: 45.80% correctly identified antibiotics as effective only against bacterial infections, 92.20% recognized the necessity of prescriptions, and 36.40% correctly defined AMR. Post-intervention, knowledge significantly improved across all parameters, with 100% recognizing appropriate antibiotic use and 97.40% understanding AMR. Awareness of causes and consequences of AMR, antibiotic side effects, and transmission routes also showed marked enhancement.

Conclusions: The study revealed considerable knowledge gaps among the study population of adults regarding use of antibiotics and AMR. Educational interventions specifically directed at individuals are very effective in improving knowledge and awareness, thus supporting antibiotic stewardship efforts to combat AMR.

Keywords: Antibiotic use, Antimicrobial resistance, Knowledge, Awareness, Educational intervention

INTRODUCTION

Antibiotics are compounds that target bacteria and, thus, are intended to treat and prevent bacterial infections. Antibiotics can kill or inhibit bacterial growth. The World Health Organization (WHO) defines antibiotics as antimicrobial substances that, at low concentrations, kill or inhibit the growth of microbial pathogens, primarily bacteria.¹ However, their misuse and overuse have accelerated the emergence of antimicrobial resistance (AMR), threatening the efficacy of existing treatments and global health security.² Misconceptions about antibiotic

effectiveness, incomplete treatment courses, self-medication, and unregulated access contribute to this crisis, especially in India, where antibiotic misuse is widespread.^{3,4}

AMR arises when microorganisms evolve mechanisms to survive exposure to antimicrobial agents, rendering treatments ineffective and leading to prolonged illness, increased healthcare costs, and higher mortality rates.^{5,6} The WHO highlights AMR as a significant global threat, necessitating urgent action through improved antibiotic stewardship and public education.⁷

Understanding public knowledge and awareness of antibiotic use and AMR is critical for designing effective interventions.^{8,9}

This study aims to assess the baseline knowledge and awareness of the general population in Pathanamthitta district, Kerala, regarding appropriate antibiotic use and AMR, and to evaluate the impact of an educational intervention.

METHODS

Study design

A cross-sectional study was conducted in Pathanamthitta district, Kerala, from April to September 2025 to evaluate knowledge and awareness of antibiotic use and AMR among general population.

Study population

A total of 500 adults of both genders, aged between 18 and 60 years, residing in Pathanamthitta district, were enrolled in the study using systematic random sampling.

Inclusion and exclusion criteria

The inclusion criteria comprised adults who were capable of understanding and responding to the questionnaire and were willing to provide informed consent. The exclusion criteria included health professionals and individuals who were unwilling to participate.

Ethical considerations

The ethics committee of the institution approved, and informed consent was obtained from all the participants.

Data collection

A pre-validated structured questionnaire, adapted from WHO guidelines, was administered in face-to-face interviews. The questionnaire assessed knowledge and awareness of antibiotic use, AMR. Following the pre-test, participants received a structured educational counselling session focusing on rational antibiotic use and AMR awareness. Post-intervention responses were collected immediately after the session using the same questionnaire. Demographic details of the participants were also recorded.

Data analysis

Data were entered into MS Excel and analyzed descriptively. Frequencies and percentages were calculated for pre- and post-intervention responses.

RESULTS

A total of 500 participants were recruited for the study. Among the 500 participants surveyed, 45.40% were male, while 54.60% were female individuals (Figure 1). The largest age group was 18-27 years (52.20%) and smallest age group was 58-67 years of age (7.40%) (Table 1).

At baseline, 45.80% accurately identified that antibiotics are effective solely against bacterial infections, while 14.40% incorrectly believed that antibiotics can treat viral infections. Following the intervention, 100.00% of participants correctly recognized that antibiotics are exclusively effective against bacterial infections (Table 2).

