Exploratory Research in Clinical and Social Pharmacy 16 (2024) 100517

Contents lists available at ScienceDirect

Exploratory Research in Clinical and Social Pharmacy

journal homepage: www.elsevier.com/locate/rcsop

Patients' insights into unused medications during the COVID-19 outbreak: A qualitative study

Mutaseim Makki [a,*], Asrul Akmal Shafie [b], Ahmed Awaisu [c], Rabia Hussain [b], Moza Al Hail [d], Walid Mohammed ElMotasim [e], Mohamed Yousif Mohamed Ali Taha [d], Einas Abdoun [d], Noriya Mohd J. Al-Khuzaei [d], Gamila Salama [d], Abdulrouf Pallivalapila [d], Wessam El Kassem [d], Binny Thomas [d]

[a] Pharmacy and Drug Control Department, Ministry of Public Health, Qatar
[b] School of Pharmaceutical Sciences, Universiti Sains Malaysia, Penang 11800, Malaysia
[c] Department of Clinical Pharmacy and Practice, College of Pharmacy, QU Health, Qatar University, P.O.Box 2713, Doha, Qatar
[d] Hamad Medical Corporation, Doha, Qatar
[e] Primary Healthcare Corporation, Qatar

ARTICLE INFO

Keywords:
Patients' insights
Unused medications
COVID-19, Qatar

ABSTRACT

Background: The COVID-19 outbreak had significant global healthcare implications, including the use of medications. This is specifically evident in the surge in use of some medication and a decline in the use of others. As a result, some medications end up unused, which may have subsequent health, economic, and environmental impacts.

Aim: To explore patients' insights into unused medications during the COVID-19 outbreak.

Materials and methods: Semi-structured interviews were conducted with 30 patients attending various public and private healthcare facilities in Qatar between January and July 2021. A thematic analysis approach was utilized, with 2 researchers independently analyzing, comparing, and discussing the coding. The resulting themes were further discussed in research group meetings until a consensus was reached.

Results: Seven themes emerged: awareness of unused medications and their impacts on health, economy, and the environment; barriers contributing to nonadherence/unused medications; sources of medications; factors facilitating medication use; patients' behaviors toward donated medications/reuse; patients' awareness of medication storage requirements; and patients' desire to appropriately dispose of unused medications.

Conclusion: The COVID-19 outbreak disrupted medication supply and adherence, resulting in an increase in unused medications and inappropriate disposal. Adherence is crucial for improving patients' health and preserving medications. Implementing mail-return systems for unused medications could be a viable solution during disease outbreaks.

1. Introduction

The existing disparities in healthcare services have further expanded with the outbreak of coronavirus disease 2019 (COVID-19).[1] These disparities are exacerbated by the healthcare system's focus on COVID-19 cases rather than other medical conditions, difficulty lies in accessing medical care, limited financial resources,[2] and the dualistic impact of social media.[3] As a result, there has been an increase in medication sales in several regions around the world since the start of this crisis.[4] This is evident in the overuse of antiviral medications while antibacterials remain underused,[5] and the stockpiling of over the counter (OTC) medications to treat symptoms similar to those of COVID-19 infection.[6] Various barriers have been identified at different levels, including patient, healthcare provider (HCP), and drug manufacturing/promotion

* Corresponding author.
E-mail addresses: mabdelrahim@moph.gov.qa (M. Makki), aakmal@usm.my (A.A. Shafie), aawaisu@qa.edu.qa (A. Awaisu), rabia.hussain@usm.my (R. Hussain), malhail2@hamad.qa (M. Al Hail), wmotasim@phcc.gov.qa (W.M. ElMotasim), mtaha1@hamad.qa (M.Y.M.A. Taha), eosman@hamad.qa (E. Abdoun), nalkhuzaei@hamad.qa (N.M.J. Al-Khuzaei), gsalama@hamad.qa (G. Salama), pabdulrouf@hamad.qa (A. Pallivalapila), welkassem@hamad.qa (W. El Kassem), bthomas28@hamad.qa (B. Thomas).

https://doi.org/10.1016/j.rcsop.2024.100517
Received 22 May 2024; Received in revised form 19 September 2024; Accepted 23 September 2024
Available online 26 September 2024

levels, that contribute to medication underuse. Unused medications may result from patient or prescriber behaviors or from the pharmaceutical form of the medication itself.[7] For example, rectal mesalamine was not adhered to, in addition to busy lifestyles,[8] and homosexual men prefer a gel over a suppository as an antimicrobial owing to its feelings and for sexual pleasure.[9] As one of the main barriers, medication nonadherence is a well-known, expanding, and costly burden worldwide,[10] leading to worsened health conditions and resource wastage.[11] The COVID-19 has further exacerbated existing nonadherence, particularly among elderly and low-income communities.[12] Irrational production and over-prescribing of medications can also contribute to unused medications and subsequent waste.[13] Differences between generic and branded medications, such as appearance, may deter patients from using generic medications when prescribed.[14] Additionally, oversized medication packages can be a barrier to completing a medication regimen as patients may receive more medication than necessary, and only use a portion of it. Medications may also go unused due to low-quality prescribing practices resulting from irrational medication promotion.[15] Direct-to-consumer pharmaceutical advertising (DTCPA), common in the U.S. and New Zealand,[16] can influence medication use positively or negatively[17] and is considered controversial. They induce the purchase of costly medications, waste time in doctors' offices, and may further give unexpected discouraging therapeutic results.[18] Unethical DTCPA on Arabic satellite channels may fail to provide information on medication side effects while claiming their effectiveness.[19] The resulting unused medications are often disposed of inappropriately,[20] or kept at home, posing a health risk to children during the COVID-19 lockdown.[21]

In Qatar, the healthcare system includes public (the tertiary Hamad Medical Corporation (HMC) and the Primary Healthcare Corporation (PHCC)) and private medical care. Medications are free for Qatari citizens and require a copay for residents in public healthcare facilities.[22,23] Unfortunately, policies regarding the return of unwanted medications are not well-known to the public.[24] However, adherence to medication regimens improved when telemedicine was effectively utilized during the COVID-19 outbreak.[25] Given the above generalizations and in context of the Qatar healthcare system, this study aimed to explore patients' insights into unused medications during the COVID-19 outbreak with a view to understand how patients can be engaged to reduce these commodities and their health, economic and environmental impacts.

