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Knowledge, Attitude & Practice about Ecopharmacology among healthcare professionals in a Tertiary Care Teaching Hospital

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A B S T R A C T

Introduction: Ecopharmacology is the science concerned with the entry of chemicals or drugs into the environment through any route. Various factors for drug entry into environment include consumption, incorrect disposal and through effluents of pharmaceutical companies. There are guidelines for pharmaceutical waste management (like GMP and FDA guidelines) for the manufacturing units, pharmacists and consumers. There is unawareness of correct disposal methods among healthcare professionals. So this study was planned to assess the knowledge, attitude and practice (KAP) of Ecopharmacology among the health care professionals.

Material and Methods: This study was a cross-sectional, survey-based study conducted to assess the knowledge, attitude, and practice of Ecopharmacology among healthcare professionals (HCPs) at a tertiary care teaching hospital in India. The data for this study were collected through a self- designed, semi-structured, pre-validated questionnaire circulated through Google forms to Health Care Professionals.

Results: This study shows a knowledge gap about Ecopharmacology. The overall attitude of participants was positive. The study showed overall unsatisfactory practice among participants.

Conclusion: The results showed an overall unsatisfactory practice of drug disposal and inadequate knowledge but a positive attitude towards Ecopharmacology among healthcare professionals. These findings suggests the need for training regarding hazards of improper drug disposal to address the gap in knowledge, attitude and practices towards Ecopharmacology among healthcare professionals.

Keywords: Ecopharmacology, Knowledge, attitude, practice, healthcare professionals, tertiary care teaching hospital.

INTRODUCTION

Ecopharmacology is the science concerned with the entry of chemicals or drugs into the environment through any route and at any concentration disturbing the balance of ecology (ecosystem), as a consequence. Ecopharmacology is also referred to as environmental pharmacology or ecopharmaco-stewardship.[1]

Medications are essential part of one's lifestyle and left over medicines are commonly found at every home. The reasons of accumulation of left over and expired medicines can be discontinuation of therapy, start of new medicine or expiry of medicines. As per the literature reports, these stocked medicines are disposed by improper methods leading to environmental hazard.[2] The presence of pharmaceuticals and their products in environment are potentially hazardous. Their accumulation in water contributes to increased antibiotic resistance or exposure of population to drugs including aquatic animals.[3] Various factors for drug entry into environment include consumption, incorrect disposal and through effluents of pharmaceutical companies. There are guidelines for pharmaceutical waste management (like GMP and FDA guidelines) for the manufacturing units, pharmacists and consumers.[4] Though the consumption phase is considered to be the biggest contributor to the emissions of medicinal products into the environment, through excretions and incorrect disposal of unused medicines through sinks and toilets, there is unawareness of correct disposal methods. This disturbs

the whole ecosystem e.g. indirect exposure to diclofenac lead to substantial decline in number of vultures in Indian subcontinent and inculcation of the same. NSAIDs (Non steroidal anti-inflammatory drugs) in treatment of livestock and consumption of their dead bodies by vultures led to their kidney failures and consequently they were declared as endangered species.[5] Various Government and non-Governmental organizations became active to save these most efficient scavengers of nature. In effort to improve the natures balance Government of India also banned diclofenac in India for veterinary use.[6]

One of the management strategies which will likely be most effective in mitigating the risks presented by pharmaceuticals in the environment is raising awareness of Ecopharmacology among stakeholders.[7] Although FDA has issued certain guidelines for proper disposal but still in India people are not that much aware.[8] Before beginning the process of creating awareness, it is first necessary to assess the existing knowledge of the issue in the community. Such studies are few, and hence this study was planned to assess the knowledge, attitude and practice (KAP) of Ecopharmacology among the health care professionals at a Tertiary Care Teaching Hospital in India.

MATERIAL AND METHODS

Study design and setting : This study was a cross-sectional, survey-based study conducted to assess the knowledge, attitude, and practice of Ecopharmacology among healthcare professionals (HCPs) at a tertiary care teaching hospital in India. The study was conducted after obtaining approval from the Institutional Ethics Committee (IEC), with Reference number: 3553 EC/Pharmac/GMC/NGP/.

Informed consent was taken from all study participants.

Study duration: The study was conducted for a duration of two months, starting from 13th September 2024.The inclusion criteria for participants in this study were healthcare professionals willing to participate in the study. The exclusion criteria were HCPs who provided incompletely filled responses.

