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Effectiveness of an Information Booklet on the Awareness of Antimicrobial Resistance (AMR) among Health Care Professionals in a Selected Primary Care Hospital

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Abstract: The study aimed to assess the level of knowledge on Antibiotics and its resistance among healthcare professionals and the effectiveness of an information booklet, which includes the Centers for Disease Control and Prevention (CDC) guidelines for to use of Antibiotics to prevent Antimicrobial resistance (AMR). AMR occurs when bacteria change over time and no longer respond to medicines. Antimicrobial resistance leads to higher medical costs, prolonged hospital stays and increased mortality. Knowledge of Antibiotics is essential in preventing from ill effects of AMR. According to the CDC, in 2018, inappropriate prescribing of antibiotics contributed to antibiotics-resistant conditions, which led to 2 million infections and killed about 23,000 Americans annually. In India, 4.95 million people died in 2019 suffered from drug-resistant infections and antibiotic resistance was the direct cause for 1.27 million of those deaths. An experimental research design employed non probability convenient sampling technique to select the 60 samples in a selected primary care hospital. The majority, 44 (73%), of health professionals were between the ages of 21 and 30 years, 40(67%) were nurses, 13(22%) were medical practitioners and 7(11%) were pharmacists. While considering their area of work majority 20(33%) of them, were from the ward and 14(23%) from the ICU setting. Level of knowledge gain score measured using Extended McNemar`s chi-square test revealed health professionals gained 20.27% with 95% CI and it was found statically significant ($\chi 2=43.81$ P=0.001***). The study results recommend such an interdisciplinary approach of training doctors, nurses and pharmacists to become sensitive and update themselves to reduce the incidence of Antimicrobial resistance among the common public.

Introduction

Antibiotics refer to substances produced by various microorganisms, such as bacteria, fungi and actinomycetes, which specifically inhibit the proliferation of other microorganisms by disrupting crucial internal functions (Gauri et al., 2016; Kalal and Charola, 2021; Katara, 2021; Mudenda et al., 2024). The terms “antibiotics” and “antimicrobial” are not the same. Microbes include bacteria, viruses, fungi and parasites. Antimicrobials are agents against any of these.

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Antibiotics that specifically target bacteria (CDC, 2018). After the discovery of penicillin in 1929, it was identified globally and changed the practice of medicine, making the infections ready to treatable. On another hand, it was noticed the commercialization of antibiotics for the treatment of infectious diseases (Zeru et al., 2019; Haider, 2023) which have serious adverse effects, which occur in roughly 20% of hospitalized patients (Tamma et al., 2017).

Antibiotics have an "afterlife" and remain biologically active even after being discharged into the environment (Evans et al., 2021). Identifying the genuine necessity and suitability of antibiotics is crucial. The primary caregivers are highly influenced to prescribe by the patient's expectations, clinical uncertainty and time pressure (O'Connor, 2018; Das et al., 2018). According to the Centers for Disease Control and Prevention, inappropriate prescribing of antibiotics contributed to antibiotic-resistant conditions, which led to 2 million infections and has killed about 23,000 Americans annually (CDC, 2018). In India, 4.95 million people died in 2019 suffered from drug-resistant infections and antibiotic resistance was the direct cause for 1.27 million of those deaths. 1 in 5 of those deaths occurred among children under 5 years old (Canton, 2022). A study indicated that between 2000 and 2015, antibiotic consumption (expressed in defined daily dose (DDD) increased by 65% worldwide, largely driven by lower and middle-income countries (LMICs). India, it increased from 3.2 to 6.5 billion DDDs (103 %). (Klein et al., 2015; Mittal et al., 2023).

