

# Practice Towards Storage of Unused and Disposal of Expired Medicines among Households in Dharan, Nepal

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## ABSTRACT

**Introduction:** Improper disposal of unused medications has been a public health problem, as unused drug adversely effects on health and environment.

**Objective:** The main objective of this study was to assess the extent of unused medications disposal knowledge, attitude, and practice of among household in Dharan, Province 1, Nepal.

**Methods:** A survey based descriptive study was used. Households were conveniently selected and interviewed using structured questionnaires. Attitudes and practices regarding medicine disposal and storage were asked. The data were analyzed by SPSS version 20.0 software and presented descriptively.

**Results:** Among 380 household surveyed, majority of respondents (82%) reported storing unused medications in their home and only 5% reported returning medication to a pharmacy. Predominant reason for medication non-used was disease or symptoms felt improved (80 %). Less than half of respondents (45%) had check the expiry date of their medicine before purchasing. Most respondents (88%) thought that improper disposal of medicine may cause harmful effects to health and environment.

**Conclusion:** Incorrect practices were found in Dharan families with regard to the storage and disposal of unused medications. Along with a comprehensive media campaign to inform consumers about safe medication disposal techniques, an efficient method for disposing of leftover medications should be offered. This system should be supported by local pharmacist.

**Keywords:** Disposal; expired; medicine; practice; storage.

## INTRODUCTION

Improper disposal of medications is a widespread issue globally, with many consumers holding onto unused drugs at home for various reasons.

Some keep them for potential future use, while others may simply forget about them.<sup>1</sup> Medications stored in homes can lead to incorrect dosages, sharing among family members or neighbours, and exposure to conditions like heat, light, and humidity, which can reduce their potency. Moreover, expiration dates may become obscured over time, making it difficult for consumers to determine a drug's safety and effectiveness.<sup>2</sup> In the USA, for

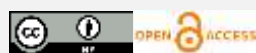
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instance, traces of various drugs have been found in water sources, with adverse effects observed in aquatic life. Antibiotics in water can contribute to antibiotic resistance, posing long-term risks to human health and marine ecosystems.<sup>3</sup>

The World Health Organization (WHO) warns that over half of medications are mishandled, leading to environmental risks from accumulation. Moreover, 50% of patients misuse medications, exacerbating the global issue of unused or expired drugs. Household storage practices contribute significantly, as many store medications for self-medication without professional consultation, fostering drug sharing and potential health hazards.<sup>4,5</sup>

Despite increasing awareness of the importance of proper medication disposal, research on influencing factors and disposal practices remains limited, especially in countries like Nepal. More studies are needed to understand the behaviours and determinants of medication disposal and storage practices among communities. Assessing the knowledge, attitude, and practices about safe disposal of medication is crucial for developing targeted interventions to address this global health concern.

## METHODS

The study design is a descriptive cross-sectional. This research was carried out in Dharan, Eastern Nepal. Responses were

collected during February 2022 to April 2022. Formal approval (approval number: ST15RE151) from institution, Sunsari Technical College, Dharan. Prior to the interview, patients provided written informed consent on the WHO household survey consent form.

Total sample size calculated was 380. The study sample size for this study was calculated using the sample size formula.<sup>6</sup>

Where, S = Sample size for infinite population; Z = Z score (for 95% confidence level Z score is 1.960); P = population proportion (Assumed as 50% or 0.5); M = Margin of error (0.05); Population= 34834 (Total households in Dharan).

Cluster sampling technique was performed for the collection of the sample. A total 19 subgroups were divided on the basis of wards (subgroup name:1, 2, 3,.....19) and equal numbers of samples were taken on random basis. The interview method was used for filling up the questionnaires. All the household present in the home at a time of data collection were included in the study whereas the children (Age up to 12 years) who didn't have the basis knowledge about storage and disposal of medicines were not taken in consideration for study.