2. Materials and methods

This qualitative study utilized a semi-structured interview guide with open-ended questions. Adult patients waiting to collect their medications from 12 healthcare centers in Qatar were conveniently selected and interviewed between January and July 2021. Similar to other qualitative studies,[26,27] a data saturation point was reached with a sample size of 30 participants. At this point collecting new data ceased to generate new insights.

Considering the impact of the COVID-19 outbreak, the researchers developed an English/Arabic interview guide, which was piloted with 20 patients, who were not part of the study. After experts and peers in the fields of pharmacy practice and social and administrative pharmacy, reviewed the questions and answers, necessary modifications were made, and the interview guide was finalized.

2.1. Data Analysis

A thematic analysis approach[28] was employed. All interviews were audio recorded, primarily conducted in English, with a few exceptions in Arabic, which were later translated to English by a qualified interpreter. Using the Taguette[R] software program, the researchers transcribed interviews to generate codes, which were then compared and grouped into themes. Two researchers independently analyzed, compared, and discussed the coding of the first transcript until consensus was reached. They, then exchanged transcript codes, and resolved any differences. Both researchers categorized the codes into sub- and key themes. These themes were further discussed in research group meetings until a consensus was reached. Cohen's kappa statistic was used to measure the inter-rater reliability, i.e., the level of agreement between the two researchers, who classified each item into mutually exclusive categories.

The formula for Cohen's kappa is as follows:

$$k = (po–pe)/(1–pe)$$

where:

po: Relative observed agreement among researchers.

pe: Hypothetical probability of chance agreement.

$k = (0.87–0.5)/ (1–0.5)$.

$k = 0.74$, which indicates a substantial level of agreement among the researchers.

3. Results

3.1. Sociodemographic data of the respondents

A total of 30 patients (17 males and 13 females) with diverse professions (students, housewives, vocational education, academic education, retired) were individually interviewed for an average of 20 min (Table 1).

3.2. Key themes identified

Seven key themes were identified from the patients' quotes on unused medications during the COVID-19 outbreak. These are: patients' awareness of unused medications and their health, economic, and environmental impacts; barriers leading to nonadherence/unused

Table 1
– Respondents' sociodemographic data.

Respondent No. and Profession	Gender	Age	Median age
Students			
1. Student (university)	Female	24	26
10. Student (university graduate)	Male	28	
21. Student	Male	26	
23. Student	Female	26	
30. Student (graduate)	Female	22	
Housewives			
2. Housewife	Female	35	35
3. Housewife	Female	44	
11. Housewife	Female	35	
Vocational education			
4. Laborer	Male	40	43.5
12. Laborer	Male	35	
15. Laborer	Male	40	
18. Laborer	Male	35	
8. Watchman	Male	48	
16. Shopkeeper	Male	49	
19. Tailor	Male	52	
22. Machine operator	Male	47	
Academic education			
5. Engineer (Architect)	Male	55	40
13. Engineer	Female	41	
6. Lab technician	Female	29	
7. Employee	Female	46	
17. Employee	Female	39	
27. Employee	Male	47	
28. Employee	Male	34	
9. Teacher	Male	52	
14. Teacher	Female	33	
25. Librarian	Female	34	
26. Business manager	Male	50	
29. Secretary	Female	33	
Retired			
20. Retired man	Male	62	63.5
24. Retired man	Male	65	

medications; sources of medications; facilitators of medication use; patients' behaviors toward donated medications/reuse; patients' awareness of medication storage conditions; and patients' desire to appropriately dispose of unused medications (Table 2).

4. Discussion

This study explores patients' insights into unused medications during the COVID-19 outbreak. Seven key themes were identified: patients' awareness of unused medications and their impacts on health, the economy, and the environment; barriers leading to nonadherence/unused medications; sources of medications; facilitators of medication use; patients' behaviors toward donated medications/reuse; patients' awareness of medication storage conditions; and patients' desire to dispose of unused medications appropriately.

The COVID-19 outbreak significantly decreased adherence to chronic medications due to difficulties accessing professional opinions during the lockdown, shifting focus to COVID-19 prevention and treatment medications, and increased isolation and depression. Depression and reduced well-being were evident as a result of isolation during the COVID-19 outbreak.[29] A study found that many of the in-case-needed medications have been stockpiled by the public since the COVID-19 outbreak.[30] These reasons led to an increase in unused medications at home. In addition to the freely available or co-paid medication policy, during this outbreak, social media created a state of panic-buying of medications that eventually accumulated at home. Similarly, a previous study revealed that social media plays a role in the emergence of medication-related panic-buying behaviors.[31] Medications are free for Qatari nationals and are at low cost for residents.[22,23] On the one hand, this is good for healthcare, especially for the needy, but could encourage both prescribers and patients to waste these commodities. Furthermore, some patients may perceive no harm in leaving medications unused. This misperception could be due to the fact that these medications are free. Direct co-payments have been shown to reduce medication use.[32] Access to medications and insurance services are considered to be a significant factor in medication use.[7] Unlike in the Qatar public healthcare sector, the medical insurance seen in the private sector seems to contribute to unused medications at patients' end, as it may incentivize some HCPs to prescribe additional medications unnecessarily in return.

Direct-to-consumer pharmaceutical advertising (DTCPA) is controversial, but can help patients adhere to medications.[33] Previously, a Kuwaiti study identified barriers to medication adherence in patients with diabetes, such as poor awareness and beliefs about the disease and/or medications, self-confidence in the ability to manage the disease, social stigma, insights regarding social and professional support, and healthcare services.[34] Poor adherence can also be caused by complicated treatment regimens and inaccessibility to doctors.[35] The current study identified almost all of these barriers, with the inability to seek medical attention exacerbated during the unprecedented COVID-19 outbreak, which may have led to self-medication, sharing, and stockpiling of medications. In Qatar, particularly during the COVID-19 outbreak, patients may imitate others' online purchases of medications, leading to a buildup of unused medications. Misuse of medications, including sharing them with others, can result in ineffective treatment and wasted medications. The COVID-19 outbreak highlights the importance of promoting medication adherence to improve health outcomes and reduce unnecessary waste and subsequent health, economic, and environmental impacts, such as, child poisoning and an increase in microbes resistant to medications.[36] These impacts were also mentioned by the study participants. Therefore, a medication box should be kept in a safe place away from children until it is used or disposed of appropriately.

