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RESEARCH ARTICLE
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INVESTIGATING PERCEPTIONS AND PRACTICES OF EXPIRED MEDICINES AMONG RURAL POPULATION

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Abstract
This study focused on expired or unused medicine's disposal practices and perceptions among the rural population of District Bhakkar ,Punjab Pakistan. This was cross sectional questionnaire based study to assess the knowledge, attitude and practices of rural population. All questions were closed ended. About 97.3% didn't verify medicines expiration date before buying, 76.7% consumed NSAIDS, 91.0% didn't hear about drug waste, 76.0% of the responded said they got information about proper disposal of unused, leftover or expired medicines from physicians, 44.0% consume leftover medications kept in their homes, 35.5% kept medications in medicine box, 28.0% dispose unused, leftover or expired medicines in dustbins and sewerage and 92.0% believed in existence of a program to collect unused, leftover or expired medicines. The subjects had no knowledge about their medications.The observation of statistically significant variations had led to the conclusion that knowledge is the key factor in rational use of medications, which will result in proper and safe disposal of expired or unused medications. The most common method of medication disposal was through household trash and in sewerage which could pose threat to the environment. Knowledge being a vital factor makes it obvious that planning and establishing appropriate educational programs, seminars and interventions regardless of the level of education of the population is crucial for safe and proper disposal of expired or unused medications in Pakistan.

Keywords: Disposal practice, rural population, expired medicines, unused medicines, knowledge and attitude.

1. Introduction

People throughout the world use medicines for different purpose. But they also hoard an enormous quantity of leftover medicines for many reasons. The unwanted medications disposal has gained a significant global apprehension because of the detrimental impact their waste has on both the environment and on human health. In earlier times, the absence of a comprehensive framework for the secure disposal of medication was evident (1).

Expired medical products may exhibit reduced efficacy or increased risk due to alterations in chemical composition or diminished potency. There is no assurance of medication efficacy and potency once the expiration has elapsed. By the expiry date is the manufacturer signifies the complete safety and therapeutic effectiveness of the pharmaceutical product. The judicious utilization of medications has immense significance, as 50% of medicines are prescribes or dispensed incorrectly, and an equal proportion of consumers use drugs inappropriately (2).

Patients' knowledge about their prescribed medicines is one of the most crucial role in disposal. Poor knowledge have detrimental effects including non-adherence and underestimation of the importance of side effects. A study conducted in Pakistan points to a need for appropriate patient education and counselling with regards medicines (3). It's important to recognize that there are significant disparities in the use of medicines between individuals living in urban and rural areas. In Pakistan almost half of the population is illiterate (4) and over two thirds (67%) of the population reside in rural areas (5).

In the rural population of Correia Pinto municipality in Brazil, a high percentage of people reported discarding leftover and expired drugs inappropriately (6). In Pakistan, practice was observed among the study respondents highlights the need for education and awareness program to promote proper medication storage and disposal practices (7).

The identification of a research gap has brought to light the fact that a significant portion of the population lacks knowledge on the appropriate methods for disposing of expired or unused medications. This necessitates the importance of this topic in order to culminate this hallmark and contribute towards rational use of medicines. The present investigation was undertaken due to the scarcity of information regarding the disposal practices of expired or unused medicines in remote regions of the country. To the best of our knowledge, this is the inaugural study conducted in the district of Bhakkar, Punjab, Pakistan.

The primary objective of this study was to investigate the perceptions and practices surrounding expired medicines in District Bhakkar. In order to achieve this goal, a questionnaire was developed to evaluate the knowledge, attitudes, and behaviors of individuals living in the rural areas of Punjab. The study has certain limitations as the findings acquired only represent a small portion of the rural regions in District Bhakkar, Punjab, Pakistan and therefore cannot be extended to the entirety of the country. The sample size also played its role.