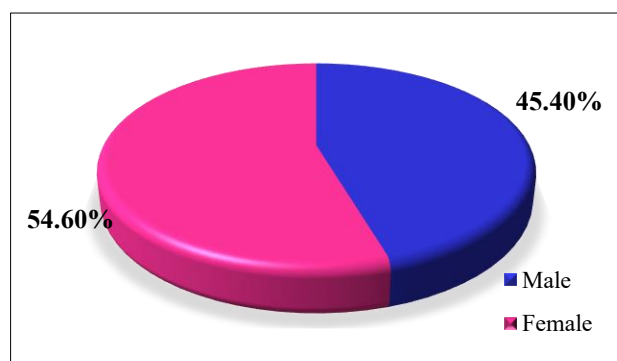


Figure 1: Distribution of gender.

Table 1: Distribution of age.

S. no.	Age group	Frequency	%
1	18-27	261	52.20
2	28-37	53	10.60
3	38-47	56	11.20
4	48-57	93	18.60
5	58-67	37	7.40
Total		500	100.00

The awareness regarding the necessity of obtaining antibiotics through a prescription from a medical practitioner was notably high at baseline (92.20%) and achieved 100.00% post-intervention (Table 3).

The recognition of common side effects, such as diarrhea, nausea, and allergic reactions, demonstrated a significant increase from 63.20% prior to the intervention to 95.20% subsequently (Figure 2).

Initial understanding of AMR as microorganisms developing resistance to medications was relatively low at 36.40%, but this understanding rose sharply to 97.40% as a result of educational efforts (Figure 3).

At baseline, only 9.20% of participants were able to identify causes of AMR, including antibiotic overuse, inappropriate use for viral infections, and incomplete courses of antibiotics. Post-intervention, there was a

substantial increase in this awareness, rising to 45.20% (Table 4).

Furthermore, the recognition that frequent antibiotic use elevates the risk of AMR increased from 60.60% prior to the intervention to 98.80% following it (Figure 4).

Knowledge and awareness regarding the transmission of AMR among humans, animals, and the environment rose from 46.40% to 85.20% as a result of the educational initiative (Table 5).

Lastly, the acknowledgment of AMR as a significant global health threat improved from 33.20% to 67.20% as a consequence of the intervention (Figure 5).

Table 2: Use of antibiotics.

S. no.	Use of antibiotics	Pre		Post	
		Frequency	Percentage (%)	Frequency	Percentage (%)
1	Bacterial infections	229	45.80	500	100.00
2	Viral infections	72	14.40	0	0.00
3	Both	166	33.20	0	0.00
4	None of the above	6	1.20	0	0.00
5	Don't know	27	5.40	0	0.00
Total		500	100.00	500	100.00

Table 3: Need for prescription.

S. no.	Need for prescription	Pre		Post	
		Frequency	Percentage (%)	Frequency	Percentage (%)
1	Yes	461	92.20	500	100.00
2	No	29	5.80	0	0.00
3	Don't know	10	2.00	0	0.00
Total		500	100.00	500	100.00

Table 4: Perceived causes of AMR.

S. no.	Causes of AMR	Pre		Post	
		Frequency	Percentage (%)	Frequency	Percentage (%)
1	Overuse or misuse	129	25.80	112	22.40
2	Taking for viral infections	25	5.00	4	0.80
3	Not completing the full course	15	3.00	3	0.60
4	Natural immunity	20	4.00	0	0.00
5	Don't know	136	27.20	1	0.20
6	Overuse and taking for viral infections	38	7.60	58	11.60
7	Overuse and not completing	60	12.00	88	17.60
8	Overuse and natural immunity	6	1.20	0	0.00
9	Taking for viral and not completing	8	1.60	6	1.20
10	Taking for viral and natural immunity	3	0.60	0	0.00
11	Not completing and natural immunity	1	0.20	0	0.00
12	Overuse, taking for viral and not completing	46	9.20	226	45.20
13	Overuse, taking for viral and natural immunity	4	0.80	0	0.00
14	Overuse, not completing and natural immunity	5	1.00	1	0.20
15	Overuse, taking for viral, not completing and natural immunity	4	0.80	1	0.20
Total		500	100.00	500	100.00