This study found that beliefs in traditional/herbal remedies may contribute to medication underuse. Similarly, in a systematic review and meta-synthesis of 34 qualitative studies, medication-related beliefs were a common theme associated with reduced adherence.[37] There has been

Table 2
– Key themes indicating patients' insights into unused medications during the COVID-19 outbreak.

Key themes	Representative quotes
1. Awareness of unused medications and their health, economic, and environmental impacts.	*"I think they are the medications that are remaining or unneeded."* 'Respondent 1: a 24-year-old university student'. *"Any drug in the house, people stop or delay using it, like cough syrup, which I didn't complete because it is bitter."* 'Respondent 2: a 35-year-old housewife'. *"They are dangerous for kids and pets. I keep them in case of need. My children like colorful things and when they see medicines… they like to taste, but I know it is not safe."* 'Respondent 3: a 44-year-old housewife'. *"Maybe they endanger animals and soil… I am not sure… or may fertilize the soil… sorry no idea."* 'Respondent 4: a 40-year-old laborer'. *"Oh yes, I admittedly have many at home, but I or a family member may need one day… in case of emergencies such as the COVID-19… I believe every home has medications, some under use and others not."* 'Respondent 5: a 55-year-old architect'. *"Never mind if a person has gotten medications in the home which are not used at present… the only important thing is that these dangerous items must be kept away from kids and from recreational use."* 'Respondent 6: a 29-year-old lab technician'.
2.Barriers leading to nonadherence/unused medications: 2.1 Patient-related barriers: 2.1.1 Sociodemographic (sex, age, education, etc.) 2.1.2 Psychological/medical status (unprecedented COVID-19 outbreak, improvement of medical conditions, depression, motivation) 2.1.3 Insensitivity/irresponsibility toward waste of free/copay medications and inappropriate disposal. 2.1.4 Perceptions/beliefs/preferences 2.1.5 Other (change of lifestyle, forgetfulness) 2.2 Medication-related barriers: frequency, duration of therapy, multiple medications, side effects, and use of alternatives (herbals, cupping, spiritual remedies), 2.3 Provider-related barriers: telemedicine, miscommunication, change in medications, inclusion in decision making. 2.4 Healthcare system-related barriers: free/copay medications, lack of guidelines, and so forth. 2.5 Societal-related barriers: social/family support, cultural beliefs, and so forth.	*"I and my husband use almost the same medications; we actually use them regularly because we schedule to take them at the same time. We brought in some more medications in case the supply might have become difficult during the COVID-19* outbreak." 'Respondent 7: a 46-year-old employee'. *"I have problems with my heart… I take Amlo 5 for that… doctor told me to take aspirin, too, but I rarely do that because I forget, or I take garlic because a relative uses the same thing."* 'Respondent 8: a 48-year-old watchman'. *"Sometimes I forget or otherwise I am not home so skipping some doses."* 'Respondent 9: a 52-year-old teacher'. *"In the beginning, I did not use the asthma diskus, but a relative pharmacist showed me. I hate the taste and size of tablets."* 'Respondent 10: a 28-year-old university graduate'. *"People with financial difficulty may skip some doses to save medicines or go to a pharmacy directly… I think people with low education may not understand that we have to finish all antibiotic tablets. I personally when I read about side effects, I stop or use medicines rarely."* 'Respondent 13: a 41-year-old engineer'. *"Ladies in general and I find that in myself, they prefer herbals, especially during pregnancy. Do you think this may prevent the use of normal medicines? I find it so."* 'Respondent 14: a 33-year-old teacher'. *"Obviously, we or let us say some people leave medicines on improvement of our sickness."* 'Respondent 15: a 40-year-old laborer'.

(*continued on next page*)

Table 2 (*continued*)