2. Materials and Methods

It was a cross-sectional and questionnaire based study which included the rural population of District Bhakkar Punjab, Pakistan. The study instrument had been designed by experts of faculty of Pharmacy, Gomal University D.I.KHAN. This study got ethical approval and completed in 3 months duration from feb to april 2024.Before filling out the questionnaire, the importance and purpose of the study were explained to the study respondents. As the respondents were unable to read and write so they were interviewed. The questionnaire comprised of four sections, in which initial section included demographic details of the study participants such as age, gender, educational qualification, marital status and family structure. The subsequent section included methods of acquiring medications and questions related to knowledge of disposal of expired or unused medicines. The penultimate section concentrates on queries regarding the practice of retaining unused or expired. Lastly, the final section had been focused on questions related to awareness of disposal of unused or expired medicines. The data collection was verified and analyzed statistically by using IBM (SPSS) statistical package for social sciences software version 16.0. Some non-parametric tests that were Krushkal Wallis test and Mann-Whitney tests, were applied, which ultimately revealed the presence of statistically significant findings.

3. Results and Discussions

3.1. Demographical Explanation

According to population consensus done in 2023 the total population residing in district Bhakkar is 1,957,470, about 48.8% are female, 51.2% are male, about 1,388,198(84.2%) population reside in rural areas and the literacy rate according to 2017 consensus is 51.8% (8) and the demographic data presented in table 1 revealed that about 73 (48.7%) respondents were illiterate. The correlation between literacy and the utilization of medications, as well as the handling and storage practices for unused or expired medicines, is therefore not surprising. While discussing associations, a key component in promoting the rational use of medicines is awareness of the need for educating all concerned in the correct use of medicines (9).

Table 1. Demographic details (n=150).

Category	Frequency	Percentage
Age		
9-13	1	0.7
14-22	12	8.0
23-31	35	23.3
32-39	25	16.7
40-48	42	28.0
49-65	23	15.3
66-74	12	8.0
Gender		
Male	70	46.7
Female	80	53.3
Marital status		
Married	117	78.0
Unmarried	33	22.0
Family type		
Joint	84	56.0
Nuclear	65	43.3
Educational qualification		
Illiterate	73	48.7
Primary	35	23.3
Matric	17	11.3
Inter	11	7.3
Graduate	14	9.3

Source: primary data

Description	Mean ± SD	P-value
Age *	42.71(14.375)	0.003
Education **	2.05(1.320)	0.006
Gender *	1.53(0.501)	0.156
Marital status **	1.22(0.416)	0.002
Family type*	1.50(0.925)	0.338