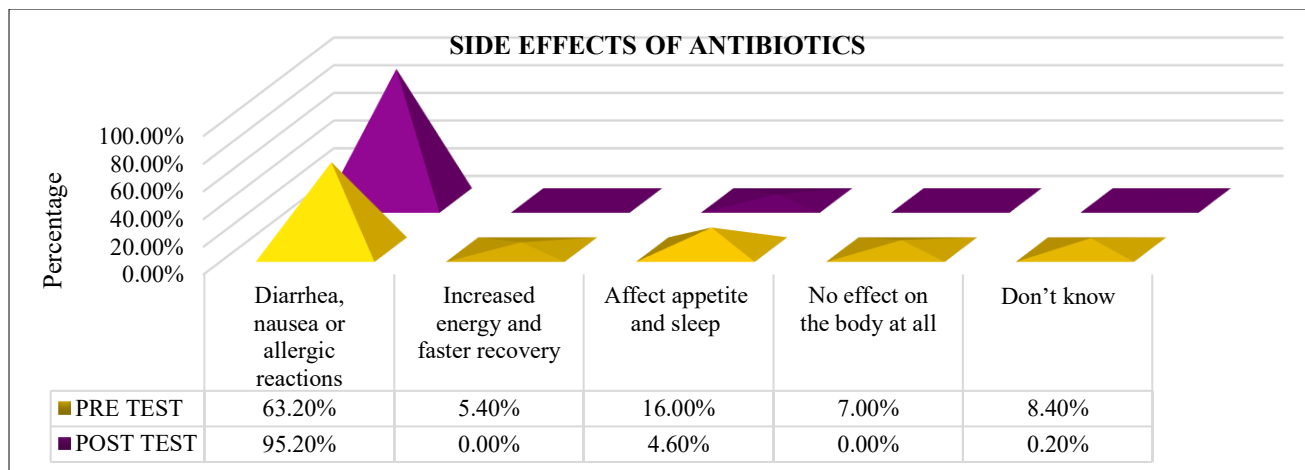


Figure 2: Awareness of antibiotic side effects.