Data Collection Methods and Tools: The data for this study were collected through a self- designed, semi-structured, pre-validated questionnaire circulated through Google forms to HCPs. The questionnaire consisted of questions related to knowledge, attitude, and practice of Ecopharmacology. The questionnaire was validated by circulating it to a panel of 10 experts in the subject who were asked to review and evaluate the design, content, and relevance of the questionnaire as well as assess its comprehensibility and readability which was consequently modified slightly based on their feedback. The responses were then collected anonymously.

Study procedure: The questionnaire was structured to obtain the demographics of the participants and total 17 questions–5 about knowledge, 4 about attitude and 8 about practice designed specifically to answer the awareness about Ecopharmacology. Before commencement of the questionnaire, the objectives of the study were mentioned in the google forms. It was assured that the data which was collected would be used only for research purposes and the findings will not be revealed to anybody.

Statistical Analysis:

The collected data and the results were presented using descriptive statistics such as percentages.

RESULTS

The majority of respondents were aged between 20-30 years old, with 57% falling within this age group.

The majority of the participants in our study were females (56.5%) while 43.5% were males. It also shows the specific population of the respondents in percentage (%). The majority of the respondents were MBBS students (47.6%) while Resident doctors were 28.6% and Nursing students were 23.8% (Table 1)

Table 2 represents the knowledge of participants towards Ecopharmacology in percentage(%). Around 57.3% participants knew the term Ecopharmacology. The majority (87.5%) of the participants knew that there were guidelines for disposal of medicines while 58% were aware about media reports regarding effects of drug pollution on environment. Around 63.7% were aware of potential hazards of expired / unused medicines while the majority (92%) agreed that improper disposal of unused and expired medications contributes to environmental pollution. (Figure 1)

Table 3 represents attitude of the participants towards Ecopharmacology in percentage (%). Around 72.6% of the participants agreed that disposal of syrup/ liquid lotion in the drain is not the correct way of drug disposal and around 70.6% participants agreed that improper drug disposal method leads to development of antimicrobial resistance. (Figure 2). The Majority (70%) of the participants said that they follow Biomedical Waste Management rules among the various methods of disposal of medicines. (Figure 3)

Around 25.7% of the participants responded that they frequently remove the drug from the container before throwing in the garbage. Around 16.9% frequently donated unused/unexpired medicines to their near dear ones/ needy. Around 10.1% of the participants frequently changed the method of drug disposal depending upon the different class of medicines.

Around 75% of the participants responded that they have not disposed syrup/lotion in the wash basin. Around 81.5% of the participants responded that they have not disposed bulk/ excess medicine. (Table 4)
Around 56.5% of the participants responded that they dispose medicines in the household garbage.(Figure 4). Around 53.6% of the participants reported that they kept the medications in bulk or excess for future use.(Figure 5). The Majority (80%) of the participants reported that increasing awareness among healthcare professionals could be the possible solution for better Ecopharmacology (Figure 6)

Tables

Table 1: Demographic Characteristics of Participants (n=248):

Characteristics		(%)
Age (years)	<20 20-30 31-40	15 57 28
Gender	Males Females	56.5 43.5
Specific population	Nursing Students MBBS Students Resident doctors	23.8 47.6 28.6

Table 2: Knowledge of the participants regarding Ecopharmacology (n= 248):

SR.NO	QUESTIONS	YES(%)	NO(%)	DON'T KNOW(%)
1	Do you know the term "Ecopharmacology"?	57.3	42.7	
2	Are there any guidelines for disposal of medicines?	87.5	10.5	2
3	Are you aware of any media reports regarding effects of drugs pollution on environment?	58	19.8	22.2
4	Do you know the potential hazards of expired / unused medicines?	63.7	36.3	

5. Improper disposal of unused and expired medications can contribute to environmental pollution

Figure 1: Improper disposal of unused and expired medications contributes to environmental pollution