*Krushkal-wallis test

**Mann-Whitney test

3.2. Geographical Location of Research Area

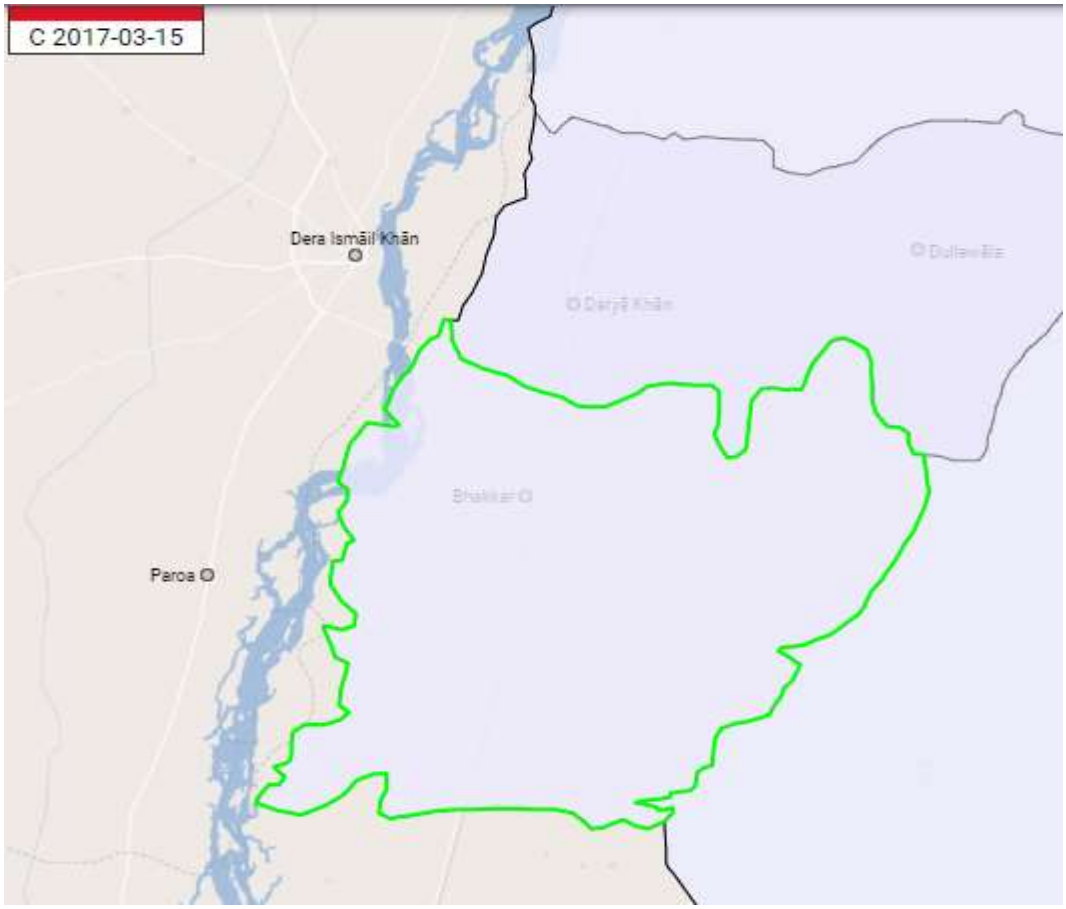

Figure 1. Map

3.3. Methods of Acquiring Medications

Access to medicines without prescription sanctions self-medication practice that is a global challenge (10–15). In a study self-medication practices with OTC drugs and antibiotics were prevalent, with a high percentage of respondents engaging in self-medication (16). This study demonstrates that for self-medication about 77.3% respondent acquired over the counter drugs and 34 (22.7%) didn't acquire over the counter, while 42 (28%) via a friend or a coworker. An overwhelming finding in study revealed that about (94.9%) checked the expiry date before procuring the medicines and family members (48 %) were considered the major source of information for self-medicated drugs. while in my study only 2.7% verify expiration dates before procuring and 18% purchased medication on recommendation of relative or friend. Various methods of acquiring medications were analyzed and results showed that 150(100%) procured medications via prescription but this is an ideal situation. In recent studies the majority of participants in rural areas of Pakistan procured medication without a prescription (17–19).

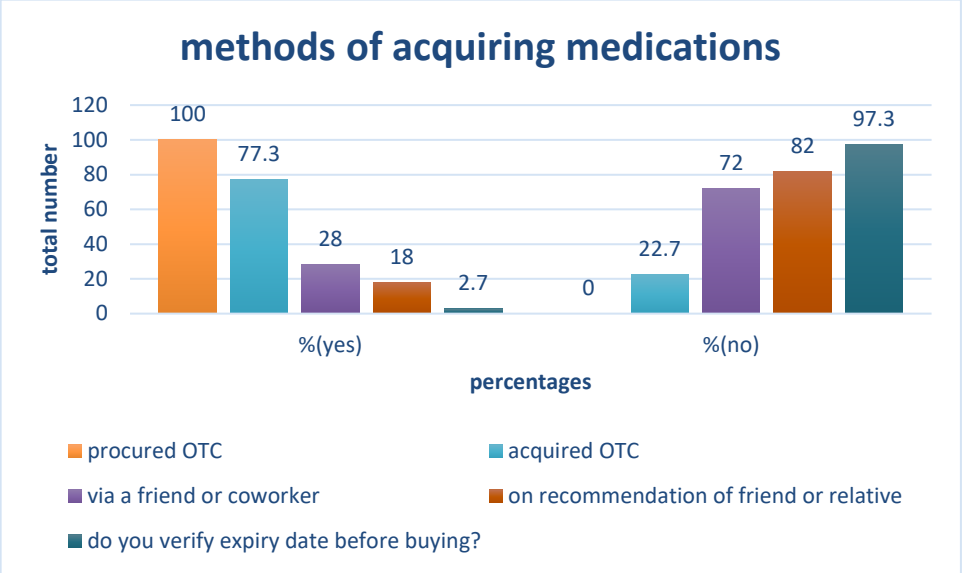

Figure 2. Methods of acquiring medications.