The questionnaire was developed after literature review and discussing with different content experts. The reliability or content validation of

the questionnaire was performed by pretesting the questionnaire in 5 words in Dharan, Eastern Nepal. The calculated Cronbach alpha value for pilot study was 0.72 and the pilot result did not include in final analysis. The questionnaire was designed as per the research objectives and the domains for knowledge and practice regarding medicine storage and disposal.

The questionnaire had two sections. The first section collected demographic information about the study participants. The second section was about Practice and attitude about medicine storage of unused medicine and disposal of expired medicine. The demographics section had various parameters such as age, gender, education level. Knowledge and attitude section initially had ten questions. The questions to assess practice deals with reasons of unused medication, storage pattern of unused medicine, disposable pattern of expired medicine. Similarly, the questions to assess practice deals with trend of questioning about storage of the medicines before procuring, trends of checking expiry date of the medicines before procuring and storage. These were developed through a thorough review of literature and discussion among the content experts.

Content validation of the first draft of the questionnaire was performed by providing the questionnaire to three content experts. These experts were a physician of BPKIHS, a medical educationist and an academician from a pharmacy college. The suggestion obtained

from whole process of validation was documented. As per their responses, the order of arrangement of the questions and the terminology used were modified.

All filled questionnaires were double-checked for accuracy and then the collected data were entered into an Excel spreadsheet dataset. The collected data were analyzed using Statistical Package for Social Sciences (SPSS version 20.0). Discrete variables were presented with tables and bar charts. The worksheet was designed in such a way that it contains all the parameters of study and final result was calculated for all the above parameters.

## RESULT

### Gender distribution:

Out of 380 respondents, 151 (39.74%) were male and 229 (60.26%) were female as shown in the table 1.

**Table 1: Gender wise distribution of respondents.**

Gander	No of respondents	Percent
Male	151	39.74%
Female	229	60.26%
Total	380	100%

### Age distribution:

Out of 380 respondents, 94 were in the age groups of 13-18 years (Adolescence), 209 were in age group of 19-59 years (Adult) and 77 were in the age group of 60 years and above (Senior adult) as shown in the table 2.

**Table 2: Age wise distribution of respondents.**

Age Group	No of respondents	Percent
Adolescence	94	24.74%
Adult	209	55%
Senior adult	77	20.26%
Total	380	100%

**Education level:**

Out of 380 respondents, 46 were illiterate, 83 had got primary level education, 159 had got secondary level education and 92 had got university level education as shown in the table 3.

**Table 3: Education Level wise distribution of respondents.**

Education Level	No of respondents	Percent
Illiterate	46	12.11%
Primary	83	21.84%
Secondary	159	41.84%
University	92	24.84%
Total	380	100%

**Table 4: Attitude towards storage of unused and disposal of expired medicines.**

Questions (N=380)	Yes	No
Do you check expiry date of your medication during your purchase?	169 (44.47%)	211 (55.53%)
Do you receive information about the storage of medication from buyer?	130 (34.21%)	250 (65.79%)
Does any medicine remain unused at your home?	342 (90%)	38 (10%)
Do you check the expiry date of your medication during storage?	220 (57.89%)	160 (42.11%)
Do you think Improper disposal of unused medicines causes damage of environment?	337 (88.68%)	43 (11.37%)

**Storage place for the medications:**

Among 380 participants, 170 (44.74%) participants store their medication on the drawer or box. Similarly, 95 (25%) store the medicine in bag or purse, 59 (15.53%) store at table, 43 (11.31%) in refrigerator and 13 (3.42%) store the medicine in others place such as medical kit or box, as mentioned in label claimed (Table 5).

**Attitude towards storage of unused and disposal of expired medicines:**

When asked, did you check expiry date of your medication during your purchase, 44.47% (169) of respondents confirmed that they checked the expiry date of the medication during purchase. Less than half of respondents (34%) have been acquired knowledge about the storage of medicine from buyer. A large majority of the sample (88%) reported that improper disposal of unused and expired medicines can affect the environment. In about 90% of the household's medication remain unused at home. During the storage of the unused medicine 58% check the expiry date of the medicine (Table 4).