Further, over-the-counter (OTC) purchase of antimicrobials obtained without a prescription remains an issue in India. A few recent reports show that pharmacists dispensed antibiotics without prescriptions or that consumers visit pharmacies to buy antibiotics as OTC medicine, e.g., in Bangladesh (Darj, 2019), China (Gong et al., 2020), Mozambique (Torres, 2020), Thailand (Siltrakool, 2021) and India (Kotwani, 2021). Thus, self-medication and easy access to antibiotics without a prescription are some of the major concerns regarding the inappropriate and overuse of antibiotics in the community (Abduelkarem et al., 2019). The regrettable consequence of discovering and the ever-expanding use of antibiotics, particularly when inappropriately, is the swift emergence of antibiotic-resistant strains seen today (Price et al., 2018; Karthikeyan et al., 2022). Antibiotics resistance has far-reaching effects, impacting both the economic domain by raising treatment expenses and depleting resources and public health through heightened rates of sickness and death, as well as a diminished quality of life (Li, 2018; Majumder et al., 2020).

Health care workers, including physicians, pharmacists and nurses, play a vital role in prescribing, distributing and administration of antibiotics to patients (Chukwu et al., 2021; Ghosh et al., 2022; Sarkar et al., 2022; Mittal et al., 2023; Kaur et al., 2023). The American Nurses Association (ANA) and the Centers for Disease Control and Prevention (CDC) had a work group to explore how nurses can become more engaged and take a leadership role to enhance antibiotic stewardship efforts (CDC, 2017). Although many research studies evident that there is a lack of knowledge on antibiotic resistance among healthcare workers (Pearson, 2019). While it is true that a poor knowledge or negative attitude towards antibiotics leads inevitably to bad clinical practice, practical skills are not always a reflection of knowledge, a situation known as "theory-practice gap" (Rabano et al., 2019; Simegn et al., 2022).

Prudent utilization of antibiotics is crucial, particularly when addressing the rise of antimicrobial resistance within a community. The present National Action Plan (NAP) is thorough and is in good accordance with the Global Action Plan for Antimicrobial Resistance (AMR) established by the World Health Organization (WHO, 2017). The improvement of awareness and understanding of AMR through education is kept as a first priority. To date, the studies that have evaluated the training that healthcare professionals have about infectious diseases, antibiotic resistance and safe use of antibiotics have been mainly carried out by professionals of medicine and pharmacy (Chukwu et al., 2021; Manikanta et al., 2022 Fuller et al., 2023). Thus, the objective of this paper has been to determine the healthcare professional knowledge and awareness of antibiotic use, and its resistance.

Material and Methods

A quantitative research approach was used to achieve the objective of this study. An experimental, one-group pre and post-test research designed was used. Non probability convenient sampling technique was used to select 60 health professionals in a Primary care hospital in Chennai. The study was conducted from August to October 2022. Health professionals who have more than 6 months of experience and become eligible to prescribe, distribute and administer medication (Registered and licensed) alone are included. The research proposal received Institutional ethical committee approval.

Measures

The pre-structured demographic data, which include Age, Qualification, Year of experience, and Area of work, were collected along with CDC guidelines based

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on 25 knowledge questionnaires both on Antimicrobial use (15 questions) and Antimicrobial resistance (10 questions) also included. A three-point Likert scale was used to assess knowledge, a score of 3 for agreeing, 2 for not sure and 1 for disagree. The maximum score was 75 and the minimum was 25. The scores for each item were summed to produce a single overall score. A high overall score indicates adequate knowledge (>75%), and the lowest score indicates Inadequate knowledge (<50%). Between 50-75% is considered Moderate knowledge. Its internal reliability was calculated using the Test-retest method, and the reliability correlation coefficient value was 0.82. The information booklet consists of Antibiotic prescription & its use, Antimicrobial resistance & its prevention strategies. These data were collected from the CDC website and validated by medical and nursing experts. After explaining the purpose of the study and written consent from the health professionals, the questionnaire was instituted through the interview technique. After collecting pre-test data, an Information booklet was given individually with a brief explanation of the content. Post-test data were collected after two weeks. Collected data were tabulated and interpreted using descriptive and inferential statistical analyses.

Table 1. Frequency and percentage distribution of background variables (N=60).

