Original Article

A Questionnaire Based Ecopharmacology Survey on Awareness and Practice of Patients towards Usage, Storage and Disposal of Drugs in Tertiary Care Hospital of Bihar

Dr. Saajid Hameed[1], Dr. Noor Husain[1], Dr. Adil Ali Shakur[2], Prof. (Dr.) Harihar Dikshit[3], Prof. (Dr.) Lalit Mohan[4]

1. Senior Resident, Department of Pharmacology, IGIMS, Patna, Bihar, India
2. Assistant Professor, Department of Pharmacology, IGIMS, Patna, Bihar, India
3. Professor and Head, Department of Pharmacology, Netaji Subhas Medical College & Hospital, Bihta, Patna, Bihar, India
4. Professor & HOD, Department of Pharmacology, IGIMS, Patna, Bihar, India.

***Corresponding author's E-mail:** noorhusain24@rediffmail.com

Received: 05-02-2024; **Revised:** 28-03-2024; **Accepted:** 06-04-2024; **Published on:** 15-04-2024.

ABSTRACT

Introduction: Globally, the use of pharmaceutical products has increased. More than half of all pharmaceuticals are prescribed and marketed improperly, according to information gathered by the World Health Organization (WHO), which causes an unneeded buildup of medications and poses a serious risk to the environment. Information on how expired and unused medications are disposed of at the consumer level in the research region is scarce. Because of this, it is imperative to investigate how pharmaceuticals are disposed of by patients.

Aims/ objective: To evaluate awareness and practice of patients towards usage, storage and disposal of drugs in tertiary care hospital of Bihar.

Materials and Method: 207 patients visited the outpatient department of general medicine were included in this survey. The participants were informed of the aim and significance of the research prior to completing the questionnaire. The structured questionnaires were given to them along with appropriate time to complete them once written informed consent was obtained. The interviewer read the options and questionnaire to the illiterate study participants and recorded their answers.

Results: 72.95% patients hadn't received any instructions from healthcare professionals about disposal of unused medicine. Most of the patients had practice of storing analgesics (71.01%), followed by antacids (64.73%) and systemic antimicrobials (58.45%). Reason for left-over medicines was discontinuation of drugs due to symptomatic relief (51.69%) followed by changes in prescription by clinicians (18.36%). Most of the patients had habit of throwing unused or expired medicine in dustbin (44.92%) and land (34.30%). Only 3.38% patients had habit of throwing drugs in rivers or water bodies.

Conclusion: Lack of instructions from clinicians to patients regarding use of prescribed medicines was highlighted as major threat to ecopharmacology in our study.

Keywords: Ecopharmacology, Drug Storage, Drug Disposal, Awareness, Practice.

INTRODUCTION

Globally, the use of pharmaceutical products has increased.[1] More than half of all pharmaceuticals are prescribed and marketed improperly, according to information gathered by the World Health Organization (WHO), which causes an unneeded buildup of medications and poses a serious risk to the environment.[2] Medication waste is caused by a number of factors, including low patient adherence to treatment, excessive physician prescribing, early remission of medical problems, and changes in therapy regimens.[3,4] Human beings, the ecosystem, and other biological species are at danger when unused and expired pharmaceuticals are present in dwellings and communities. [5,6]

The effects of this problem are demonstrated by two examples: first, being exposed to of the non-steroidal anti-inflammatory drug (NSAID) diclofenac, which caused renal failure and almost drove vultures extinct in Southeast Asia; second, the exposure of ethinyl-estradiol (EE2), an ingredient in oral contraceptives, which led to fish feminization in European waters and impaired sexual development. [7,8]

In terms of volume produced, India is ranked fifth in the world's pharmaceutical markets. [2] The pharmaceutical industry in India includes drug production, excipient synthesis, completed dosage production, impurity analysis, and raw material assessment. [3, 4] Studies show that a large percentage of these prescription drugs are either outdated or remain unused. [5-7] Half of all patients do not take their medications as recommended, and 50% of medications are prescribed, distributed, or sold improperly, according to the WHO. [8] As a result, many drugs are thrown away and left unused when they are not taken as prescribed.

An important risk to environmental contamination is the buildup of left over, unused, or expired medicines in homes and the incorrect disposal of it. This build-up may be caused by a number of things, including prescription drug modifications, dosage alterations, medication expiration, and sickness recovery. [9–12] The general public

also frequently keeps medications at home in case they need them later. [13, 14]

Drugs that have expired may lose their strength, efficacy, and safety, creating goods that could be harmful to one's health. Drugs that have expired may eventually lead to antimicrobial resistance, treatment failure, and possibly even cancer. Drugs that have expired can also lead to drug misuse, unintentional poisoning, ineffective use of healthcare facilities, and missed chances for medical care. Drugs that have been used up or expired may also have their physico-chemical characteristics changed, which might encourage the absorption of moisture and lead to microbial infection. Enforcing strict adherence to drug disposal procedures for unused or expired medications is essential. [9, 10]

