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A descriptive study to assess the pattern of utilization and knowledge regarding storage, reuse and disposal of medicines available at home among adults visiting a tertiary care hospital in Raipur, Chhattisgarh

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ABSTRACT

Background and objectives

The aim of the present study was to understand the utilization pattern of medicines available at homes of patients. We also assessed their knowledge regarding appropriate storage, reuse of unused medicines, and proper disposal of unused and/or expired medicines and self-medication and/or self-discontinuation of medicines.

Methods:

A descriptive cross-sectional study was carried out between May 2021 and August 2021 in Raipur Institute of Medical Sciences (RIMS) among adults (18 years and above) using a predesigned, semi-structured and pretested proforma. Data collected was entered in Microsoft Excel and analysed using Stata v16. The data was described using numbers, percentages and presented in tables

Results:

The most common source of medication was a pharmacy (65.1%); and 13.1% obtained their medications without any prescription. The participants with more than eight medications in current use and unused were 16.0% and 11.7% respectively. Importantly, only 35.3% of medications currently in use were advised by doctor or healthcare worker. The most common reason for having unused medication was self-discontinuation (76.6%) and 52.0% of unused medication went into general wastes. The knowledge regarding medication storage, reuse and disposal was appropriate in 44.7%, 24.3% and 12.5% participants. Majority (81.6%) had lack of appropriate knowledge regarding self-medication and/or self-discontinuation.

Conclusion: Need of the need of the hour to establish a medication disposal system in the country – available at household level in addition to being culturally appropriate, acceptable, and affordable.

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INTRODUCTION

Globally, the use of medicines has increased at a 3%compound annual growth rate (CAGR) since 2014; accounting for estimated 1.8trillion days of therapy, an average of 234 per person in 2019.[1,2] This may be attributed to the increasing burden of diseases, in particular, non-communicable diseases which were responsible for71% of deaths worldwide.[3-5]Across nations, the overall use of medicines is outpacing expected use.[6] This suggests that there have been real improvements in the number of people receiving medicines; or in other words, accessibility is much improved.[7] However, emphasis has to be on the rational use of medicines such that the patients should receive the right medicines at the right time and use them appropriately.[8]

Epidemiological and demographic transition in India has resulted in non-communicable diseases (NCDs) being attributed to more than 62.0% of overall mortality and increasing proportion of elderly (9.0%).[9,10] The major NCDs are cardiovascular diseases, cancers, chronic respiratory diseases, and diabetes that involves drug titration, use of multiple medicines at a time and frequent change in formulations.[11]This necessitates appropriate storage, reuse (if applicable and necessary) and disposal knowledge and practice among patients or consumers.

Pharmaceutical products require appropriate storage conditions in order to ensure the quality and efficacy of medicines. Improper storage can increase the unnecessary burden on the economy of general population due to their poor efficacy.[12] It has been noted that these prescribed medicines are often left unused due to various reasons like the treatment change, adverse effects, symptom improvement resulting in discontinuation of the course of treatment.[13] This may either be self or based on opinion of a healthcare provider. The storage of such unused medicines at home may also increase the risk of a wide range of potential drug-related problems like errors in taking medications and adverse drug reactions in additional to being considered a wasted resource.[14]Lately, the concept of medicine reuse is emerging. Medicines reuse is about re-dispensing unused medication returned by one patient for use by another.[15,16]This can help to reduce the waste and environmental pollution created by unused medicines and/or help save money and provide medicines to people who cannot otherwise afford them. This might also be a way of dealing with drug shortages.[17] However, in practice; reuse of leftover drugs for self-medication is most common.[18] The awareness regarding appropriate medication reuse and safety concerns related to no adherence should be readily accessible to consumers.

Literature evidence also highlights that there are lacunae in knowledge and practices with how unused and expired medicines are disposed of. Improper disposal of medicines is a source of contamination and pollution – making it a health and an environmental hazard.[19] Recent studies show that standard drug disposal protocols are not present in most countries;[20] either throwing medicines in the trash or rinsing down the sink or flushing them down the toilet has been the most common ways of discarding medicines. Huge amounts of pharmaceutical wastes flow through sewerage into the water bodies alarming the environmental scientist around the world and are also getting absorbed into the land when they are disposed of as solid waste in landfills. [21]Importantly, it has been found that the pharmaceuticals were not removed byte water treatment systems available. According to Jones et al.(2007)[22] and Fent et al. (2006),[23] conventional sewage treatment plants are inefficient in removing pharmaceutical compounds as they are primarily designed to remove and treat human excrements and not anthropogenic substances. Among the various other consequences of improper disposal of medicines, emergence of antibiotic resistance takes a specific mention.[24]Among the common classes of leftover and unused drugs found in household surveys, antibiotics was found to be one of the highest (21% in Pakistan, 36% in India and31.5% in Malaysia).[19] The World Health Organization (WHO) has estimated that more than half of all medicines were prescribed, dispensed, or sold inappropriately, and that half of all patients fail to take them correctly. The resulting misuse, overuse or underuse of

medicines has resulted in wastage of scarce resources and widespread health hazards.[25]