Key themes	Representative quotes
	"Due to a medical condition, depression, I miss a lot of doses… I sometimes take more than needed… I know it is wrong, but I cannot help it." 'Respondent 16: a 49-year-old shopkeeper'. *"It is not always that knowledge controls things. We in several times, and for ages know best, but act against that. My community knows why we should adhere to doctors' guidance, and they still waste medicines because they are irresponsible."* 'Respondent 17: a 39-year-old employee'. *"In my home country, we are used to going to temple for relief of stress and disease. Some of us, even here in Qatar, believe in spiritual therapy and therefore use little of drugs."* 'Respondent 18: a 35-year-old laborer'. *"Lots of people like me, forget to consume medicines daily or as given by doctors. You know this happens when I use my inhaler… I am supposed to use it regularly, but when I feel fine… I leave it behind when on short leave, but I continue with the other one… it is called Ventolin."* 'Respondent 19: a 52-year-old tailor'. *"With 7 medicines I bimonthly get from HMC* (Hamad Medical Corporation), *I take 4 or 5 regularly and skip the other… I did not notice any change if I use or not."* 'Respondent 20: a 62-year-old retired man'. *"Frankly, I cannot finish Claril because it hurts my stomach. I got bad gastritis… I think it may help if I take it as syrup or I will ask doctor to change it."* 'Respondent 21: a 26-year-old student'. *"I have just settled in Doha; I find life difficult with the language barrier. Once I had a meeting with a physician, we couldn't communicate very well… I speak mainly Tamil… the story is long… finally, I didn't like the approach… I think this affected my medication taking. I also think that the doctors in private clinics take care of their patients better than in public ones which would also affect medication taking, but on the other hand private pharmacies help in accumulation of medications because of overselling"* 'Respondent 22: a 47-year-old machine operator'. *"Due to the lockdown during the COVID-19, it is difficult to see a doctor, so we simply purchased medications online or from pharmacy"* 'Respondent 1: a 24-year-old university student'. *"I heard about free medications… I pay little for medications. I pay attention to using my medications. My father is not regular on medicines… may be due to side effects or not bothering about almost free medicines form the primary healthcare centers. In case of not using them, we throw in garbage"* 'Respondent 23: a 26-year-old student'. *"As you see son… I'm not able to take my tablets. Most of the time, my wife or daughter helps me, and I struggle when they aren't around… I may miss some doses when I am alone. I hate drugs and being alone."* 'Respondent 24: a 65-year-old retired man'.
	In response to impacts of social media and others on medication accumulation and use: *"It is cool, especially during this COVID-19 outbreak. My wife usually purchases only items, including medicines and dietary supplements for hair and skin, but this time she got different flu drugs. She said it is worth trying that because her friends tried them. She has a pile of those medicines."* 'Respondent 25: a 34-year-old librarian'. *"Well, I know many products are out there for promotion, but they little work… I disbelieve online promos, but I can try OTC medicines if recommended by somebody I trust. No or rarely is there a medical person to ask for advice."* 'Respondent 26: a 50-year-old business manager'. *"Depends on its attractiveness and what people say… I usually wait till a product is liked by others… never rush baby"* 'Respondent 27: a 47-year-old employee'. *"At first, things were hard, we bought medicines online or shared with relatives and neighbors, but then we accommodated, and drugs are supplied by local pharmacies and delivered by Qatar post to homes."* 'Respondent 28: a 34-year-old employee'. *"We managed to get medicines from the public pharmacies, but the appointments schedules keep changing many times. I think some people take medicines by themselves from a nearby pharmacy."* 'Respondent 29: a 33-year-old secretary'. *"I, my family and neighbors stockpiled vitamin C and zinc and some other medicines, such as Panadol, for emergencies. I know some residents who imported some coronavirus medicines from their countries."* 'Respondent 7: a 46-year-old employee'.
3. Sources of medications: free/copay, shared or online medications.	*"With 7 medicines I bimonthly get from HMC* (Hamad Medical Corporation), *I take 4 or 5 regularly and skip the other… I did not notice any change if I use or not."* 'Respondent 20: a 62-year-old retired man'. *"I have just settled in Doha; I find life difficult with the language barrier. Once I had a meeting with a physician, we couldn't communicate very well… I speak mainly Tamil… the story is long… finally, I didn't like the approach… I think this affected my medication taking. I also think that the doctors in private clinics take care of their patients better than in public ones which would also affect medication taking, but on the other hand private pharmacies help in accumulation of medications because of overselling"* 'Respondent 22: a 47-year-old machine operator'. *"I heard about free medications… I pay little for medications. I pay attention to using my medications. My father is not regular on medicines… may be due to side effects or not bothering about almost free medicines form the primary healthcare centers. In case of not using them, we throw in garbage"*

(*continued on next page*)

Table 2 (*continued*)

Key themes	Representative quotes
	'Respondent 23: a 26-year-old student'.
4. Facilitators to adherence/medication use: 4.1 improving awareness to minimize unused medications. 4.2 controversial social media. 4.3 improving patient and HCPs communication (tailored telemedicine when in outbreak) 4.4 Sensitizing patients to medication price and risks of unused medications.	When responding to whether doctors explain how medication should be taken, respondents said: *"Yes, almost always… a few times a doctor says, a pharmacist will explain to you."* 'Respondent 11: a 35-year-old housewife'. *"Pharmacists are always the ones who give details on medicines."* 'Respondent 12: a 35-year-old laborer'. When responding to impact of education on minimizing unused medications *"Yes, education helps. I think education by attractive ways like nice promo on the streets."* 'Respondent 27: a 47-year-old employee'. *"Education of the young generation is a good idea I think… they understand better."* 'Respondent 20: a 62-year-old retired man'. - Additional respondents' suggestions to minimize unused medications: *"The Ministry of Health can do something like telling people and patients of their negative effects and calling for studies."* 'Respondent 25: a 34-year-old librarian'. *"Repetition of drug supply is problematic. Patient information must be available in private and HMC hospitals."* 'Respondent 19: a 52-year-old tailor'. *"Online service of pharmacists to review medicines from time to time with patients."* Respondent 30: a 22-year-old graduate'. *"Supply of small quantity of drugs, I think should be allowed in some cases."* 'Respondent 17: a 39-year-old employee'.
5. Patients' behaviors toward donated medications/reuse.	Responses regarding donating or receiving unused medications: *"If it suits me why not. Generally, I give out unneeded medicines to relatives. However, I like to get fresh medicines."* 'Respondent 27: a 47-year-old employee'. *"People get medicines freely from pharmacies… for some people…this is for laborers for FIFA World Cup may be helpful… they have no extra money for medicines."* 'Respondent 30: a 22-year-old graduate'. *"We have good enough medicines so how about sharing with people in poor places like displaced people."* 'Respondent 16: a 49-year-old shopkeeper'.
6. Patients' awareness about medication storage conditions.	In response to awareness and source of information about medication storage: *"From the pack I guess."* 'Respondent 29: a 33-year-old secretary'. *"I rarely ask questions such as this about storage. A pharmacist nearby my house tells me about details like these."* 'Respondent 30: a 22-year-old graduate'.
7. Patients' desire to appropriately dispose of unused medications.	*"I know most people put them in the trash. Although people do that, I don't think it's alright."* 'Respondent 30: a 22-year-old graduate'. *"I guess they must be gathered decently. The government should take care of that."* 'Respondent 11: a 35-year-old housewife'. *"If the place is not far or it is secure."* 'Respondent 12: a 35-year-old laborer'. *"They should allow us to return unwanted drugs when we go to medical appointments in the center; they should… doctors should discuss with us about medicines old and new. As in telemedicine, we can return them* via *mail"* 'Respondent 3: a 44-year-old housewife'. In response to a question regarding patient information leaflet (medication package insert) having mandatory text advising patients on the proper disposal of unwanted/ unused medications, respondents said: *"Yes, yes, it is necessary. Please, this should be in different languages for people speaking Hindi and Malayalam,* etc.*"* 'Respondent 29: a 33-year-old secretary'. Opinions about an unused medication collecting point near you: *"Definitely, I like that. I think all people would like that."* 'Respondent 7: a 46-year-old employee'. *"Tracking medicine use is seen by some pharmacies, by sending reminders. The collection boxes near Almeera departmental stores and other public areas are good places for the return of medicines."* 'Respondent 7: a 46-year-old employee'. *"Pharmacists in any pharmacy nearby or in residential areas should direct the community or receive the medicines… I think packs can be marked by patients as 'returned' so nobody can use them."* 'Respondent 9: a 52-year-old teacher'.

expanded use of herbal medications worldwide for several reasons.[38] One of these reasons could be that people have the perception that natural medications are non-toxic or less expensive, and this could be a barrier to disusing conventional medications. For many communities, using of herbal medications to treat COVID-19 infection was an option.[39] Approximately 286 natural substances have been used since medieval times in the Levant for medical treatment[40]; comprehensive studies and trials of these remedies are warranted to determine their safety and efficacy.