3.4. Types of Medicines Consumed

In my study about 76.7% responded that they consumed NSAIDs which is supported by findings of a study that revealed that a higher percentage of rural population in Pakistan consume NSAIDs. (20). Analysis on the type of medicines consumed showed result that out of 150 respondents 115(76.7%) consumed NSAIDs while 35 (23.3%) didn't, about 13(8.7%) consumed antibiotics and 137(91.3%) didn't, 28(18.7%) consumed antihypertensive while 122(81.3%) didn't. about 10(6.7%) consumed anti-diabetics, while 29(19.3%) consumed antacids. Majority of respondents had no knowledge about the medications they have consumed which is a serious concern. They had little knowledge regarding antibiotics. Findings of this study are supported by the study conducted in rural areas of Sindh, Pakistan (21).

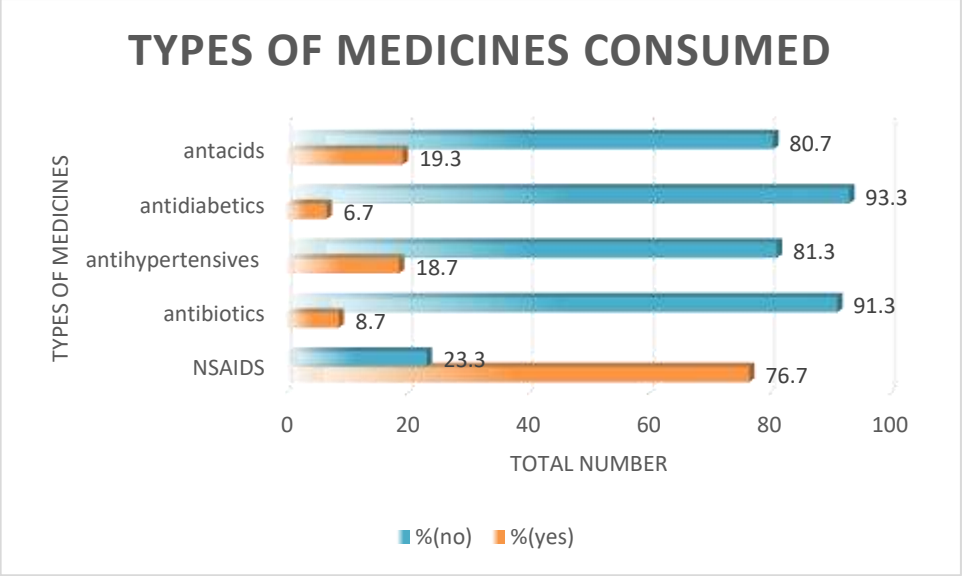

Figure 3. Types of medicines consumed

3.5. Knowledge Related Questions

The knowledge related questions were assessed by questionnaire and the results are presented in table 1.3.4. About 90(60.0%) do inquire with the pharmacist about the recommended storage conditions of medications, while 60(40.0%) didn't inquire pharmacist regarding storage conditions of medicines. About 137(91.3%) didn't know about drug waste. Then about 131(87.3%) respondents said that they

were given instruction on how to get rid of expired, undesirable medications. A study conducted showed that 9.1 % of respondents had received instructions concerning the correct disposal of medication (22) while in my study 87.3% responded that they were given instructions on how to get rid of expired, undesirable medications. Contrary to the findings of a study conducted in second year medical students in India about 98 (83%) of students said that they are aware of medicinal waste (23), while in my study 91.3% didn't know about drug waste.