Against this background, the present study was planned with an aim of understanding the utilization pattern of the medicines available at homes of patients. We also assessed their knowledge regarding appropriate storage, reuse of unused medicines, proper disposal of unused and/or expired medicines and self-medication and/or self-discontinuation of medicines.

Methods

A descriptive cross-sectional study was carried out between May 2021 and August 2021in a tertiary care teaching hospital, Raipur district, Chhattisgarh, India. The study included adults aged 18 years and above, attending any outpatient department of Raipur Institute of Medical Sciences (RIMS) and consenting to participate.

In a cross-sectional observational questionnaire-based study conducted by Gupta R et al. in 2018, it was found that the awareness regarding disposal of unused medicines among consumers at a tertiary care teaching hospital was 55.9%.[26]We computed sample size using 55.9% prevalence, 10.0% absolute precision and 95% confidence interval (CI). As the study participants were selected from only one hospital and not from all hospitals in Raipur, Chhattisgarh – to account for the variation in probability at which participants were selected, we used design effect of 1.5. Finally, the minimum sample size was estimated to be 142. The adults (18 years and above) attending outpatient departments of specialities and super specialities on a particular day constituted the sampling frame. We performed proportional sampling to choose the number of study participants from each speciality or super speciality department. Then in each department study participants were enrolled by simple random sampling approach. A predesigned, semi-structured and pretested proforma that included demographic details, questions related to patterns of medication usage and appropriate storage, reuse of unused medications, disposal, and self-medication and/or self-discontinuation was administered using face to face interview. Following this, the study participants were organized in groups (one for each speciality and Superspeciality department) and were then given health education (based on predesigned module) in the Hindi language through an interactive talk. Health education was focused primarily on appropriate medication storage and disposal, risk of medication reuse, self-medication and/or self-discontinuation.

Knowledge regarding storage of medications was considered appropriate if the participant complies with storage recommendations provided for each medication. It includes (but not limited to) those specified in the packages of medications like appropriate temperature, humidity, place and away from direct sunlight. Knowledge regarding medication reuse was considered appropriate if the participant quality-checked (self or through healthcare worker or pharmacist), unused, prescribed medication – for other patients or self-use, instead of disposal as waste. Knowledge regarding disposal of medication was considered appropriate if the participant delivered medications (unused or expired) at drug take-back facilities or sites in pharmacies or other healthcare facilities; aware of medications that can be flushed and that cannot be flushed. Knowledge regarding self-medication and self-discontinuation were assessed by questioning the role of prescriptions from qualified healthcare workers and importance of continuing the medication for prescribed duration irrespective of improvement in symptoms.

Data collected was entered in Microsoft Excel and analysed using Stata v16. The data was described using numbers, percentages and presented in tables. The study was approved by Institute Ethical Committee (IEC),Raipur Institute of Medical Sciences (RIMS), Raipur(IEC no.RIMS/IEC-2019/027).

Results

The study included 152 participants of mean (SD) age 41.3 years (5.8). More than half, 85 (55.9%) participants were males and nearly two third, 94 (61.8%) participants were from lower socioeconomic class. The most common source of medication was a pharmacy (65.1%); and we found that more than one in ten (13.1%) obtain their medications without any prescription. Though 58.5% participants obtained their

medications free of cost from healthcare facilities, 41.5% had to obtain the same at a cost.

Pattern of medication utilization

With regards to the medications currently being used, more than half (51.3%) had five to eight medications and 16.0% had more than eight medications. Importantly, only 35.3% of medications currently in use were advised by doctor or healthcare worker; 27.3% medications were advised by family or friends, and 37.4% were self-medications (Table 1).

