

Handling of Leftover Medicines Among General People: A Cross-Sectional Study in Vatara Thana Dhaka, Bangladesh

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ABSTRACT: *With the growth of the pharmaceutical sector, there is a growing issue concerning leftover medicines. The purpose of this study was to evaluate medication consumers' knowledge and practice regarding the disposal of leftover medicines. Considering the total population of 1400 in Vatara thana, a total of 302 (CI-95%) subjects were included for the study. A questionnaire was used to examine knowledge, attitude, and practice of safe disposal techniques, as well as the quantity, most prevalent class, dosage forms, and causes for remaining medications. General people were provided several information on demographics, education, employment, medications purchased, and the quantity of unused or expired medicines along with reasons. Attitudes and habits about medicine purchase and disposal were elicited. The information was processed and presented in a descriptive manner. In result, among the participants, 53.64% were male and most of the respondents were students. 55.39% of respondents purchased their medicine according to the prescription whereas 26.37% of respondents purchased over the counter (OTC) drugs. Around 63% of respondents had leftover medicines for various reasons. Analgesics were more prevalent leftover medicine in households. 58% of respondents were unaware of the proper disposal practice of leftover medicine; they mostly discarded their leftover medicine in household trash. Most of the individuals are not cautious enough when it comes to disposing of leftover medications. A comprehensive campaign targeted at increasing public knowledge should be taken for avoiding the unwanted consequences of leftover medicines.*

Keywords: *Medicines disposal, Unused medicines, Medicines wastage.*

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1. INTRODUCTION

Pharmaceutical sector is regarded as one of the world's most important and rapidly growing industries. Increased pharmaceutical production and consumption, as well as the accumulation and inappropriate disposal of leftover and expired household medicines, can wreak havoc on the environment and public health. Medicines enter the environment through sewage effluent, human and animal excreta, and then enter the food chain, where they possess toxicological effects on biological entities [1,2].

As the access to medicines increase, bulk of medicines become unused and are kept at home which is often associated with adverse effects and other drug-related problems that can generate increased health care costs, including a need for new consultations with other health care professionals, use of additional drugs, need for more diagnostic tests, hospitalization, permanent disability, and even death [3]. Safe healthcare waste management involves segregation, collection, transportation, treatment, and waste disposal [4]. Although different studies have been conducted in developed countries to capture the extent of improper medicine disposal but in developing countries, this problem is enormous and not well documented [5,6]. Moreover, most of the medicine users remain unaware of the disposal of unused or expired medicines [7].

Improper disposal is still prevalent among environmentally aware people, which suggests that knowledge and awareness of environmental issues regarding medicines disposal only partially account for people's medicine disposal habits [8]. Neither the government bodies nor the pharmaceutical companies are currently concerned about the safe and secure disposal of unused medicines in Bangladesh's households. Until 2019, there was no protocol regarding leftover household medicine disposal [9]. Furthermore, if the causes for the presence of undesired or unneeded pharmaceuticals in patients' homes can be recognized, measures to reduce waste and encourage safe and appropriate disposal of these medications may be developed [10]. As a result, it's critical to assess consumer awareness and habits regarding drug disposal in Bangladesh. In light of these facts, this study was conducted to assess the general public's knowledge, attitude, and habits regarding the disposal of unused and expired drugs.

3. GENERAL SERVICE ADMINISTRATION (GSA) GUIDE LINES CRITERIA

The GSA criteria for existing and newly developed structures which are not exempted from disproportionate failure, contains guide lines for analysis of typical and atypical structural system. In this study two typical structural systems having relatively simple layout with no unusual structural configurations, were considered.

To assess the potential of disproportionate failure for the typical structures, designers can carry out structural analyses in which the instantaneous loss of one of the following first floor columns at a time is assumed:

- i. An exterior column near the middle of the long side of the building.
- ii. An exterior column near the middle of the short side of the building.
- iii. A column located at the corner of the building.
- iv. A column interior to the perimeter column lines for facilities that have underground parking and/or uncontrolled public ground floor areas.

This analysis utilizes the alternate load path method to assess the potential of resisting disproportionate failure of the structure. In this work, only linear elastic static analysis is performed. For static analysis the following gravity load is applied to each structural member of the alternate path structure:

$$\text{Load} = 2(\text{DL} + 0.25\text{LL})$$

Where,

DL = Dead load

LL = Floor Live load.