Table 2. Knowledge related questions

Knowledge related	Yes %	No %
Do you inquire with the pharmacist about the recommended storage conditions?	60.0	40.0
Have you ever heard of drug waste?	8.7	91.0
Have you ever been given instructions on how to get rid of expired, unused or leftover medications?	87.3	12.0

Source: primary data

3.6. Source of Information Regarding Disposal of Expired, Unused or Leftover Medicines

The source of information regarding disposal of expired, unused or leftover medicines were media, pharmacist and physicians. About 149(99.3%) said that they didn't get any information about proper disposal of unused expired or leftover medicines through media, 63(42.0%) said that they didn't get information about proper disposal of expired, unused or leftover medications through pharmacist. About 36(24.0%) didn't get information by physicians. The findings of this study was supported by the study conducted in India where majority have not received information from health professionals (24).

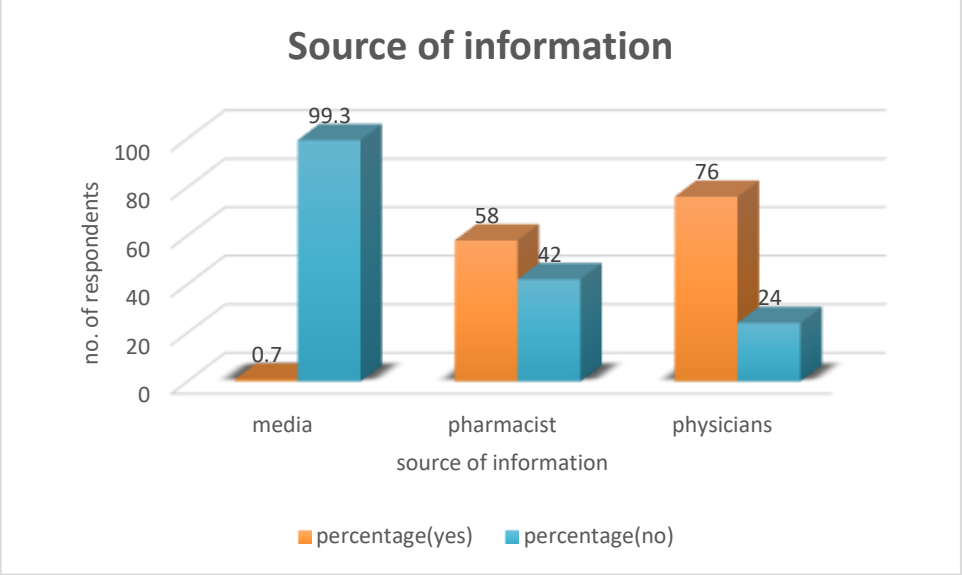

Figure 4. Source of information regarding disposal of expired, unused or leftover medicines

3.7. Practice Related Questions

Practice related questions was assessed by the questionnaire and the results are presented in table 1.3.6 showed that about 60(40.0%) said that they don't notice drug's expiration date before purchasing, 109(72.7%) said that they do frequently review directions for disposing of medications. Out of 150 respondents 12(8.0%) normally stored their expired, unused or leftover prescription drugs in kitchen shelf, 43(28.7%) in bedroom drawer,9(6.0%) in refrigerator, 1(0.7%) bathroom cabinet,53(35.5%) in medicine box, 4(2.7%) store in bedroom drawer, medicine box and refrigerator,17(11.3%) store in bedroom drawer and medicine box,3(2.0%) in kitchen, bedroom drawer and refrigerator,2(1.3%) in

both medicine and refrigerator,6(4.0%) in both bedroom drawer and refrigerator. Then respondents were asked about whether they consume any leftover medications kept in their homes so out of 150 respondents about 66(44.0%) responded that they do consume them, then about 20(13.3%) didn't know how to properly keep medications at home, then about 23(15.3%) said that they don't know how to get rid of expired medications, after that they were asked about how expired, unused or leftover medicine be disposed of so about 1(0.7%) said that the expired, unused or leftover medications be disposed of by returning to nearby pharmacy, 4 (2.7%) said by burning them or in river in canal, 42 (28.0%) said by discarding in dustbins, 19(12.7%) by disposing in sewerage, 20 (13.3%) in landfill, 42 (28.0%) in both dustbins and in sewerage, 6 (4.0%) in dustbins, sewerage and by landfilling, 14 (9.3%) in sewerage and in ladfill, 1 (0.7%) donating to hospital/clinic, in dustbins and in sewerage. Then they were asked that have they ever witnessed any incidence on unsafe disposal of medicine so out of 150 about 30 (20.0%) said they have witnessed incidence on unsafe disposal of medicines. Findings of the study were found contrary to the study conducted in Pakistan and Libya (7,25).