Table 1Sociodemographic details, source, and pattern of medication use

Variables(N=152)		Total n (%) or mean (SD)
Socio demographic details		
Age(in years)		41.3 (5.8)
Gender	Male	85 (55.9)
	Female	67 (44.1)
SES	Lower	94 (61.8)
	Higher and middle	58 (38.2)
Source of medication		
From health facility*	Free of cost	31 (58.5)
(n = 53)	At a cost	22 (41.5)
Pharmacy	With prescription	86 (86.9)
(n = 99)	Without prescription	13 (13.1)
Pattern of medication (in current use) utilization(n = 150)		
Number of medications	1 to 4	49 (32.7)
	5 to 8	77 (51.3)
	More than 8	24 (16.0)
Source of advice	Doctor or healthcare worker	53 (35.3)
	Family or friends	41 (27.3)
	Self-medication	56 (37.4)
Pattern of unused medication		
Number of medications	1 to 4	88 (64.2)
(n = 137)	5 to 8	33 (24.1)
	More than 8	16 (11.7)
Reasons	Self-discontinuation#	105 (76.6)
(n = 137)	Change in prescription	24 (17.5)
	Medicine expired	8 (5.3)
Handling of unused	Return them to medical store	15 (9.9)
medications	Pass on to family members/relatives	29 (19.1)
	Goes into general wastes (dustbin)	79 (52.0)
	Flush in toilet and sink	5 (3.3)
	Thrown in unused land nearby	20 (13.2)
	Do not know	4 (2.6)

*Health facility refers to any primary, secondary, or tertiary health center. It includes (but not limited to primary health center, physician clinic etc.)

#Among participants with self-discontinuation of medication – the reasons for self-discontinuation were - disease was cured (n = 59, 56.3%), the participant felt that the medication was not helping the condition (n = 27, 25.7%) and had adverse effects (n = 19, 18.0%)

SES, socioeconomic status

The study found that nearly one in four had five to eight unused medications at home (24.1%) and 11.7% had more than eight medications. The most common reason for having unused medication was self-discontinuation (76.6%), followed by change in prescription (17.5%). More than half (52.0%) responded that the unused medication goes into general wastes (dustbins at individual, family, or community level), followed by passing it on to family members or relatives(19.1%) and throwing it in unused land nearby (13.2%) in that order. Only 9.9% return them to a medical store or pharmacy.

Knowledge related to appropriate storage, reuse of unused medications, disposal, and self-medication and/or self-discontinuation:We found that 44.7% participants had knowledge regarding appropriate storage of medications,and they ensured medication specific storage recommendationsare met. However, 77.0% participants reported that medications were accessible to children at home (Table 2).

Knowledge regarding reuse of unused medications was in less than one fourth study participants. Importantly, consequences of inappropriate medication reuse were unknown to 79.6% and 65.8% had the practice of reusing medications. Less than half (46.7%) had the practice of checking medication expiry dates before purchase and use.

We found that only 12.5% had knowledge regarding appropriate disposal of medications and only 7.9% followed such practices. Health and environmental consequences of inappropriate medication disposal were unknown to 62.5% and 59.9% of the study participants.

Majority, 81.6% and 88.8% had lack of appropriate knowledge regrading self-medication and/or self-discontinuation and its consequences respectively.

DISCUSSION

The study found that pharmacies are the common source of medication, and a substantial number of medications are dispensedwithout any prescription. These findings corroborate with a study conducted by Mirza N et al. which highlighted that 16.7% medicine formulations were prescription in urban areas and 11.8% in rural areas.[27] The medicine formulations obtained without prescriptions were commonly non-steroidal anti-inflammatorydrugs (NSAIDs) in the form of tablets. We found that the number of study participants with more than eight medications in current use and unused were 16.0% and 11.7% respectively. This may be attributable to the characteristics of settings which is served by the hospital, or in other words sociodemographic and morbidity characteristics of patients utilizing the hospital – prevalence of non-communicable diseases, proportion of elderly, presence of large family size, insurance coverage, lower socioeconomic status, illiteracy, without medically related jobs may be responsible for higher storage of medicines in homes.[28]Also, excessive or over prescribing, imperfect therapeutic adherence or self-discontinuation and treatment modifications after hospitalization and oversized drug packages may result in excess storage of medications at home.[29]

More than one third participants (37.4%) in the present study reported self-medication. In contrast to these findings, a study reported from an urban area in Delhi, India found the prevalence of self-medication to be 92.8%.[30] This is much higher than that reported in the present study and that reported by Lal et al. in an urban resettlement colony in Delhi (31.3%).[31] The study discussed that the practice of self-medication is higher among younger age group participants, graduates, and those from higher socioeconomic background. Similar studies carried out in India showed the prevalence of self-medication to be 37.0% and 17.0% in urban and rural areas respectively.