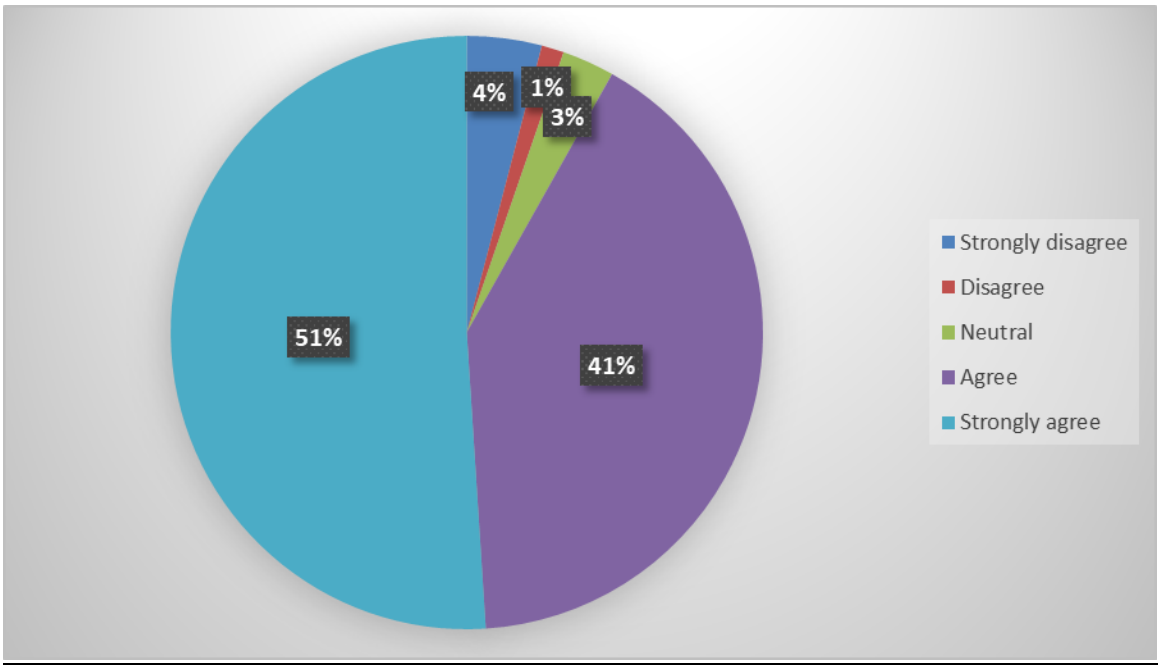
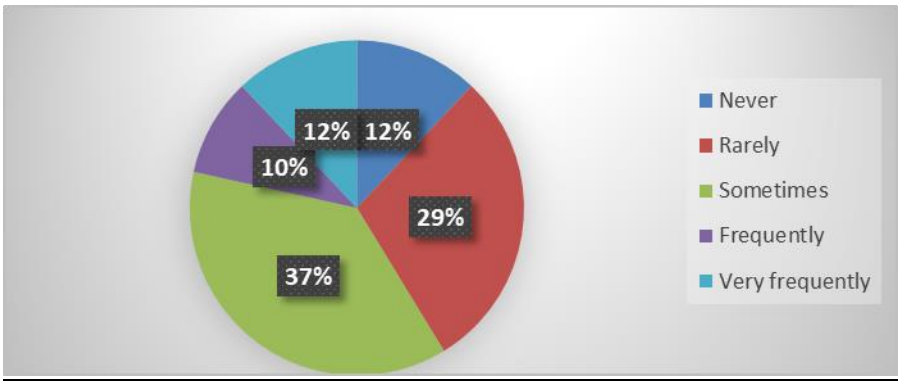


Table 3: Attitude of participants towards Ecopharmacology (n=248):

SR NO.	QUESTIONS	Strongly disagree(%)	Disagree(%)	Neutral(%)	Agree(%)	Strongly agree(%)
1	According to you disposal of syrups / liquid lotion in the drain is a correct way of drug disposal?	37.1	35.5	15.3	7.7	4.4
2	According to you, improper drug disposal methods leads to development of antimicrobial resistance	3.6	5.6	20.2	49.2	21.4

3. How often do you sensitize/ discuss regarding the concerns due to drug disposal in the environment with family members / friends?