Table 3. Practice related questions

Practice related questions	Yes %	No %
Do you notice drug's expiration date before purchasing it?	60.0	40.0
Do you frequently review directions for disposing of medications?	72.7	27.3
Do you consume any leftover mediations kept in your home?	44.0	54.7
Do you know how to properly keep medications in your home?	86.7	13.3
Do you know how to get rid of expired medications?	84.7	15.3
Witnessed any incidence on unsafe disposal of medicines?	20.2	80.0

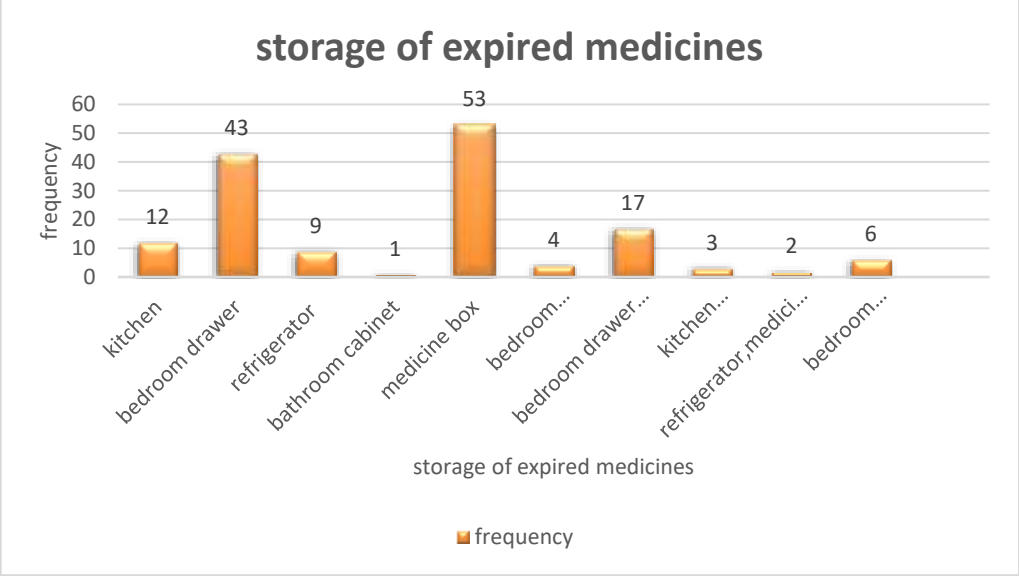

Figure 5. Storage of expired, unused or leftover medicines

Table 4. Frequency and percentage of disposal of expired, unused or leftover medicines

How expired, unused or leftover medicines be disposed of?	Frequency	Percentage (%)
1. Donate to hospital/clinic	1	0.7
2. Return to nearby pharmacy	1	0.7
3. Burning them	4	2.7
4. Discard in dustbins	42	28.0
5. In sewerage	19	12.7
6. Landfill	20	13.3
7. Discard in dustbins and in sewerage	42	28.0
8. Discard in dustbins, in sewerage and		

landfill	6	4.0
9. Donate to hospital/clinic, discard in dustbins and in sewerage	1	0.7
10. In sewerage and landfill	14	9.3
11. Discard in dustbins and landfill	1	0.7