Table 2: Knowledge regarding storage, reuse, disposal and self-medication or self-discontinuation

Knowledge related variables (N=152)		Total n (%)
Appropriate storage		
Ensures storage recommendations*	Yes	68 (44.7)
	No	84 (55.3)
Away from children	Yes	35 (23.0)
	No	117 (77.0)
Reuse of unused medicines		
Appropriate knowledge	Present	37 (24.3)
	Absent	115 (75.7)
Consequences of inappropriate medication reuse	Known	31 (20.4)
	Not known	121 (79.6)
Practice of reusing medications^	Present	100 (65.8)
	Absent	52 (34.2)
Practice of checking expiry dates	Present	71 (46.7)
	Absent	81 (53.3)
Disposal		
Appropriate knowledge	Present	19 (12.5)
	Absent	133 (87.5)
Health consequences of inappropriate disposal	Known	57 (37.5)
	Not known	95 (62.5)
Environmental consequences of inappropriate disposal	Known	61 (40.1)
	Not known	91 (59.9)
Practices appropriate disposal	Yes	12 (7.9)
	No	140 (92.1)
Self-medication and/or self-discontinuation		
Appropriate knowledge	Present	28 (18.4)
	Absent	124 (81.6)
Consequences	Known	17 (11.2)
	Not known	135 (88.8)

*Storage recommendations refer to (but not limited to) those specified with the medication like appropriate temperature, humidity, place and away from direct sunlight.

^With specific reference to antibiotics

[32]Data from low and middle countries show that there is wide variation in the prevalence of self-medication ranging from 12.7% to 95.0%.[33,34] The common reasons for self-medication were perceived minor illness and lack of time to consult a doctor or longer waiting time from consultation.

Majority of participants in the present study reported self-discontinuation of medication (76.6%). The common reasons for self-discontinuation were either cure (56.3%) orperception that the medication was not helping the condition (25.7%) or emergence of adverse effects (18.0%). These findings were

similar to those discussed in a systematic review – factors contributing to self-discontinuation or poor medication adherence were either related to patients (for example, suboptimal health literacy and lack of involvement in the treatment decisionmaking process) or related to physicians (for example, prescription of complex drug regimens, communication barriers, ineffective communication of information about adverse effects, and provision of care by multiple physicians), or related to health care systems (for example, healthcare facility visit time limitations, limited access to care, and lack of health information technology).[7]The complexity of reasons for medication self-discontinuation implies that the solutions to address the same should also be multifactorial.

In the present only 9.9% of participants returned the unused medication to a pharmacy or a medical store or drug take-back facilities. In a similar study it was found that majority (87%), had stored unused or expired medicines at home; and almost all (92.6%) threw them away at some point in time, most commonly in household trash (73.0%).[35] The National Formulary of India specifies guidelines for the proper disposal of medicines; however, majority are not aware of these guidelines and the importance to follow them. This is reiterated by the findings of this study – majority are not aware of the appropriate disposal of medications, health, and environmental consequences of non-adherence.[26,36]

It is evident that lack of established programs has largely contributed to the substandard nature of medication waste management in developing countries like India. The number of medicines discarded as waste can be substantially minimized by consumer education and prescribing and/or issuing the minimum required number of medicines per person in each visit. This should liaise with a medication take-back system.[37] The enormity of task may put on the existing human resources – it is vital to define roles for each stakeholder group to minimize negative consequences, offering the consumers with discounts for their purchases based on returned medicines, and initiatives like 'National take-back day for medicines' will promote community participation.

However, the study is not without limitations. Firstly, because of hospital-based enrolment of the study participants, we could not comment on the group of drugs (for example, antibiotics, NSAIDs, antipsychotics etc.) that were commonly used, unused, reused, over the counter as patients were not aware of the drug names. Secondly, the findings from patients attending tertiary care hospital settings may not be applicable to general population raising concerns over external validity. However, we hope that the participants from tertiary care hospital settings handle major proportion of medications, and therefore assessing their patterns of use, knowledge regarding storage, reuse and disposal are pivotal.

To conclude, it is the need of the hour to establish a medication disposal system in the country – available at household level in addition to being culturally appropriate, acceptable, and affordable. India is facing multidrug-resistant bacterial infections which are only the visual impact of our doing-undoing; monitoring and prompt detection of pharmaceutical impact on environment is a priority.

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