Demand Capacity Ratio (DCR)

The numerical index used in robustness assessment against disproportionate failure called Demand capacity Ratio (DCR), is defined as the ratio of the force (bending moment, axial force, shear force) resulting from elastic analysis of the structure for a design load in the structural member after the instantaneous removal of a column to the member capacity. The Demand Capacity Ratio (DCR) of each primary

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Statistical data analysis and calculation of all collected data using descriptive statistics to summarize the demographic data and responses of the participants were done with Microsoft Excel 2013 and Statistical Package for Social Sciences (SPSS software, Inc., Chicago, USA) version 22.0.

3. RESULTS

After extensive field work, we've got the data of 302 respondents.

A. Demographic data

In total, 302 people participated in the study, among them the number of male participants was 162 and that of female 140, with a response rate of 100%. Table 1 shows the socio-demographic characteristics of the participants. Most (76.16%) of the participants were unmarried, 23.84% were married. Most of them (76.16%) were Student, 16.56% were job holder, 3.31% were housewife and 2.98% were businessmen. Of the participants, 0.99% were uneducated, 4.97% completed their primary education, 10.60% completed secondary education, 76.16% were graduated or above. They were asked some related questions to evaluate their knowledge of cervical cancer. 100% of the participants said cervical cancer is rare; 91.5% did not know how to do a cervical self-examination, 61.5% had never heard of cervical cancer, and 74.5% had never heard of screening programs.

Table 1: Demographic characteristics (n=302).

Parameters	Number of respondents (n)	Percent (%)
Sex		
Male	162	53.64
Female	140	46.36
Age (year)		
16-20	53	17.55
21-25	179	59.27
26-30	38	12.58
31-35	16	5.30
36-40	7	2.32
Above 40	9	2.98
Educational qualification		
Uneducated	3	0.99

School	15	4.97
College	32	10.60
University	230	76.16
Others	22	7.28
Occupation		
Business	9	2.98
Housewife	10	3.31
Job	50	16.56
Student	230	76.16
Others	3	0.99
Marital status		
Married	72	23.84
Unmarried	229	75.83
Others	1	0.33

B. Medicine purchase habit

Purchase habit includes the way of purchasing the medicine, checking the expiry date, preferred company, concerning about medicine price and buying and keeping extra medicine for future use in case of emergency.

Figure 1 depicts the medicine purchasing pattern where it is evident that the majority of respondents purchase their medicine according to the prescription (55.39%) on the other hand 26.37% of respondents purchase their medicine over the counter (OTC). On the contrary few medicines are purchased based on others' advice (18.22%) without prescription.

Table 2 contains the issues regarding the medicine purchase habit on the basis of checking the expiry date and keeping storage of extra medicine to use emergency. Here 81.46% of the respondents checked the expiry date and 79.14% of respondents keep extra storage medicine for future needs.

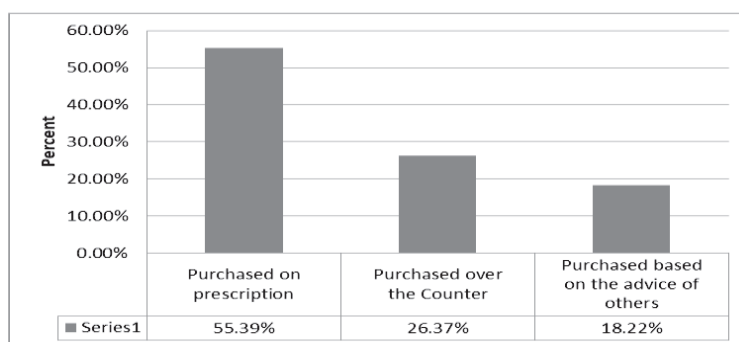


Figure 1: Medicine purchasing pattern.

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Table 2: Issues regarding the checking the expiry date, and storage of extra medicine.

Parameters	Percent (%)
Checking expiry date of medicines	
Yes	81.46
No	18.54
Keeping storage of extra medicine to use in case of emergency	
Yes	79.14
No	14.57
Not Answered	6.29

C. Leftover (unused/expired or both) Medicine

Leftover medicines include the unused medicine or expired medicine or both. Almost 63% (n=189) of respondents have leftover medicine at their homes. In contrast 18% (n=55) of respondents don't have any leftover medicines as shown in figure 2.