Distant communication between HCPs and patients, i.e., telemedicine performed during the outbreak, helped in many cases related to COVID-19 infection but affected adherence, according to the study participants. This is contrary to a previous study in Qatar.[25] Telemedicine is not expected to create a strong relationship between HCPs and patients, and therefore may affect their adherence. Similarly, experiences with medications, the nature of the relationship between patients and HCPs, patients' beliefs, and medication costs compromised adherence.[41] Some patients may benefit from seeing a pharmacist to adhere to their medications.[42] The same concept was mentioned by the current participants, but they used online or telephone communication instead of face-to-face communication due to the lockdown caused by the COVID-19 outbreak. Tailored telemedicine with optimal follow-up care could help improve adherence.

In many Arab countries, negative notions, such as that medications are harmful, HCPs overprescribe, and patients cannot tolerate the side effects of medications, are barriers to adherence.[43] Overprescribing, particularly in the private sector of Qatar, was noted by some participants in the current study. Similarly, a Chinese study revealed that medications are unlikely to be completely used because many

medications are prescribed.[44] In favor of this overprescribing, patients in this study expected to receive medicinal treatment at each doctor's visit. This was also observed in a study in neighboring Oman.[45] To counteract this over-medicalization, HCPs should promote a healthy lifestyle to patients.

In a previous Qatar study, the pharmacist-patient time was considered too short for the patient to receive sufficient information about medications, and the full role (i.e., educating and monitoring drug therapy and screening health conditions) of pharmacist was not experienced.[46] In contrast, the current study revealed that pharmacists were well involved in clarifying many medication-related issues but, unfortunately, not in the storage or disposal of unused medications. This may be the case, as pharmacists expect adherence to these medications.

The participants' insights into checking the availability of medications on hand before purchasing were consistent with the idea of an online consultation with a prescriber before purchasing medications, as suggested by the UK Medicines and Healthcare Products Regulatory Agency (MHRA).[47] In addition, the National Health Service (NHS) proposed price labeling of medications to encourage patients to save these valuable items from being wasted.[48] In the current study, participants primarily insisted on raising awareness and enforcing policies to reduce medication waste and its consequences. To build sustainable awareness, new generations should be taught this early in their educational curriculum.

In a previous study, patient information leaflets (PILs) improved adherence.[35] Participants in the current study believed that PILs should be in different languages and describe appropriate methods of medication disposal. Limited awareness of the risks of inappropriate disposal was one barrier. Second, the lack of public awareness of the policy allowing the return of unwanted medications to public pharmacies was another barrier. Third, the lack of the same policy in private pharmacies exacerbated this problem. Furthermore, fear of COVID-19 infection has threatened public safety by preventing them from returning their unused medications to collection points, as shown in another study.[49] Similar to another study,[50] an encouraging professional model for appropriate disposal was perceived as missing by the participants in this study, i.e., HCPs sometimes dispose of unused medications inappropriately. Paid mail return of unused medications to pharmacies seems worth trying in a busy world. In an Oman study, one-third of respondents exchanged medications with others[45]; this sharing practice in the first place is discouraged, as the medication may not suit the patient, and may lead to a deterioration in their health. Such practices were also observed in the current study, particularly during the lockdown. The establishment of an inclusive disposal policy and periodic campaigns were mentioned during the current study as solutions to avoid such sharing and to facilitate the appropriate disposal of unused medications.

The common theme of improving public awareness for better practices seemed applicable to this study. Persson et al.[51] made a similar suggestion in their study, in which consumer awareness of the consequences of incorrect disposal was followed by a 3 % reduction in garbage disposal. When consumers are persuaded that such behavioral change can reduce their negative impact on the environment, they are more likely to change and sustain their behavior.[52] Motivation also leads to pro-environmental behavior, although some studies have suggested that it plays only a minor role in moral behavioral decisions.[53] Incentivization of the public helps encourage the return of unused medications to collection boxes for appropriate disposal.[54,55] The latter approach was also mentioned by the participants in this study.

Controlled donation of unused medications to organizations for needy patients was frequently suggested in the current study, whereas sharing medications with others was a common finding in another study.[56] Donation of well-stored, unused medications was thought to be viable, consistent with the beliefs of the UK public,[57] practiced in the U. S.,[58] and the Netherlands.[59] Otherwise, access to medication collection points was suggested.[24] Participants suggested that patients accept the reuse of medications provided that their quality is maintained and proven by technological sensors in packages and visual tests by the pharmacist.[60] However, these technologies may not be feasible in many regions around the world.

Overall, to minimize unused medications and their subsequent impacts, the following measures were suggested: reducing unnecessary prescribing, optimizing pharmacy processes (e.g., auto-refills, prescription plans), limiting pharmaceutical marketing campaigns, and conducting awareness campaigns to reduce the overuse of antibiotics and OTC medications.[61] These measures and other strategies, such as "SIMPLE" strategies, i.e., (1) simplifying regimen characteristics; (2) imparting knowledge; (3) modifying patient beliefs; (4) patient communication; (5) removing bias; and (6) evaluating adherence, help reduce unused medications.[62]

Taking into account the insights of these patients, future studies should incorporate the insights of HCPs and policymakers to alleviate the issue of unused medications and their inappropriate disposal. Future studies should also focus on the adherence of older and poorer communities, as they seem to be more affected by such outbreaks. Given the high capacity of the Qatar healthcare system, pharmacists should be equipped with capabilities and technologies to test the validity of unused medications for reuse to reduce waste.

Strengths and limitations.