**Table 5: Storage place for the medications.**

SN	Storage Place	No of respondents	Percent
1.	Drawer	170	44.74%
2.	Table	59	15.53%
3.	Refrigerator	43	11.31%
4.	Bag/Purse	95	25%
5.	Others	13	3.42%
6.	Total	380	100%
7.	Others	Medical kit or box, as mentioned in label claimed.	

Reason for unused medications:

The main reason for unused medications among the households was found to be disease or symptoms improved (79.74%). Doctor's modification on the medication (53.42%) and patients didn't feeling that the medication was helping the diseases or conditions (58.95%)

were the major reason for the unused medications. Similarly in 42.32% households the reason for unused medicine was due to the experiencing of side effects and in 22.89 % of households due to they changed to other medication system, the previous system medication remained unused (Table 6).

**Table 6: Reason for unused medications.**

SN	Reasons for unused medicines	Number of respondents	Percent
1.	Symptoms improved and felt better	303	79.74%
2.	Doctor changed the medication and asked to stop earlier medication	203	53.42 %
3.	Did not feel it was helping the condition	224	58.95 %
4.	Experienced side effects	157	42.32%
5.	Changed to others medicine system	87	22.89 %

\*Each respondent chose more than one choice answer.

The way to storage of unused medicine:

More than two-third of all respondents 82 % reported storing unused medications in their homes. About 14% of respondent were giving their unused medicine to their friends or neighbours and only 4 % reported returning medication to a pharmacy (Table 7).

**Table 7: The way to storage of unused medicine.**

SN	Way to Storage of unused medicines	Number of respondents	Percent
1.	Store them at home	311	81.84%
2.	Give it to others	52	13.69%
3.	Return it to pharmacy	17	4.47 %
4.	Total	380	100 %

The way to dispose expired medicine:

More than two-third of all respondents 330 (86.84%) reported disposing the expired medications in their household trash and less

one third 107 (28.16%) reported disposing medications in the sink or toilet. About 22% of respondent dispose the expired medication by digging a hole and buried the medication under the soil and only 4.74 % reported returning medication to a pharmacy (Table 8).

**Table 8: The way to dispose expired medicine.**

SN	Way to dispose expired medicine	Number of respondents	Percent
1.	Dispose in household trash	330	86.84%
2.	Down in the sink or toilet	107	28.16%
3.	Dig a hole and bury it	85	22.37%
4.	Return it to pharmacy	18	4.74 %

Respondents' views about checking expiry date of the medicines before procuring and during storage:

The majority of university graduates (67/92) checked the expiry date of the medicine prior to its procurement and 74 (80.43%) checked the

expiry date of the medicine during storage. While the trends of checking the expiry date during procuring and storage of the medicine was found to be less privilege as among primary and secondary graduates. Only 45.91% secondary level graduates check the expiry data during procurement and 67.30% check the expiry data during storage. Similarly, only 27.71% of primary level graduate check the expiry data during procurement and 40.96% check the expiry data during storage. The study has shown that the trend of checking the expiry date during procurement and during storage found to be low among the illiterate people i.e. 13.04% and 10.87% respectively. Overall, 44.47% respondents checked expiry date during procurement and 57.89% check the expiry data during storage (Table 9).

**Table 9: Respondents views about checking expiry date of the medicines before procuring and during storage.**

SN	Education Level	Yes (N/%)	No (N/%)	Total
1.	Illiterate	6 (13.04%)	40 (86.96%)	46
2.	Primary	23 (27.71%)	60 (72.29%)	83
3.	Secondary	73 (45.91%)	86 (54.09%)	159
4.	University	67 (72.83%)	25 (27.17%)	92
5.	Total	169 (44.47%)	211 (55.53%)	380

Respondent views about acquiring the knowledge about storage of medicines during procuring:

More than half of university graduates (51/92) acquired the knowledge about storage of medicines during procuring prior to its

procurement. While the trends of acquiring the knowledge about storage of medicines during procuring prior to its procurement was found to be less privilege among primary and secondary graduates. Only 37.74% Secondary level graduates acquired the knowledge about storage during procurement. Similarly, only 20.48% of Primary level graduate acquired the knowledge about storage during procurement. The study has shown that the trend of acquiring the knowledge about storage during procurement found to be low among the illiterate people (4.35%). Overall, 34.21% respondents acquired the knowledge about storage during procurement (Table 10).