Figure 2: Discussion regarding drug disposal in environment with family members



4. What according to you are the various methods of disposal of medicines?

Figure 3: Various methods of disposal of medicines

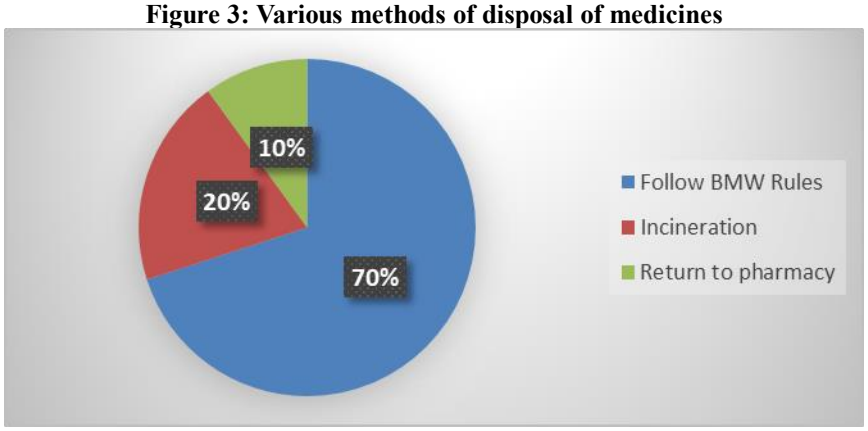


Table 4: Practice of participants towards Ecopharmacology (n=248):

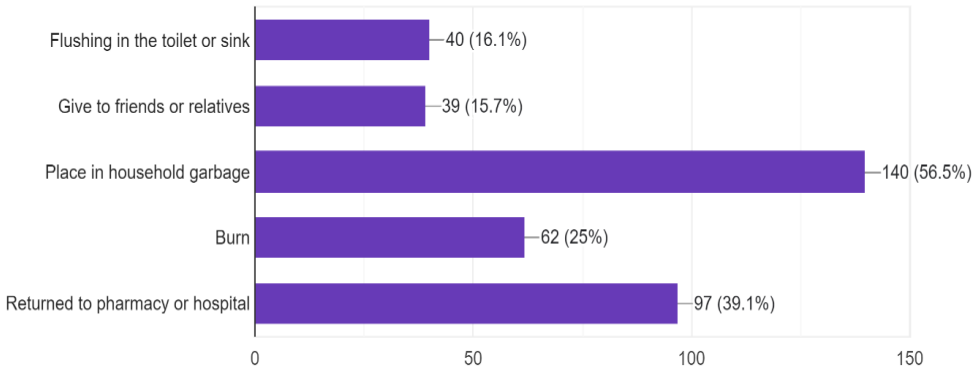
SR.NO	QUESTIONS	Never(%)	Rarely(%)	Sometimes(%)	Frequently(%)	Very frequently(%)
1	How often do you remove the drug from the container before throwing in the garbage?	22.6	20.2	31.5	18	7.7
2	How often do you donate unused / unexpired medicines to your near dear ones/ the needy?	30.6	20.2	32.3	14.5	2.4
3	How often do you change the method of drug disposal depending upon the different class of medicines?	19	30.6	40.3	8.1	2

		Yes (%)	No (%)

4	Have you ever disposed syrup / lotion in the wash basin?	25	75
5	Have you ever disposed bulk / excess medicine?	18.5	81.5

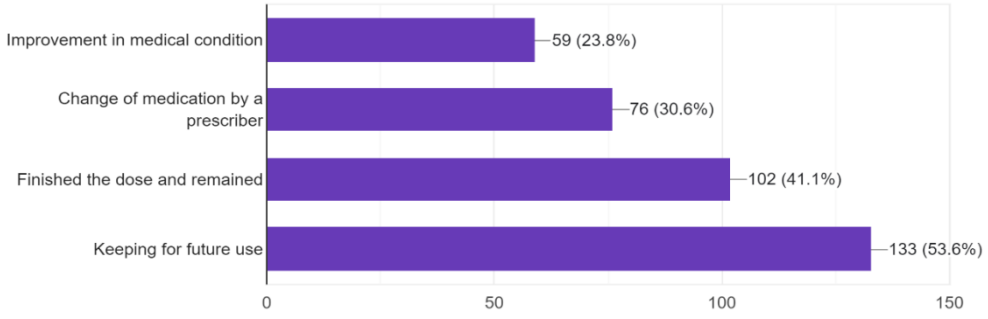
6. What are the different methods of medication disposal do you practice?