The accounts generated from this qualitative approach were detailed and exhaustive and would not have been possible using a broader survey approach. The semi-structured English/Arabic versions of the interview guide helped to obtain as much information as possible, as per the open-ended nature of the questions that were presented in the two languages commonly spoken in Qatar. A validated interview guide minimizes bias, although social desirability and expectancy biases may have influenced participants' responses. These biases were minimized by clearly explaining the purpose of the study to participants. Data trustworthiness was maintained, but some participants may have falsely uttered some information to please the researchers or otherwise.

5. Conclusion

A resilient healthcare system is crucial during challenges such as the COVID-19 outbreak. This study is of significant value as it is the first of its kind in Qatar to address medication supply, use, and disposal, particularly during this unprecedented crisis. This value can be further enhanced by extracting strategies from this study and similar ones to improve adherence and mitigate the health, economic, and environmental impacts of unused medications. Adherence is essential for enhancing health and reducing the negative impacts of unused medications. Therefore, all measures that can improve adherence should be implemented. Utilizing mail returns for inevitable unused medications can be one of the solutions during disease outbreaks.

Ethics approval

The entire study was approved in Qatar by the research ethical committees of the Ministry of Public Health (Reference No. 01, March/1/2020), the Medical Research Center at HMC (Reference No. MRC 01/18/237, September/1/2020), and the Research Section at PHCC (Reference No. PHCC/IEC/19/01/001, July/14/2019). The participants' consent was obtained prior to the commencement of this study.

Funding

This work was funded by the Medical Research Center (MRC) at Hamad Medical Corporation (HMC), Qatar.

CRediT authorship contribution statement

Mutaseim Makki: Writing – review & editing, Writing – original draft, Visualization, Validation, Software, Resources, Project

administration, Methodology, Investigation, Funding acquisition, Formal analysis, Data curation, Conceptualization. **Asrul Akmal Shafie:** Conceptualization, Formal analysis, Methodology, Project administration, Supervision, Validation, Visualization, Writing – review & editing. **Ahmed Awaisu:** Conceptualization, Data curation, Formal analysis, Funding acquisition, Investigation, Methodology, Project administration, Software, Supervision, Validation, Visualization, Writing – review & editing. **Rabia Hussain:** Data curation, Methodology, Supervision, Visualization, Writing – original draft. **Moza Al Hail:** Conceptualization, Funding acquisition, Project administration, Supervision, Visualization. **Walid Mohammed ElMotasim:** Data curation, Investigation, Project administration, Validation, Visualization. **Mohamed Yousif Mohamed Ali Taha:** Data curation, Investigation, Project administration, Validation, Visualization, Writing – original draft. **Einas Abdoun:** Data curation, Investigation, Project administration, Visualization. **Noriya Mohd J. Al-Khuzaei:** Data curation, Funding acquisition, Investigation, Methodology, Project administration, Visualization. **Gamila Salama:** Data curation, Investigation, Project administration, Validation, Visualization. **Abdulrouf Pallivalapila:** Conceptualization, Data curation, Formal analysis, Funding acquisition, Investigation, Project administration, Visualization, Writing – review & editing. **Wessam El Kassem:** Data curation, Investigation, Project administration, Validation. **Binny Thomas:** Data curation, Formal analysis, Investigation, Validation.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

The datasets generated during the current study are available in the supplemental material.

Acknowledgments

The authors wish to thank all the study participants and researchers. The authors would like to thank late Prof. Dr. Mohamed Azmi Ahmad Hassali, School of Pharmaceutical Sciences, Universiti Sain Malaysia, for his professional supervision and contributions to many of our studies.