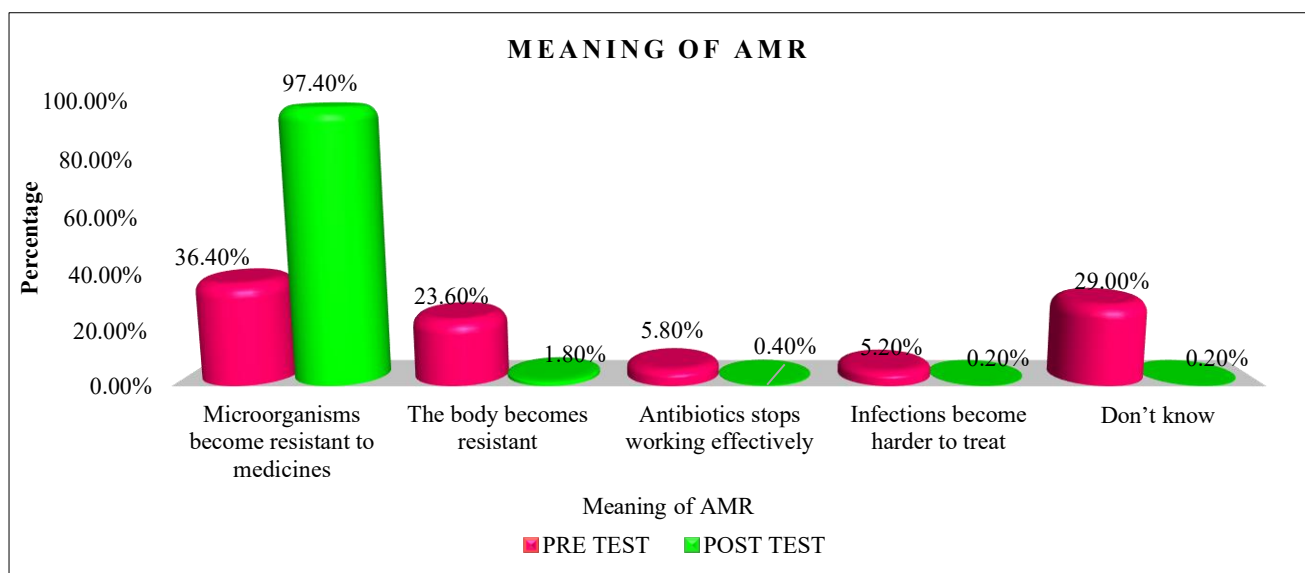


Figure 3: Understanding of AMR.

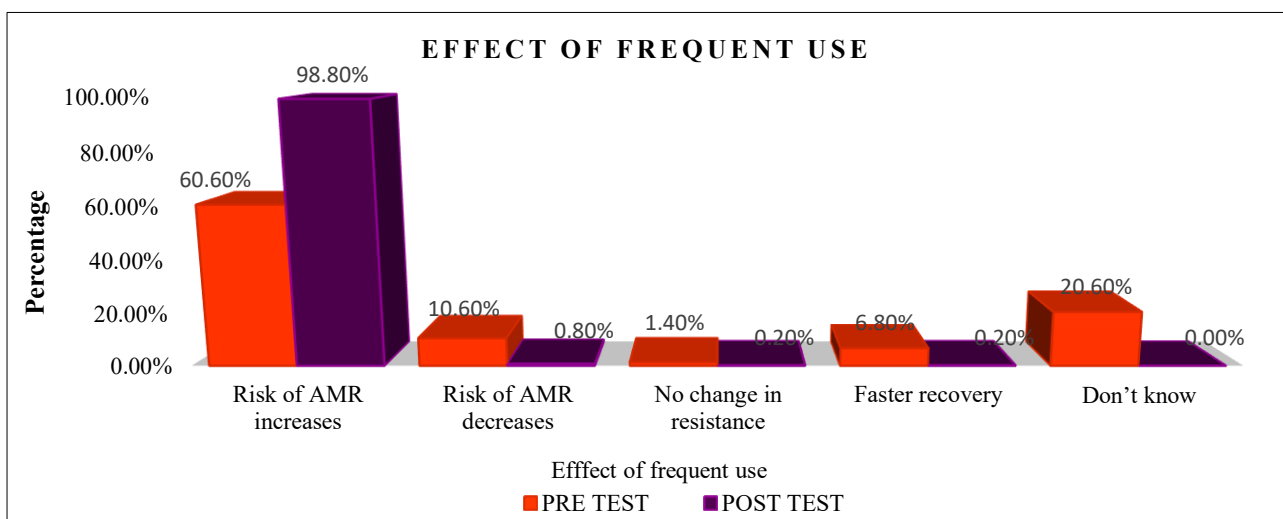


Figure 4: Effect of frequent antibiotic use on resistance.