**Table 10: Respondents views about acquiring the knowledge about storage of medicines during procuring.**

SN	Education Level	Yes N (%)	No N (%)	Total
1.	Illiterate	2 (4.35%)	44 (95.65%)	46
2.	Primary	17 (20.48%)	66 (79.52%)	83
3.	Secondary	60 (37.74%)	99 (62.26%)	159
4.	University	51 (55.43%)	41 (44.57%)	92
5.	Total	130 (34.21%)	250 (65.79%)	380

The influence of the education level on the respondent practices towards the checking expiry date and questioning about storage of the medicine:

On examined the association for all the knowledge related parameters used in the questionnaire by using chi-square test on the

basis of education level of the participants and calculated the chi square statistic and p-value, there were significant associations between education level of the participants and whether or not the participants check expiry date of the

medicine during procuring or storing and quire about the storage of the medicine during procuring among the resonant with different education level (Table 11).

**Table 11: The influence of the education level on the respondent practices towards the checking expiry date and questioning about storage of the medicine.**

Education Level	Yes	No	Chi square statistic	p-value
Do you check expiry date of your medication during your purchase				
Illiterate	13.04 %	86.96 %	57.9267	<0.00001
Primary	27.71 %	72.29 %		
Secondary	45.91 %	54.09 %		
University	72.83 %	27.17 %		
Do you check the expiry date of your medication during storage				
Illiterate	4.35 %	95.65 %	44.4683	<0.00001
Primary	20.48 %	72.29 %		
Secondary	37.74 %	62.26 %		
University	55.43 %	44.57 %		

**DISCUSSION**

Currently, medicine waste management and disposal are a hot topic grabbing attention because it has been realized that improper disposal can contaminate the environment and pose the risk to water, air, agricultural products, and food chain and even harm animals/livestock. Therefore, studies have been conducted throughout the world about this issue to find the policy solutions.<sup>7</sup>This is the study to access the practice towards storage of unused and disposal of expired medicines among households in Dharan.

Misperception about disposal of unused medication was observed, although our

respondents were young aged and high educational background. The table 4 shows that, the 45 % of respondents checked the expiry date of the medication during the procurement. A similar study among households in Yogyakarta has shown the similar results (41 % checked the expiry date of the meditation during procurement).<sup>8</sup>The study revealed that only 35 % got information about the storage of meditation. The study also shows that in about 90 % households the medications remain unused and the main reason for this was either due symptoms improvement (80%) or the patients didn't feel it was helping the condition (59%). The trend of meditation remained unused among

households in Dharan was found to be better than the study among households in Yogyakarta which have shown that the trend of medicine remaining unused in house is almost 100 %.<sup>9</sup> A study previous study highlighted that in about 97 % households the medications remained unused due to the symptom's improvement, doctor changed the medication and asked to stop earlier medication (45%).<sup>7</sup> Our study revealed that in about 54 % households the medication remained unused due to doctor's modification and less than half 43 % of respondents left the consumption of the medication as they experience side effects during the course of medication. There is a wrong practice regarding the trend of unused medicine among households in Dharan. Most of the patient takes the complete dose of the drug for the effective treatment of the diseases condition which may reduce the change of antibiotics resistance. To address the concern of unused medications, it would be beneficial to formulate strategies on rational prescribing practices, improve patients' medication belief and adherence, and promote pharmacist involvement in education on medication safety. The study revealed that the people of Dharan are aware about the harmful effect of the expired medicine on the environment. On asking "do you think improper disposal of unused medicines causes damage of environment," 89 % of respondents thought that the improper disposal of unused medicines might cause damage of environment. The study

has shown the more than half (58%) checked the expiry date of the medicine during storage.