Background variables		Frequency (NO.)	Percentage (%)
Age	21-30 years	44	73.33
	31-40 years	13	21.67
	41-50 years	3	5.00
	>50 years	0	0.00
Qualification	Nursing	40	66.67
	Medical Practitioner	13	21.67
	Pharmacist	7	11.66
Years of experience	< 1year	6	10.00
	1-2 years	22	36.67
	3-5years	22	36.67
	> 5years	10	16.66
Monthly Income	Rs. 47348 and above	0	0.00
	Rs.23674- Rs.47347	16	26.67
	Rs.17756 -Rs.23673	19	31.66
	Rs.11837-Rs.17755	12	20.00
	Rs.7102-Rs.11836	9	15.00
	Rs.2391-Rs.7101	4	6.67
	Less than 2390	0	0.00
What is the area of work	ICU	14	23.33
	Ward	20	33.3 3
	OT	6	10.00
	ER	9	15.00
	OPD	4	6.67
	Pharmacy	7	11.67

Table 1 depicts the Frequency and percentage distribution of background variables of Health Professionals. The majority, 44 (73%) of health professionals were between the age of 21 and 30 years, 40 (67%) were nurses, 13 (22%) were medical practitioners and 7 (11%) were pharmacists. While considering their area of work majority, 20 (33%) of them were from the ward and 14 (23%) from the ICU setting (Figure 1 & 2).

Table 2 & 3 depict the pre and post-test level of knowledge, mean and standard deviation on antimicrobial use and its resistance among Health Professionals. Level of knowledge gain score measured using Extended McNemar`s chi-square test revealed health professionals gained 20.27% with 95% CI and it was found statically significant ($\chi 2$=43.81 P=0.001***).

The mean and SD of knowledge score in the pre-test was 47.98± 6.58, in post-test, 63.18 ± 4.24 (Fig. 3) and the mean difference was 15.20 and hence, the student

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paired `t` test identified as statistically significant (t=19.44, P=0.001***). Medical practitioners (X^2=7.50, P=0.02*) and >5 years of experience (X^2=9.43, P=0.05*) have more adequate knowledge scores than others, which was shown statically significant association in the chi-square test.

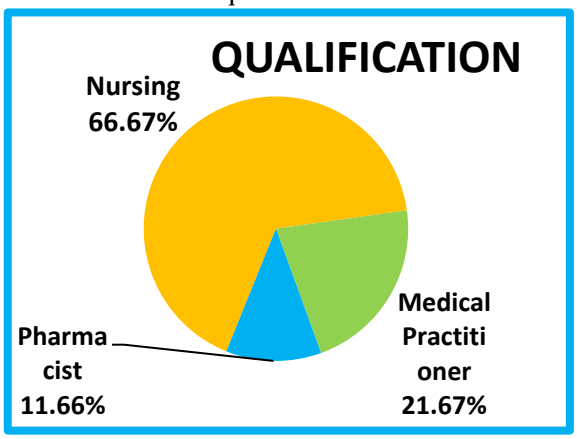

Figure 1. Qualifications of healthcare professionals.

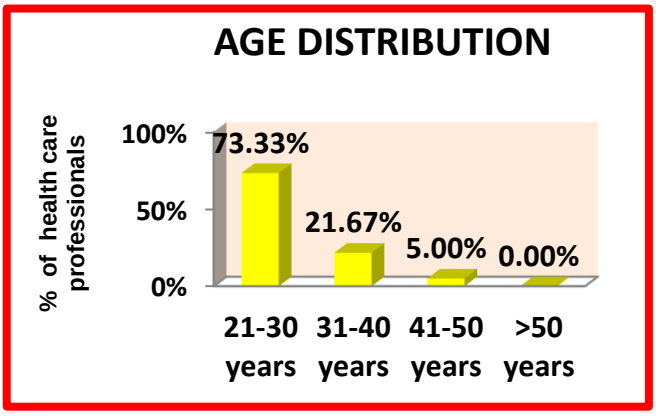

Figure 2. Age distribution of healthcare professionals.

by Nayak et al. (2016) on Knowledge about antibiotics and antibiotic resistance among health-related students in Nepal, where medical students exhibit a high level of knowledge and care among 176 respondents, 87.5% of them using antibiotics only with doctor`s consultation and 84.7% were aware that injudicious usage of