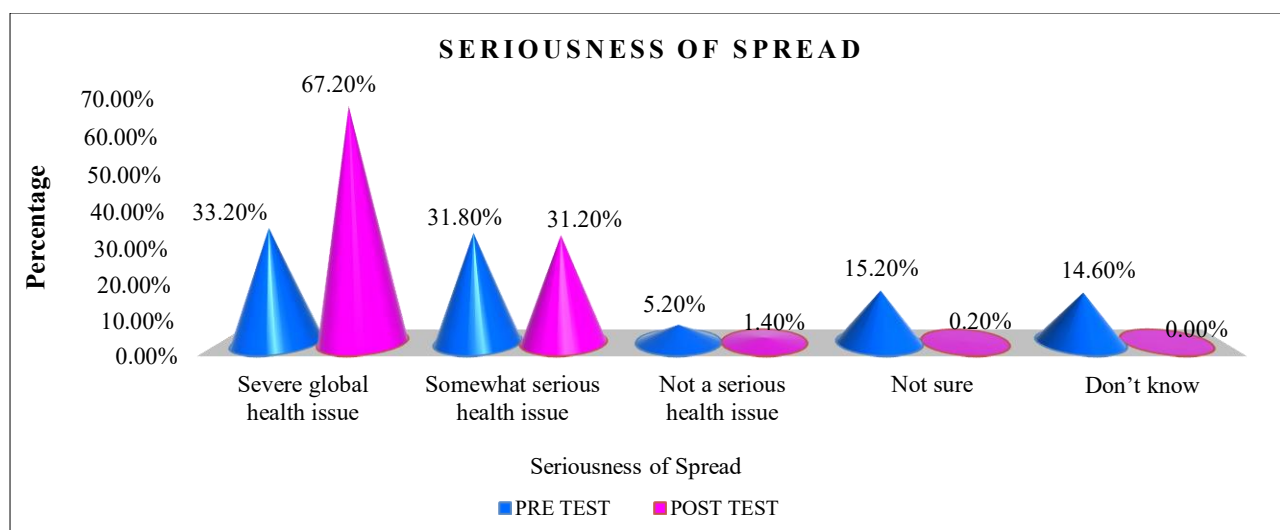


Figure 5: Perception of AMR as a health issue.

Table 5: Awareness of AMR spread routes.

S. no.	Spread of AMR	Pre		Post	
		Frequency	Percentage (%)	Frequency	Percentage (%)
1	Between humans	129	25.80	71	14.20
2	Between animals	20	4.00	3	0.60
3	Through the environment	31	6.20	0	0.00
4	Between humans, animals and environment	232	46.40	426	85.20
5	Don't know	88	17.60	0	0.00
	Total	500	100.00	500	100.00

DISCUSSION

The present study assessed the knowledge and awareness of antibiotic use and AMR among 500 adults in Pathanamthitta district, Kerala, and the short-term effect of a single structured counselling session. At baseline, awareness was uneven. Most participants (92.20%) knew that antibiotics need a prescription, but only 45.80% knew that antibiotics act against bacterial infections alone, 36.40% could correctly describe AMR, 33.20% recognised it as a significant global health threat and 9.20% identified all three major causes of AMR. A gap between familiarity with antibiotics and understanding of resistance has been reported in public surveys across countries.^{8,10} The sample was young (52.20% were aged 18-27 years) and slightly more than half were women (54.60%), and the studies used for comparison below recruited different populations, so the comparisons are indicative and not exact.

Only 45.80% of participants knew that antibiotics act against bacterial infections alone. This is much lower than the 80.50% reported among the general public in Bangladesh.¹¹ Almost half (47.60%) of our participants believed that antibiotics act against viral infections, either alone (14.40%) or in addition to bacterial infections (33.20%). This is close to the 49.00% of the general public

in coastal Karnataka who stated that antibiotics kill viruses, and lower than the 64.00% of respondents in the WHO multi-country survey who believed that antibiotics can treat colds and flu.^{10,12} Differences in the wording of the questions and in the samples may explain part of the variation between studies. Because antibiotic consumption in India is very high,³ this misconception is of practical importance, as it is likely to encourage the use of antibiotics for self-limiting viral illnesses.

Awareness of the need for a prescription was high (92.20%). In the Western Region of Saudi Arabia, 72.60% of respondents disagreed that antibiotics can be obtained without a prescription, a related item for which the figure was lower than ours.¹³ High awareness of the prescription requirement is also consistent with the low prevalence of antibiotic self-medication (3.31%) reported from an urban population in Kerala.¹⁴ However, knowing that a prescription is required does not guarantee that it is followed, and the present study did not measure purchasing behaviour.

Recognition of common adverse effects such as diarrhoea, nausea and allergic reactions was moderate at baseline (63.20%), which is lower than the 87.80% reported in the Saudi survey.¹³ That survey was conducted online, which may favour better-educated respondents, whereas our

participants were interviewed face to face. More than one-third of our participants were unaware that antibiotics can cause harm, so counselling at the point of dispensing should cover adverse effects as well as dose and duration.