Figure 4: Methods of medication disposal practiced



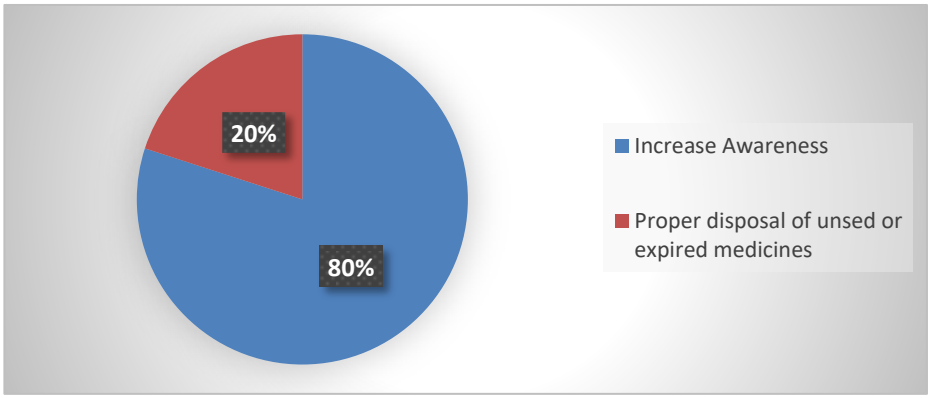
7. What are the different reasons for keeping the bulk / excess medication?

Figure 5: Reasons for keeping bulk or excess medication



8. What according to you could be the possible solutions for better Ecopharmacology?

Figure 6: Possible solutions for better Ecopharmacology



DISCUSSION

The study aimed to assess the knowledge, attitude, practices related to Ecopharmacology among healthcare professionals. The study was required to identify gaps in knowledge of Ecopharmacology among healthcare professionals, ensuring safe disposal of unused or unexpired medicines in the community. In our study more than half of the participants were aware of media reports regarding effects of drug pollution on environment and knew about the potential hazards of expired or unused medicines and it was encouraging to know that the majority of the participants were aware that there were guidelines for disposal of medicines and were aware that improper disposal of unused and expired medication contributes to environmental pollution. Similar findings have been found in studies conducted by (Bashaar et al, 2017 and Seehusen et al, 2006).[10,11] This could be due to combination of education and media influence which likely plays a crucial role in shaping awareness about the environmental risks of improper medication disposal.

One of the positive findings of our study is that when it came to disposal of syrups/ liquid lotion in the drain/ wash basin most(72.6%) of the participants agreed that it is not the correct way of drug disposal and similar perception was observed in practice. Similar practices were reported in studies from (Kuspis et al, 1996 and Abahussain et al, 2007).[12,13] According to standard guidelines also small quantity liquid medications should be diluted with water and drained.[4] Drugs or their metabolites also find their path to enter the food chain through this route.[14] Interestingly our study found that most of the participants agreed that improper drug disposal methods can lead to development of antimicrobial resistance. Similar findings were found in studies conducted by (Zuccato et al, 2005 and Kolpin et al, 2002).[15,16]This may be due to Participant's understanding that improper disposal, such as flushing medications or throwing them in the trash, can lead to pharmaceuticals entering water systems, creating an environment where bacteria can develop resistance.

When asked about the practice of medication disposal it was encouraging to know that almost half of the participants returned the medication to pharmacy or hospital while more than half the participants placed medicines in the household garbage and very few of the participants gave it to friends or relatives respectively when it came to various methods of unused/ excess or expired medication disposal practice. Though awareness was good but when it comes to practice it was poor. This is similar to findings of an Asian study in which most of the respondents were throwing the expired medicine in household trash while 21.3% of the respondents returned unused and expired pharmaceuticals to medical stores. Returning expired and unused medicines to medical stores is community practice in the USA (23%) and UK (22%).[10,12,17] This could be probably because for many individuals, throwing medicines in the trash is often seen as the simplest and most convenient option. Returning medications to pharmacies may require extra effort, such as travel or planning. When it came to how often they remove the drug from the container before throwing in the garbage only few of the participants reported that they frequently practiced it. This is similar to findings of another study conducted by (Advani M et al, 2019). [18] This could be probably because participants might prioritize convenience over safety, opting to dispose of medications in their original containers rather than taking the extra step to them. Our study found that only few of the participants donated unused or unexpired medicines to their near dear ones or the needy and only very few of them changed the method of drug disposal depending upon the different class of medicines. Although the knowledge and attitude of the participants is good but practice was unsatisfactory.

LIMITATIONS

The study only includes participants from a specific hospital, limiting generalizability of results to other settings or populations. The knowledge and attitudes of healthcare professionals can vary widely based on location and experience. Self-reported data is subject to recall bias and is thus a confounding factor.

CONCLUSION

The results showed an overall unsatisfactory practice of drug disposal and inadequate knowledge but a positive attitude towards Ecopharmacology among healthcare professionals. These findings suggest the need for training regarding hazards of improper drug disposal to address the gap in knowledge, attitudes and practices towards Ecopharmacology among healthcare professionals.

Conflict of interest : Nil
Sources of funding : Nil

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