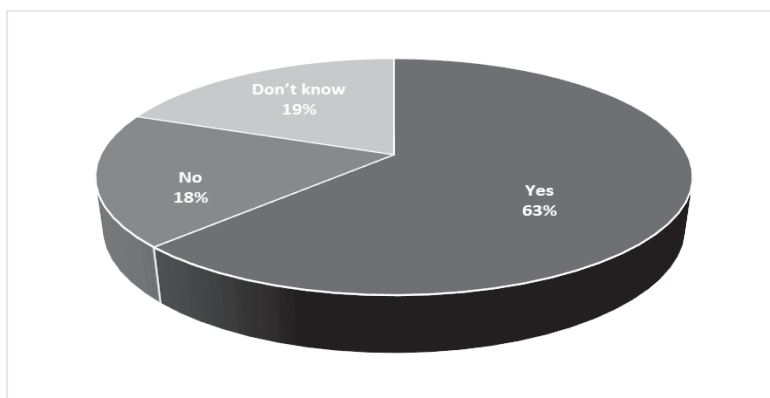


Figure 2. Having leftover medicine in household.

Figure 3 represents the reasons behind the leftover medicines at home. Here top three reasons are change in doctors' advice or alteration of treatment (24.14%), discontinuation of treatment after feeling better (20.69%) and stock for future needs (17.43%). Due to experiencing the side effects 8.05% of respondents discontinued the treatment as a result the medicines remains unused.

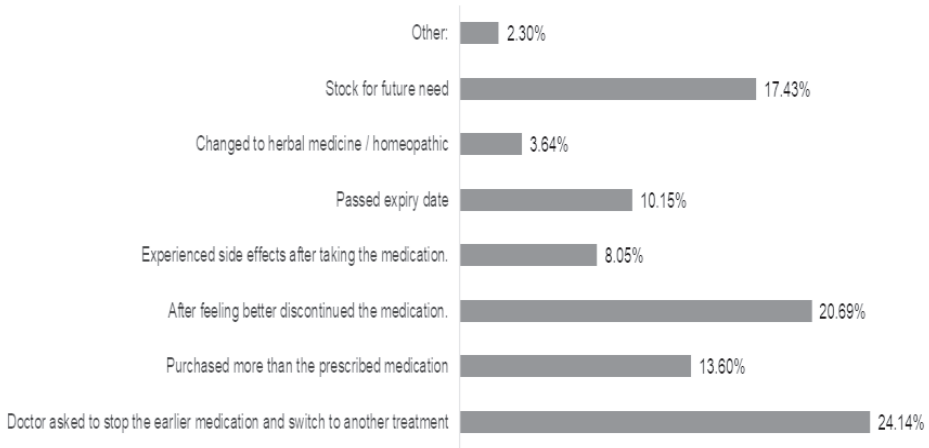


Figure 3. Reasons behind the leftover unused medication at home.

D. Class of medicines mostly leftover

Figure 5 shows the class of unused medications. Interestingly it was found that mainly analgesic, Drugs used in gastric acidity, antipyretic, and antibiotics are leftover at home almost in similar quantities. Moreover, Vitamins, Antihypertensive and Antidiabetic are found in 13.28%, 6.87%, and 4.93% respectively. Among the different dosage form, the solid dosage form i.e. tablets (49%) and capsules (18%) were more prevalent that remain leftover at home. Additionally, the semisolid dosage form i.e. cream/ointment/lotions were found 17% and liquid dosage form i.e. syrup were found 16% as shown in figure 5.

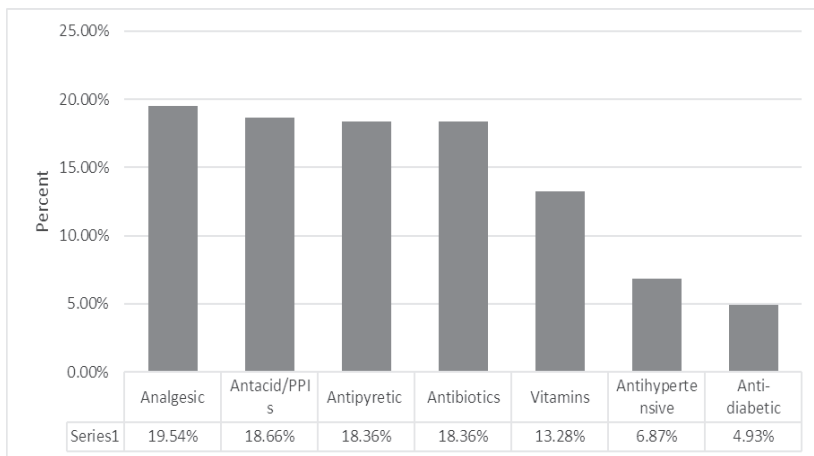


Figure 4. Class of leftover medicine.