Table 5 shows that, the majority of the drugs were stored in drawer (45%) and bag or purse (25%), followed by refrigerator (17 %) and table (16 %). However, the similar study in Northern Ethiopia revealed that, the majority of the drugs were stored in a drawer (36%) and cupboard (35%). From our finding, it can be easily concluded that the place and condition of storage of drugs were not appropriate and in fact the storage places were accessible to children which can lead to accidental ingestion of oral drugs by children and cause negative harm to their health.

One of the findings of the study was that 82 % of the respondents reported storing unused medications in their homes. About 14% of respondent were giving their unused medicine to their friends or neighbours. A study in Madigan, the US reported that 45% of all respondents reported storing unused or expired medications in their homes.<sup>10</sup> A study in Riyadh highlighted that 55.3% of respondents were unaware of the consequences of keeping expired medication in the home.<sup>11</sup> The large quantity of unused medications has been attributed to ignorance about their disposal and lack of communication between prescribers, pharmacists and patients, overuse and misuse of prescription drugs, and poor medication adherence, which is potentially adverse effect on health and environment.<sup>12</sup>



Another finding of the study was that in 87% of households the expired medicines were disposing in their household trash and 29 % reported disposing medications in the sink or toilet. The White House Office of National Drug Control Policy (ONDCP) guidelines said that prescription drugs should not be flush down the toilet unless this information specifically instructs. If no instructions are given on the drug label and no takeback program is available in your area, throw the drugs in the household trash, but first take them out of their original containers and mix them with an undesirable substance, put them in a sealable bag, empty can, or other container to prevent the medication from leaking or breaking out of a garbage bag. The improper disposal of the expired medicine can causes harmful effects to the environment and human health.<sup>13</sup>

The study revealed that the majority of university graduates (73%) checked the expiry date of the medicine prior to its procurement and 81% checked the expiry date of the medicine during storage. Only 46 % secondary level graduates check the expiry data during procurement and 28 % of primary level graduate check the expiry data during procurement. The study has shown that the trend of checking the expiry date during procurement and during storage found to be low among the illiterate people (13.04% and 10.87 %, respectively). The study highlighted that 56 % university graduates acquired the knowledge about storage of

medicines during procuring prior to its procurement. Nearly, 38 % secondary level graduates acquired the knowledge about storage during procurement and 21 % of primary level graduate acquired the knowledge about storage during procurement. The study has shown that the trend of acquiring the knowledge about storage during procurement found to be low among the illiterate people (4.35%). On examined the association for all the knowledge related parameters used in the questionnaire by using chi-square test on the basis of education level of the participants and calculated the chi square statistic and p-value, there were significant associations between education level of the participants and whether or not the participants check expiry date of the medicine during procuring or storing and enquire about the storage of the medicine during procuring among the respondents with different education level.

The main reason for the difference in the practice of checking the expiry date of the medication during procuring and storage and acquiring the knowledge about storage of medicines during procuring was due to the level of education among the respondents. The university graduates were awarded about the negative impact of the expired medication so the trend of checking the expiry date during procurement and during storage was found to be higher among such population. These trends decreased with decrease in the level of

education. The illiterate people were less aware about the negative impact of the expired medication so they usually did not check the expiry date during procurement and during storage and also did not acquire the knowledge about storage of medicines during procuring.

### Conclusion

According to the study, most university graduates were aware of the importance of verifying a medicine's expiration date both when buying and storing it. Despite this, 90% of homes had unused medications, often due to

symptom improvement or medication changes by doctors. Most participants disposed of expired medications in household trash, including sinks and toilets. Medicines were primarily stored in drawers, bags, or purses, next to refrigerators, and on tables. Incorrect storage and disposal practices were common, with 89% recognizing environmental and health risks. A comprehensive media campaign and local pharmacist support are needed to promote safe disposal techniques.

**Conflict of interest:** None.



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