References

1.. Attacks on health care in the context of COVID-19. Accessed: Aug. 05, 2024. [Online]. Available https://www.who.int/news-room/feature-stories/detail/attacks-on-health-care-in-the-context-of-covid-19; 2024.
2.. COVID-19 significantly impacts health services for noncommunicable diseases. Accessed: Aug. 05, 2024. [Online]. Available https://www.who.int/news/item/01-06-2020-covid-19-significantly-impacts-health-services-for-noncommunicable-diseases.
3. Cho H, Li P, Ngien A, Tan MG, Chen A, Nekmat E. The bright and dark sides of social media use during COVID-19 lockdown: contrasting social media effects through social liability vs. social support. *Comput Hum Behav*. 2023;146, 107795. https://doi.org/10.1016/j.chb.2023.107795.
4.. Han J, He S, Lichtfouse E. Waves of pharmaceutical waste. *Environ Chem Lett*. 2023;21(3):1251–1255. https://doi.org/10.1007/s10311-022-01491-0.
5. Safarah FO, Priyandani Y, Athiyah U, Rahem A, Sukorini AI, Hermansyah A. The impact of COVID-19 on the management of medicines at a public health Centre: a showcase of pharmacist resilience. *Pharm Educ*. 2023;23. https://doi.org/10.46542/pe.2023.232.223226. no. 2, Art. no. 2, May.
6. Eccles R, Boivin G, Cowling BJ, Pavia A, Selvarangan R. Treatment of COVID-19 symptoms with over the counter (OTC) medicines used for treatment of common cold and flu. *Clin Infect Pract*. 2023;19, 100230. https://doi.org/10.1016/j.clinpr.2023.100230.
7.. Castensson S, Ekedahl A. Pharmaceutical Waste: The Patient Role. In: Kümmerer K, Hempel M, eds. *Green and Sustainable Pharmacy*. Berlin, Heidelberg: Springer; 2010:179–200. https://doi.org/10.1007/978-3-642-05199-9_12.
8. Boyle M, Ting A, Cury DB, Nanda K, Cheifetz AS, Moss A. Adherence to rectal Mesalamine in patients with ulcerative colitis. *Inflamm Bowel Dis*. 2015;21(12):2873–2878. https://doi.org/10.1097/MIB.0000000000000562.
9. Carballo-Diéguez A, Dolezal C, Bauermeister JA, O'Brien B, Ventuneac A, Mayer K. Preference for gel over suppository as delivery vehicle for a rectal microbicide: results of a randomized, crossover acceptability trial among men who have sex with men. *Sex Transm Infect*. 2008;84(6):483–487. https://doi.org/10.1136/sti.2008.030478.
10.. Osterberg L, Blaschke T. Adherence to medication. *N Engl J Med*. 2005;353(5):487–497. https://doi.org/10.1056/NEJMra050100.
11. Col N, Fanale JE, Kronholm P. The role of medication noncompliance and adverse drug reactions in hospitalizations of the elderly. *Arch Intern Med*. 1990;150(4):841–845.
12.. Di Novi C, Leporatti L, Levaggi R, Montefiori M. Adherence during COVID-19: the role of aging and socio-economics status in shaping drug utilization. *J Econ Behav Organ*. 2022;204:1–14. https://doi.org/10.1016/j.jebo.2022.10.012.
13. Alnahas F, Yeboah P, Fliedel L, Abdin AY, Alhareth K. Expired Medication: Societal, Regulatory and Ethical Aspects of a Wasted Opportunity. *International Journal of Environmental Research And Public Health*. Jan. 2020;17(3). https://doi.org/10.3390/ijerph17030787 [doi: E787 [pii].
14.. Trueman P, Taylor D, Lowson K, Bligh A, Meszaros A. Evaluation of the scale, causes and costs of waste medicines. Report of DH funded national project, [Online]. Available: http://discovery.ucl.ac.uk/1350234/1/Evaluation_of_NHS_Medicines_Waste_web_publication_version.pdf; 2010.
15. Spurling GK, et al. Information from pharmaceutical companies and the quality, quantity, and cost of Physicians' prescribing: a systematic review. *PLoS Med*. 2010;7(10), e1000352. https://doi.org/10.1371/journal.pmed.1000352.
16. Abel GA, Penson RT, Joffe S, Schapira L, Chabner BA, Lynch TJ. Direct-to-consumer advertising in oncology. *Oncologist*. 2006;11(2):217–226. https://doi.org/10.1634/theoncologist.11-2-217.
17. Morris AW, Gadson SL, Burroughs V. For the good of the patient,' survey of the physicians of the National Medical Association regarding perceptions of DTC advertising, Part II, 2006. *J Natl Med Assoc*. 2007;99(3):287–293.
18. Ventola CL. Direct-to-consumer pharmaceutical advertising. *P T*. 2011;36(10):669–684.
19.. Mikhael E. Evaluation of the ethical issues for the direct to consumer advertisement in Arabic satellite channels. *Global Research Analysis*. 2013;2.
20.. S. Manocha *et al.*, "Current Disposal Practices of Unused and Expired Medicines Among General Public in Delhi and National Capital Region, India," Curr Drug Saf, vol. 15, no. 1, pp. 13–19, doi: https://doi.org/10.2174/1574886314666191008095344.
21.. FDA stresses critical importance of safe disposal of medications ahead of National Prescription Drug Take Back day | FDA. Accessed: Aug. 06. [Online]. Available: https://www.fda.gov/news-events/fda-voices/fda-stresses-critical-importance-safe-disposal-medications-ahead-national-prescription-drug-take; 2024.
22. Rahman MM, Umar S, Awad Almarri S. Healthcare provisions for migrant Workers in Qatar. *Health Soc Care Community*. 2023;2023(1):6623948. https://doi.org/10.1155/2023/6623948.
23.. The healthcare system in Qatar, Expatica Qatar Accessed: Aug. 21 [Online]. Available: https://www.expatica.com/qa/healthcare/healthcare-basics/the-healthcare-system-in-qatar-71485/; 2024.
24. Hendaus MA, et al. Medication take-back programs in Qatar: parental perceptions. *J Family Med Prim Care*. 2021;10(7):2697–2702. https://doi.org/10.4103/jfmpc.jfmpc_1141_20.
25. AlAhmad YM, et al. The effect of telemedicine on patients' compliance in family medicine follow-ups in Qatar. *Avicenna*. 2022;2022(1):3. https://doi.org/10.5339/avi.2022.3.
26.. Determining sample size for qualitative research: what is the magical number? | InterQ research. Accessed: Aug. 20. [Online]. Available: https://interq-research.com/determining-sample-size-for-qualitative-research-what-is-the-magical-number/; 2024.
27.. Mason M. Sample Size and Saturation in PhD Studies Using Qualitative Interviews. *Forum Qualitative Sozialforschung / Forum: Qualitative Soc Res*. 2010;11, no. 3, Art. no. 3. https://doi.org/10.17169/fqs-11.3.1428.
28.. Braun V, Clarke V. Using thematic analysis in psychology. *Qual Res Psychol*. 2006;3(2):77–101. https://doi.org/10.1191/1478088706qp063oa.
29. Holm-Hadulla RM, Wendler H, Baracsi G, Storck T, Möltner A, Herpertz SC. Depression and social isolation during the COVID-19 pandemic in a student population: the effects of establishing and relaxing social restrictions. *Front Psych*. 2023;14:1200643. https://doi.org/10.3389/fpsyt.2023.1200643.
30.. Al-Azzawi S, Masheta D. Impact of the COVID-19 pandemic on dispensing medicines in the community pharmacy. *JRS*. 2023;34(4):295–311. https://doi.org/10.3233/JRS-220061.
31.. Yang Y. Use of herbal drugs to treat COVID-19 should be with caution. *Lancet*. 2020;395(10238):1689–1690. https://doi.org/10.1016/S0140-6736(20)31143-0.
32.. Austvoll-Dahlgren A, et al. Pharmaceutical policies: effects of cap and co-payment on rational drug use. *Cochrane Database Syst Rev*. 2008;1:CD007017. https://doi.org/10.1002/14651858.CD007017.
33.. Auton F. Opinion: the case for advertising pharmaceuticals direct to consumers. *Future Med Chem*. 2009;1(4):587–592. https://doi.org/10.4155/fmc.09.58.
34. Jeragh-Alhaddad FB, Waheedi M, Barber ND, Brock TP. Barriers to medication taking among Kuwaiti patients with type 2 diabetes: a qualitative study. *Patient Prefer Adherence*. 2015;9:1491–1503. https://doi.org/10.2147/PPA.S86719.
35.. Al-Saffar N, Deshmukh A, Carter P, Adib S. Effect of information leaflets and counselling on antidepressant adherence: open randomised controlled trial in a psychiatric hospital in Kuwait. *Int J Pharm Pract*. 2005;13:123–132. https://doi.org/10.1211/0022357056181.
36.. Michael I, Ogbonna B, Sunday N, Anetoh M, Matthew O. Assessment of disposal practices of expired and unused medications among community pharmacies in