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E. Type of unused dosage form of drugs are mostly leftover at home

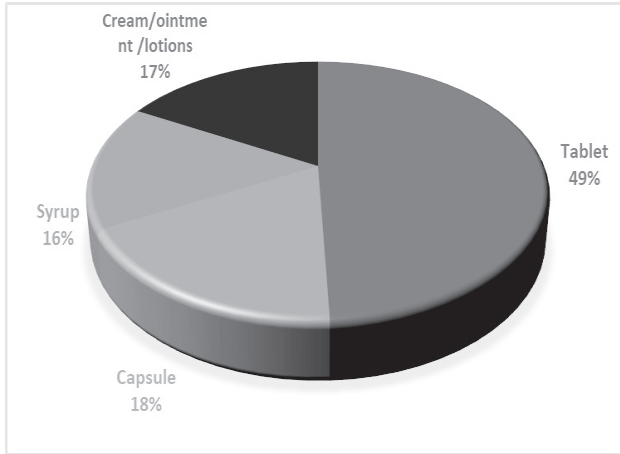


Figure 5. Dosage form of leftover medicine.

F. Knowledge regarding disposal of unused and expired medicines

In our survey, we tried to trace out from respondents about having any idea or knowledge regarding the disposal of the unused medicine. More than half of the respondents (58%) have no any idea about it even they are not aware about the disposal of the unused medicine. On the other hand, 42% of the respondents have a bit or more knowledge about this issue and they practice it on a regular basis as shown in figure 6.

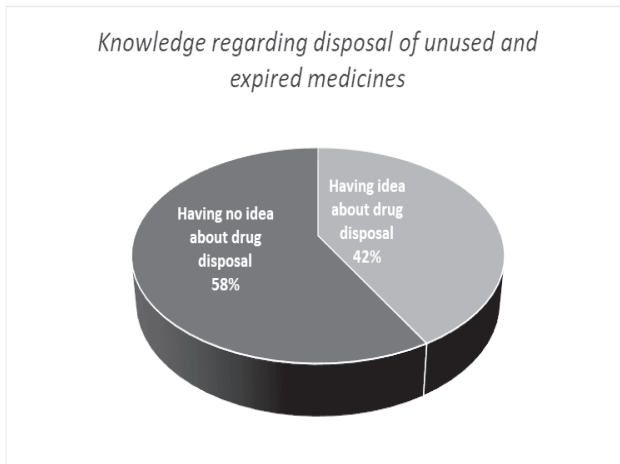


Figure 6. Knowledge regarding disposal of unused and expired medicines.

G. Disposal practice of unused and expired medicines

Among the various ways of medicine disposal practices, more than half of the respondents (57.25%) through the unused medicines in their household trashes. Around 19% of the respondents return their medicines to the pharmacy shop followed by flushing to toilet by 11.87%. The extra medicines are given to the friends, fellows, or relatives by nearly 6.06% of people whereas 5.80% of them sink down in water as shown in figure 7.

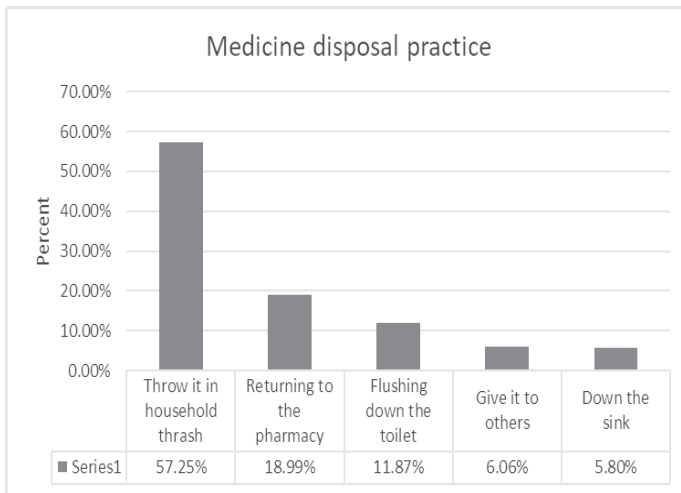


Figure 7. Medicine disposal Practice.

In recent years, unused and expired medicine management and disposal has received a lot of attention not only for health hazards but also environmental pollution, disruption of the food chain, and harm living creatures. The participants' educational, occupational, and socioeconomic backgrounds had a substantial influence on how they purchase medicines but had little influence on their understanding of the implications of inappropriate drug disposal. Although 55.39% of respondents purchased their medicine as per the direction of the physician in contrast a huge number of respondents (26.37%) purchased their medicine OTC. These OTC drug contains Analgesics, Antipyretics, Agents used in GI discomfort, Antibiotics, etc. After remission of symptoms, these medicines remain unused. Another alarming issue regarding leftover medicine is sharing with others. Consequently, adverse drug reactions, improper dosing, and improper counselling lead to serious health problems. Interestingly 79.14% of respondents agreed that they kept storage of extra medicine to use in case of emergency or future needs.