Before transporting the pharmaceuticals to a pharmaceutical center for destruction, effective household disposal techniques for unused and expired prescriptions entail properly encapsulating the medications alongside other inert substances. [11,12] Although burning is thought to be the best way to dispose of drugs, it is not feasible for households to employ. [6,13] Notably, national agencies like the Ministries of Health, Environment, and Drug authorities are the primary target of current international standards, including those from the WHO, which ignore the household level. [14] International recommendations regarding appropriate procedures for disposing of medical waste are either not widely known to the public or have not been sufficiently modified for public usage. [14]

Information on how expired and unused medications are disposed of at the consumer level in the research region is scarce. Because of this, it is imperative to investigate how pharmaceuticals are disposed of by patients. Therefore, this study was planned to evaluate awareness and practice of patients towards usage, storage and disposal of drugs in tertiary care hospital of Bihar.

MATERIALS AND METHODS

This questionnaire-based, observational study was conducted among the patients visiting outpatient department of general medicine in a tertiary care center of Bihar, Eastern India, from January 2023 to December 2023. The data collection was started after taking approval from institutional ethics committee and taking written informed consent of study participants under the guidelines of Good Clinical Practice and Declaration of Helsinki.

Consecutive sampling was done and all patients fulfilling our eligibility criteria during the study period were included in the study.

Inclusion criteria:

Patients between the ages of 18 and 65 who visited the outpatient department of general medicine and who had been exposed to medications during the last three months and were willing to provide information were included in the study.

Exclusion criteria:

Critically ill patients requiring hospitalization or patients with psychiatric disorders.

Data collection:

There were two sections to the questionnaire. The first section was devoted to collecting the study participants' personal information, including their gender, age, level of education, and socio-economic status. The habits and opinions of the respondents about getting rid of leftover medication were examined in more detail in the second section. The questions were written in English and transcribed into the common language of Hindi using straightforward language that was suitable for the customers' educational level. After the questionnaire's validation, a pilot study with thirty participants was carried out to improve it even more.

Methodology:

The individual was informed of the aim and significance of the research prior to completing the questionnaire. The structured questionnaires were given to them along with appropriate time to complete them once written informed consent was obtained. The interviewer read the options and questionnaire to the illiterate study participants and recorded their answers.

Statistical analysis:

Data collected from study participants were presented in tabular form using Microsoft Excel 2016 and then transferred to Graph-pad version 8.4.3 for further statistical analysis. Descriptive statistics was used to demonstrate the different variables as frequency and percentages.

OBSERVATIONS AND RESULTS

A total of 207 study participants were included in our study. Their baseline demographic characteristics is given in Table 1. Most of the patients in our survey belonged to 31-40 years age group (38.65%) and there was slight male preponderance. Most of the patients belonged to lower middle class (30.92%) and their education was up to primary school level.

59.90% patients agreed that environmental pollution is caused by improper disposal of drugs. Most of patients (79.71%) were unaware of ecopharmacology and 72.95% hadn't received any instructions from healthcare professionals about disposal of unused medicine. (Table 2)

Table 1: Baseline Demographic Characteristics of Patients in Survey

Variables	Category	Number of Patients	Percentage of Patients (n = 207)
Age in Years	18-30	43	20.77
	31-40	80	38.65
	41-50	39	18.84
	51-60	22	10.63
	>60	23	11.11
Gender	Male	119	57.49
	Female	88	42.51
Socio-economic status[15]	Upper Class	19	9.18
	Upper Middle Class	31	14.98
	Middle Class	45	21.74
	Lower Middle Class	64	30.92
	Lower Class	48	23.19
Education	Illiterate	27	13.04
	Up to Primary School	81	39.13
	Up to Secondary School	56	27.05
	Intermediate or Higher	43	20.77

Table 2: Knowledge of Patients about Ecopharmacology

Variables	Categories	Number of Patients	% (n=207)
Improper disposal of unused and expired medications can contribute to environmental pollution.	Yes	124	59.90
	No	83	40.10
Pharmaceutical residues in the environment endanger the ecosystem and wildlife species.	Yes	113	54.59
	No	94	45.41
Antimicrobial residues in the environment contribute to antimicrobial resistance.	Yes	87	42.03
	No	120	57.97
There are laws or guidelines for proper disposal of pharmaceuticals.	Yes	86	41.55
	No	121	58.45
Have you heard any reports about how pharmaceuticals can contribute to pollution?	Yes	42	20.29
	No	165	79.71
Have you been taught the proper disposal of medications from healthcare professionals?	Yes	56	27.05
	No	151	72.95

Table 3: Classes of Unused Drugs stored by Patients

Class of drugs	Number of Patients	% (n = 207)
Analgesics	147	71.01
Antacids	134	64.73
Systemic Antimicrobials	121	58.45
Vitamins	111	53.62
Cold & cough medicines	69	33.33
Laxatives and Purgatives	57	27.54
Topical Antimicrobials	28	13.53
Others	22	10.63

Most of the patients had practice of storing analgesics (71.01%), followed by antacids (64.73%) and systemic antimicrobials (58.45%).