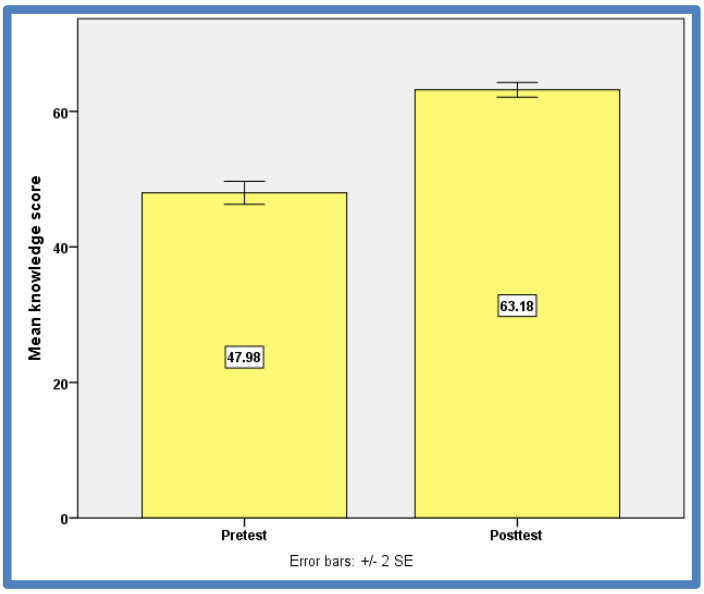

Figure 3. The bar diagram compares the pre-test and post-test knowledge scores.

antibiotic can lead to adverse effect. Evidence (Akbar et al., 2021; Allemailem, 2024; Precha et al., 2024) suggested the learning need on Antibiotics among medical students, which was rightly identified from the current study where there was the highest level of knowledge gain among healthcare professionals

Table 2. Comparison of pre-test and post-test level of knowledge score.

Level	Pre-test		Post-test		Extended McNemar's test
	n	%	n	%	
Inadequate	11	18.33%	0	0.00%	χ2=43.81 P=0.001***(S)
Moderate	43	71.67%	12	20.00%	
Adequate	6	10.00%	48	80.00%	
Total	60	100.0%	0	0.00%	***significant at p≤0.001 level

Table 3. Comparison of overall knowledge score before and after intervention.

	Assessments	Mean knowledge score	SD	Mean difference	Student's paired t-test
Knowledge Score	Pre-test	47.98	6.58	15.20	t=19.44 P=0.001*** DF = 59, significant
	Post-test	63.18	4.24		
*** very high significant at P≤0.001					

Discussion

The study findings identified that there was a 20.27% gain in knowledge score after instituting an information booklet. This finding was supported by the study done identified after instituting information booklet on Antibiotics and its resistance. The following question denotes increased knowledge gain after the intervention, "Frequent use of antibiotics cannot cause antibiotic

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resistance" (34.34%) and "Antibiotics work against bacterial infections" (35.67%). In contrast, there was the least knowledge gain for the question, "Antibiotic resistance has been found only in specific countries" (1.67%), "Antibiotics are not useful for viral infection: (2.67%), which says they were already aware of this information.

This study gave an insight into the benefits of the information booklet learning tool in creating knowledge and awareness among healthcare professionals on antibiotic use and its resistance. The administrators can create opportunities to upgrade and update themselves through regular in-service CNE/CME programs. The study recommends studying the attitude and practice of health care professionals in regard to Antibiotic usage.

Conclusion

The study concludes that knowledge gain is possible with simple strategies among healthcare professionals. Despite the small size and specific setting, this study gave useful data to go for further larger scale studies. It is indeed essential to train or educate healthcare professionals with learning materials to prevent Antimicrobial resistance, which is a high sensitive need in current health settings. Such an interdisciplinary approach of training doctors, nurses and pharmacists will assuredly reduce the incidence of Antimicrobial resistance among the common public.

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Conflict of Interest

The authors disclosed no conflicts of interest.

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