Understanding of AMR itself was poor. Only 36.40% of participants correctly defined AMR as microorganisms becoming resistant to medicines, compared with 75.90% in a population survey in China.¹⁵ A common misunderstanding in other surveys is that the human body, rather than the microorganism, becomes resistant. This view was held by 76.00% of respondents in the WHO survey and 52.00% of the public in coastal Karnataka.^{10,12} Only 9.20% of our participants identified all three causes (overuse, use for viral infections and incomplete courses), compared with 47.60% of respondents who recognised risk factors for AMR in a community survey in Ethiopia.¹⁶ Part of this difference may reflect the strict criterion used here, as a response was counted only when all three causes were selected, and 27.20% of our participants did not know any cause. In contrast, recognition that frequent antibiotic use increases the risk of AMR (60.60%) was similar to the 58.40% reported in Bangladesh, which suggests that the link between use and resistance is more intuitive than its mechanism or causes.¹¹

Only 46.40% knew that resistant organisms can spread between humans, animals and the environment, 25.80% thought that spread occurs between humans only, and 17.60% could not answer. This indicates limited awareness of the one health nature of AMR, an approach emphasised in the WHO global action plan.⁷ In a national survey in Nigeria, 49.50% of respondents acknowledged that resistant bacteria can spread from person to person, a related but not identical item.¹⁷ Only 33.20% of our participants recognised AMR as a significant global health threat, which shows that public understanding of the scale of the problem lags behind, and improving public awareness and understanding is a stated objective of the WHO global action plan.⁷

After the counselling session, the proportion of correct responses increased in all domains, for example from 45.80% to 100% for the action of antibiotics, from 36.40% to 97.40% for the definition of AMR and from 60.60% to 98.80% for the effect of frequent use. Most of the comparison studies above reported baseline knowledge only, so the change after education has to be compared with intervention studies. A pharmacist-led intervention in South India found larger knowledge gains with video-based counselling than with pamphlets, and a structured training programme for community health workers in Karnataka reduced the belief that antibiotics treat viral infections from 67.90% to 14.60% four weeks after training, although that study was conducted among health workers and not the general public.^{18,19} A systematic review found that most public AMR education interventions improved knowledge, attitudes or behaviour, but the effect was clearer for schoolchildren and parents than for the general public, and a narrative review of

community-based stewardship in low- and middle-income countries concluded that multifaceted, education-focused interventions are probably the most effective.^{9,20}

The gains were not uniform. Simple factual items reached almost 100% immediately after the session, whereas items involving several components improved less: identification of all three causes rose from 9.20% to 45.20% and recognition of AMR as a global threat from 33.20% to 67.20%. A single brief session therefore appears sufficient to convey simple facts but not the full concept of AMR, which supports repeated and multimodal education.

Post-test responses were collected immediately after the session with the same questionnaire, so the near-complete scores mainly reflect short-term recall. This study cannot show whether the gains persist or change practice. Follow-up assessments after several months, ideally with a control group, are needed to show lasting change in community antibiotic use.

These findings indicate a need for extensive and sustained public awareness programmes and patient education on the appropriate use of antibiotics and AMR, particularly on the difference between bacterial and viral infections, what AMR is, and how resistance develops and spreads.

Limitations

Limitations of the study are, it is a bit difficult to get data without any response bias and also missing or inadequate or erroneous response by respondents and the response time allowed for counseling was somewhat small and it was difficult for busy adults to be a part of study due to the busy schedules.

CONCLUSION

The study demonstrates that while baseline knowledge and awareness of antibiotic use and AMR among the general population in Pathanamthitta district are moderate, significant improvements can be achieved through structured educational interventions. Scaling up such programs, reinforcing prescription regulations, and integrating AMR education into public health strategies are vital to promote rational antibiotic use and mitigate the threat of antimicrobial resistance in Kerala and beyond.

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Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee

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