Table 4: Reasons for Storage of Unused Medicine

Reasons	Number of Patients	% (n = 207)
Stoppage of drugs on symptomatic relief	107	51.69
Changes in prescription	38	18.36
Purchasing a greater number of drugs than required	33	15.94
Change to other doctor due to dissatisfaction	29	14.01

Reason for left-over medicines was discontinuation of drugs due to symptomatic relief (51.69%) followed by changes in prescription by clinicians (18.36%).

Table 5: Method of Disposal of Unused Medicine

Method	Number of Patients	% (n = 207)
Throw away in dustbin	93	44.92
Throw away in land	71	34.30
Flush in toilet	16	7.73
Donate to poor patient	10	4.83
Throw away in rivers or water bodies	7	3.38
Return to pharmacy	6	2.90
Burn	4	1.93

Most of the patients had habit of throwing unused or expired medicine in dustbin (44.92%) and land (34.30%). Only 3.38% patients had habit of throwing drugs in rivers or water bodies.

DISCUSSION

207 people participated in this study, of whom 42.51% were female and 57.49% were male. In a survey done in Kabul, 73.4% of the 301 respondents were male and 26.6% were female. University graduate students made up over half of the interviews.[16] In a different Saudi Arabian study by Wajid et al., 40.7% of respondents were married, and 74.7% of those who were interviewed had a university degree.[1] In a study was carried out in India among patients who were visiting outpatient departments (OPDs) in Western India, the majority of respondents were from middle-class to lower-class backgrounds, with 77.5% of them being male and having a mean age of 32±6.2 years.[1]

According to this study, the most frequent class of unused medications in households was analgesics (71.01%). 95.3% of unutilized medications were found in a study done in Kabul; of these, 46.5% of antibiotics and 20.3% of NSAIDS were primarily kept in the home before being thrown out.[16] According to a Saudi study, 89.3% of medications are left unused, with NSAIDs accounting for 80.7% of leftovers and antibiotics for 48.7%.[17] According to a study done in Ahmedabad, India, 30.5% of analgesics, 17.5% of nutraceuticals, and 11% of systemic and topical antibiotics kept in households were not utilized and were subsequently thrown away.[1]

Reason for left-over medicines was discontinuation of drugs due to symptomatic relief (51.69%) followed by changes in prescription by clinicians (18.36%).

52.2% of Afghans, according to research, kept unused medications at home until they ran out, followed by 21.3% who took them back to a pharmacy and 14.3% who threw them in trash cans. On the other hand, 12% of expired medications were flushed down the toilet and 77.7% were disposed of in dustbins.[16] In a comparable manner, 48.1% of Saudis disposed of leftover medications in the trash, 13.7% donated them to friends or family, and 5.4% flushed the medications down the toilet.[17] According to a survey conducted in Western India, 30.5% of customers disposed of unneeded medications in dustbins, 12% flushed them down the toilet, and eight percent returned them back to the pharmacy.[1] Furthermore, procedures for the safe disposal of unwanted or expired medications should be developed by the government, according to 60.8% of those surveyed in Kabul and 85.5% of participants in Saudi Arabia.

The vast majority of survey participants—more than 90% of them—said they had not been taught the proper and secure ways to dispose of drugs. As a result, it is critical that healthcare practitioners carry out training programs that address the safe and appropriate disposal of pharmaceuticals, making sure that patients are informed of this important information when they visit medical facilities. Especially, medical professionals have a big part to play in spreading correct information on how to dispose of drugs safely.

Right now, the take-back initiative program should be given first priority. This should be followed by educating the public about the negative effects that current disposal practices have on the environment and human health. This strategy might have a beneficial effect on reducing the current disposal practices.

The fact that the research area was restricted to particular areas of Patna city is one of its limitations. Due to the inclusion of research participants who had recently been exposed to medications, recollection bias may also be a constraint. A longer survey that covers more distant regions might find more important data.

CONCLUSION

Lack of instructions from clinicians to patients regarding use of prescribed medicines was highlighted as major threat to ecopharmacology in our study. The inappropriate disposal of outdated and unwanted medications is becoming a global issue, particularly in developing nations like India. The health sector's lax regulation is largely to blame, and a sizable portion of the populace is less informed about medication disposal regulations and the risks involved in their incorrect application. We have to build some perfect laws and regulation system on ecopharmacology, defining the evaluation index for ecopharmacology, continuing the clinical rational medication, and the pharmaceutical take back programs popularizing the concept of ecopharmacology and strengthening the policy-guided and scientific researches of ecopharmacology in pharmaceutical firms and academia.

Acknowledgement: We are thankful to the healthcare workers of IGIMS, Patna.

Ethical clearance: Institutional Ethics Committee of IGIMS, Patna

Source of Support: The author(s) received no financial support for the research, authorship, and/or publication of this article

Conflict of Interest: The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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