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But in the medicine purchase habit, we've found that 54.59% of medicines are purchased over the counter and through advice of others. So, to some extent, people bought extra medicines for chronic diseases like Hypertension, Diabetes, Arthritis, etc. Moreover, it is comparable that around 63% of people had leftover medicines for switching other treatments, and discontinuation of treatment after feeling better without completing the course. Furthermore, the core of this study reveals that around 58% of respondents had no idea or knowledge regarding the disposal of leftover medicines and the rest of them hardly follow the disposal practice after knowing the ideal practice. There are a lot of factors involved behind this scenery such as lack of an awareness-building program, lack of strict regulation regarding medicine purchase, lack of well-defined places of leftover medicine disposal, not following the category-wise medicine disposal practice, etc.

In developed countries there are Medication return or Take-back programs of unused drugs is performed in regular intervals by the drug regulatory authorities. More than half of respondents (57.25%) admitted that they had discarded their leftover medicines in the trash because it is found that almost 67% of leftover medicines were solid dosage form (e.g., Tablet & Capsule). Only 18.99% of unused medicines were returned to the pharmacy shop and some liquid dosage forms were dumped in the toilet or sink. In the present study, most of the participants are not careful enough regarding medicine disposal. So, for the sake of health and the environment, various government entities should implement a comprehensive program aimed at raising awareness and enforcing rigorous regulations for appropriate drug disposal. Although this study is relatable but still a very small sample size is the limitation of this study, and a comprehensive nationwide study should be conducted to find the real scenario.

5. CONCLUSIONS

The study gives us a through reflection of leftover drug disposal practices in Bangladesh. The current study revealed that most of the people are unaware about handling of the unused medicines of both prescription drugs and OTC drugs. Therefore, an effective system must be developed regarding this for the safety of the environment as well as for betterment of mankind. Continuing this, different geographical area with larger sample size is recommended for the continuation of the present work.

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Institutional Review Board Statement : The study was conducted according to the guidelines of the WMA Declaration of Helsinki.

Conflict of Interest: The authors declare no conflict of interest.

Abbreviations:

WHO: World Health Organization; OTC: Over-the-Counter.

REFERENCES

- [1] Sharma K, Kaushik G (2021) Urbanization and Pharmaceutical Waste: An Upcoming Environmental Challenge. In: Kateja A, Jain R (eds) Urban Growth and Environmental Issues in India. Springer, Singapore. https://doi.org/10.1007/978-981-16-4273-9_18
- [2] Kristina, S, Wiedyaningsih, C, Cahyadi, A, & Ridwan, BA (2018). A survey on medicine disposal practice among households in Yogyakarta. *Asian Journal of Pharmaceutics*, 12(3), S955–S958
- [3] Angi'enda, SA, & Bukachi, SA (2016). Household Knowledge and Perceptions on Disposal Practices of Unused Medicines in Kenya. *Journal of Anthropology and Archaeology*, 4(2). <https://doi.org/10.15640/jaa.v4n2a1>
- [4] World Health Organization . (2017). Safe management of wastes from health-care activities: a summary. World Health Organization. <https://apps.who.int/iris/handle/10665/259491>. License: CC BY-NC-SA 3.0 IGO
- [5] Tong AY, Peake BM, Braund R Disposal practices for unused medications around the world. *Environ Int* 2011;37:292-8
- [6] [6] Kristina SA, Wiedyaningsih C, Cahyadi A, Ridwan BA A survey on medicine disposal practice among households in Yogyakarta. *Asian J Pharm*. 2018;12(3): S955-S958.

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- [7] Bashaar M, Thawani V, Hassali MA, Saleem F Disposal practices of unused and expired pharmaceuticals among general public in Kabul. BMC Public Health. 2017;17(1):1-8. doi:10.1186/s12889-016-3975-z
- [8] Eijsackers H, Reinecke A, Maboeta MS Volume 249 Pim de Voogt Editor. Vol 240.; 2019.
- [9] Begum MM, Rivu SF, Hasan MM Al, et al. Disposal Practices of Unused and Leftover Medicines in the Households of Dhaka Metropolis. Pharmacy. 2021; 9 (2):103. doi:10.3390/pharmacy9020103
- [10] Azad, MAK, Ansary, MRH, Akhter, MA, Al-Mamun, SMM, Uddin, M, & Rahman, MM (2012). Disposal practice for unused medications among the students of the international islamic university Malaysia. Journal of Applied Pharmaceutical Science, 2 (7), 101-106. <https://doi.org/10.7324/JAPS.2012.2712>