Source: primary data

3.8. Attitude Related Information

The attitude related information regarding disposal of expired, unused or leftover medications is presented in table 4.6 showed that 150 respondents were asked about existing methods to reduce wastage of medicines so only 2(1.3%) said that dispensing be done only when necessary, also 2(1.3%) said that prescribing be done rationally, 148(98.7%) didn't agree on providing persons in need with expired, unused or leftover medicines. About 142(94.7) also didn't agree on returning to nearby pharmacies, then about 138(92.0) were in favor of existence of a program to collect expired, unused or leftover medications. Then respondents were asked about how to enhance consumer knowledge of proper medication disposal so about 35(23.3%) said either a pharmacist ,doctor or nurse should educate patients to enhance knowledge of proper medication disposal, 4(2.7%) said information dissemination through publications, television or posters, 8(5.3%) supported in favor of governmental awareness campaigns, 2(1.3%) agreed on local health personnel's instructions , 3(2.0%) said there must be written directions for using a medication, about 27(18.0%) were in favor of both governmental campaigns and on pharmacist, doctor or nurse educating patients , 58(38.7%) in pharmacist, doctor or nurse educating patients, information dissemination through publication, television or posters and by governmental awareness campaigns, while 13(8.7%) in pharmacist, doctor or nurse educating patients, information dissemination through publications, television or posters, by governmental awareness campaigns, by local health personnel's instructions and by written directions for using a medication.

According to the Food and Drug Administration (FDA), the best option of managing unused or expired medicines is to find a drug take-back location. Normally, the take-back location is a local pharmacy or a hospital. These facilities offer on-site medicine drop-off boxes, mail-back programs, or in-home disposal products. The other option in the absence of a take-back location is checking the FDA's Flush List. However, if the medicines are not in the Flush List, FDA recommends disposing the medicine in trash before mixing them with unappealing substance such as dirt or cat litter. Medicines should not be crushed, and the mixture should be placed in a sealed plastic bag before disposing into the trash (26). As in this study about 92.0% of respondents were in favor of existence of a proper program and this study is supported by the study conducted in Pakistan (27). Medicine management is a highly debatable topic around the globe (28–30), however, data from Pakistan is limited in literature and is reported from metropolitan areas of the country (31,32).

Table 5. Attitude related questions

Attitude related questions	Yes %	No %
Existing methods to reduce medicine wastage		
Only dispense when necessary	1.3	98.7
Prescribe medications rationally	1.3	98.7
Provide persons in need with expired, unused or leftover medications	1.3	98.7
Return to nearby pharmacies	5.3	94.7
Do you believe in existence of a program to collect expired, unused or leftover medications?	92.0	8.0

Consumer knowledge	Frequency (n=150)	Percentage
How to enhance consumer knowledge of proper medication disposal?		
Either a pharmacist, doctor or nurse should educate patients	35	23.3%
Information dissemination through publications, television or posters	4	2.7%
Governmental awareness campaigns	8	5.3%
Local health personnel's instructions	2	1.3%
Written directions for using medications	3	2.0%
Either pharmacist, doctor, nurse should educate patients / governmental awareness campaigns	27	18.0%
Either pharmacist, doctor, nurse should educate patients / information disseminated through publications, televisions or posters / governmental awareness campaigns	58	38.7%
Either pharmacist, doctor, nurse should educate patients/information disseminated through publications, televisions or posters/ Local health personnel's instructions / Written directions for using medications and governmental awareness campaigns	13	8.7%

It is recommended that in order to minimize improper drug disposal, government or the respective authority should establish a formal nationwide drug take back programs preferably collecting the returned unused or expired drugs. Although efforts to safely dispose medications are managed by pharmacies and healthcare facilities but these efforts are not uniformly implemented. Educational level has an impact on practice and attitude, which should be taken into account and corrective measures should be implemented. Another parameter is that the awareness programs should be conducted periodically for population residing in rural settings on safe drug disposal. Media like television, social networks should also contribute towards it.

4. Conclusion

In this study majority of study subjects had poor knowledge regarding drug waste. They had no knowledge about the mediations they were using as the study was conducted in rural population. It is concluded that knowledge is the key factor for rational use of medications and when there will be a rational use then automatically there will be proper and safe disposal of expired or unused medications. The most common method of medication disposal is through household trash and in sewerage which could pose threat to environment so it must be addressed properly. As knowledge is the key factor so it is obvious to plan and apply appropriate education programs, seminars and interventions regardless of the level of education of the population to propagate the knowledge regarding safe and proper disposal of expired or unused medications in Pakistan.

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