Anambra State southeast Nigeria: A mixed study design. *Journal of Pharmaceutical Policy and Practice*. Apr. 2019;12(1). https://doi.org/10.1186/s40545-019-0174-1.
37. Mohammed MA, Moles RJ, Chen TF. Medication-related burden and patients' lived experience with medicine: a systematic review and metasynthesis of qualitative studies. *BMJ Open*. 2016;6(2), e010035. https://doi.org/10.1136/bmjopen-2015-010035.
38.. S. Geneva, "WHO Guide lines on Safety Monitoring of Herbal Medicines in Pharmacovigilance Systems.[Google Scholar]," 2004.
39. Onyeaghala AA, Anyiam AF, Husaini DC, Onyeaghala EO, Obi E. Herbal supplements as treatment options for COVID-19: a call for clinical development of herbal supplements for emerging and re-emerging viral threats in sub-Saharan Africa. *Sci Afr*. 2023;20, e01627. https://doi.org/10.1016/j.sciaf.2023.e01627.
40.. Lev E, Amar Z. Ethnopharmacological survey of traditional drugs sold in the kingdom of Jordan. *J Ethnopharmacol*. 2002;82(2–3):131–145. https://doi.org/10.1016/s0378-8741(02)00182-4.
41.. Dolovich L, Nair K, Sellors C, Lohfeld L, Lee A, Levine M. Do patients' expectations influence their use of medications? Qualitative study. *Can Fam Physician*. 2008;54(3):384–393.
42.. Cameron K. Medication safety in the home: the need for pharmacist involvement. *Canadian Pharmacists Journal/Revue des Pharmaciens du Canada*. 2007;140(1):47–49.
43.. Al Qasem A, Smith F, Clifford S. Adherence to medication among chronic patients in middle eastern countries: review of studies. *EMHJ-Eastern Mediterranean Health Journal*. 2011;17(4):356–363.
44. Lam CL, Catarivas MG, Lauder IJ. A pill for every ill? *Fam Pract*. 1995;12(2):171–175. https://doi.org/10.1093/fampra/12.2.171.
45. Abdo-Rabbo A, Al-Ansari M, Gunn BC, Suleiman BJ. The use of medicines in oman: public knowledge, attitudes and practices. *Sultan Qaboos Univ Med J*. 2009;9(2):124–131.
46. El Hajj MS, Salem S, Mansoor H. Public's attitudes towards community pharmacy in Qatar: a pilot study. *Patient Prefer Adherence*. 2011. https://doi.org/10.2147/PPA.S22117.
47.. Fox N, Ward K. Global consumption and the challenge to pharmaceutical governance in the United Kingdom. *BMJ*. 2005;331(7507):40–42.
48.. Torjesen I. Costs of some drugs will be displayed on packs to try to reduce waste and improve adherence. *BMJ*. 2015;351, h3637. https://doi.org/10.1136/bmj.h3637.
49. Zand AD, Heir AV. Emanating challenges in urban and healthcare waste management in Isfahan, Iran after the outbreak of COVID-19. *Environ Technol*. 2021;42(2):329–336. https://doi.org/10.1080/09593330.2020.1866082.
50.. Abahussain E, Waheedi M, Koshy S. Practice, awareness and opinion of pharmacists toward disposal of unwanted medications in Kuwait. *Saudi Pharmaceutical Journal*. 2012;20(3):195–201. https://doi.org/10.1016/j.jsps.2012.04.001.
51.. Persson M, Sabelström E, Gunnarsson B. Handling of unused prescription drugs — knowledge, behaviour and attitude among Swedish people. *Environ Int*. 2009;35(5):771–774. https://doi.org/10.1016/j.envint.2008.10.002.
52. Tanner C, Kast SW. Promoting sustainable consumption: determinants of green purchases by Swiss consumers. *Psychol Mark*. 2003;20(10):883–902. https://doi.org/10.1002/mar.10101.
53.. Saunders M, Lewis P, Thornhill A. *Research Methods for Business Students*. Pearson education; 2009.
54. Garey KW, Johle ML, Behrman K, Neuhauser MM. Economic consequences of unused medications in Houston, Texas. *Ann Pharmacother*. 2004;38(7–8):1165–1168. https://doi.org/10.1345/aph.1D619.
55. Sim SM, Lai PSM, Tan KM, Lee HG, Sulaiman CZ. Development and validation of the return and disposal of unused medications questionnaire (ReDiUM) in Malaysia. *Asia Pac J Public Health*. 2018;30(8):737–749. https://doi.org/10.1177/1010539518811161.
56. Abruquah AA, Drewry JA, Ampratwum FT. *What happens to unused, expired and unwanted medications? A survey of a community-based medication disposal practices*. 2014:11.
57.. Alhamad H. *Sustainability and Medicines Waste: Investigating Public Attitudes towards the Reuse of Medicines Returned to Community Pharmacies*. phd. University of Reading; 2018. Accessed: Feb. 10, 2021. [Online]. Available http://centaur.reading.ac.uk/79994/.
58.. *SIRUM – saving medicine : saving lives*; 2024. Accessed: Sep. 06, 2021. [Online]. Available https://www.sirum.org/.
59. Bekker C, Bemt BVD, Egberts TCG, Bouvy M, Gardarsdottir H. Willingness of patients to use unused medication returned to the pharmacy by another patient: a cross-sectional survey. *BMJ Open*. 2019;9, no. 5, Art. no. 5. https://doi.org/10.1136/bmjopen-2018-024767.
60.. The effect of quality indicators on beliefs about medicines reuse: an experimental study - PubMed. Accessed: Aug 01, 2024. [Online]. Available https://pubmed.ncbi.nlm.nih.gov/34449720/; 2024.
61.. S. Vielma Delano, "An economic assessment of household unwanted medicine disposal programs,"2024 Open Access Theses, Jan. 2016, [Online]. Available: https://docs.lib.purdue.edu/open_access_theses/1136.
62. Atreja A, Bellam N, Levy SR. Strategies to enhance patient adherence: making it Simple. *MedGenMed*. 2005;7(1):4.