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Original article

Impact of COVID-19 pandemic on medicine supply chain for patients with chronic diseases: Experiences of the community pharmacists



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ABSTRACT

Problem considered: Coronavirus disease(COVID-19) outbreak towards the end of December 2019 in China, soon it started spreading rapidly to various countries leading to an outbreak of pandemic. Due to the restrictions imposed to control the spread of the infection, globally the manufacturing, import and export of medicine and the healthcare services to patients with chronic illness had been affected. This study aimed to explore the perspectives of the pharmacists on the medicine supply chain for patients with chronic diseases during COVID-19 pandemic in India.

Methods: This study is a prospective, qualitative research involving telephonic, semi-structured in-depth interviews. An interview guide for pharmacists was prepared and validated using "Interview Protocol Refinement" method. Purposive sampling method was used to recruit the pharmacists; a telephonic oral consent was obtained. The interview session was audio recorded and the recordings were transcribed verbatim. Further, transcripts were validated and later analysed using NVivo software.

Results: A total of 8 participants were interviewed during our study. Thematic analysis of the transcripts resulted in seven main themes. The study showed that there was deficiency in medicine supply during the COVID-19 pandemic and the pharmacists faced several challenges in procuring and storing the medication, arranging for unavailable medicines, medication dispensing and provision of the services such as medicine delivery, patient counselling. There was also scarcity of manpower leading to extra workload and working overtime.

Conclusion: Uninterrupted supply of essential medicine is the backbone of health care system. An effective plan and appropriate strategies are vital to combat such future emergencies.

1. Introduction

Coronavirus disease outbreak has globally challenged the healthcare system and it drastically affected the low-income countries. Various qualitative studies conducted during the COVID-19 period have shown that the pharmacists reported that COVID-19 has a deleterious impact on medicine supply.^[1-4] To minimize the risk of importation of virus from high transmission areas, national and overseas travel were suspended, screening was enhanced.^[5] Due to these restrictions, globally the manufacturing, import and export of medicine has been affected. It has also deranged the healthcare services to patients with chronic illness.^[6,7] The leading causes of COVID-19 mortality are chronic and

non-communicable diseases conditions such as diabetes, hypertension, cardiac, and renal disorders. Chronic diseases account for a number of COVID-19 deaths and should receive more focus in the midst of a pandemic.^[8] A face to face interview conducted with pharmacists, physicians and nurses in a hospital in Jordan reported that there was shortage of staff and supplies, stress due to work, fear of COVID-19 among the health care professionals.^[2] A semi-structured interview conducted among pharmacists in 16 European countries revealed that community pharmacies experienced shortage in manpower and medication supply during the COVID-19 period.^[3] Another study to understand the obstacles in accessing healthcare services for non-COVID diseases before and after COVID-19 in Bangladesh, Kenya, Nigeria and

Abbreviations: COVID-19, Coronavirus Disease; WHO, World Health Organisation; PIS, Participant Information Sheet; IC, Informed Consent; HCQ, Hydroxychloroquine; OTC, Over-The-Counter; ADR, Adverse drug reaction.

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Pakistan observed a reduction in access to healthcare services during COVID-19 period.^[4]

The community pharmacists are the first line of contact for the patients exposed to medicine supply chain issues during the pandemic in India. Hence a methodological approach for reducing shortage of essential medicines is crucial in order to minimize adverse effects on health care. There is lack of literature on impact of Covid-19 on medicine chain supply from Indian studies.

This study provides an insight that with proper training, pharmacists can influence the healthcare system in a better manner during the pandemic especially in India where there is limited role for pharmacists. The findings of this study will help in developing robust protocols to ensure uninterrupted supply of medicine, while preserving care for patients with chronic diseases during such future pandemics and other calamities.

The objective of this study was to understand the barriers and perspectives of the pharmacists, with respect to medicine supply chain for patients with chronic diseases during COVID-19 pandemic by using the interview guide adapting Interview Protocol Refinement (IPR) framework.

2. Methods

2.1. Ethical approval

The study was approved by the Institution Ethics Committee. An oral telephonic informed consent (IC) was taken from the participants prior to the initiation of the interview.

2.2. Study design and participants

We conducted a qualitative phenomenological study through telephonic interview to understand the pharmacists' needs, expectations, barriers and other relevant experiences in order to learn the various effects of COVID-19 on the medicine supply. The pharmacists were recruited through purposive sampling method. Registered pharmacists having D Pharm or B Pharm degree were eligible to participate in the study. Those pharmacists who were not willing to participate and other non-qualified staffs working in the pharmacy were excluded. An email containing participant information sheet (PIS) and questionnaire was shared before scheduling the interview. The pharmacists were contacted telephonically to explain the purpose of the interview and to obtain an oral IC prior to the interview.

2.3. Development and validation of the interview guide

An expert panel consisting of a pharmacist and an academician along with the literature review contributed to the development of the interview guide. Using the "Interview Protocol Refinement"^[9] process, the interview guide was validated [Appendix A]. The final interview guide consisted of questions on demographics, concerns with the storage and shortage of the medicines, managing the staffing situations, fear of catching COVID-19 among the pharmacy staffs and coping with it, barriers in provision of services to the patients and impact of the pandemic on the sales and profit (Appendix B).

2.4. Data collection

The interview was conducted by a primary student researcher who was pursuing her Masters in Clinical Pharmacy. She has undergone training under qualitative experts. One-on-one telephonic interview was conducted in a private room of the department as per the convenience of the participants. The interviews were stopped upon data saturation and no follow-up interviews were conducted. The telephonic interview session was recorded and transferred into a password protected laptop. The recorded audios were transcribed verbatim in English. Validation of the

transcripts was carried out using 3 pass-per-tape methodology and also proofreading of the transcripts was done by two of the research team members by randomly selecting the transcripts. Transcripts were not returned for participants for validation.

2.5. Data analysis

Two of the authors re-read the transcripts while listening to the recordings. The themes were discussed by the research team members to establish relevance and reliability. The field notes taken during the interviews were reviewed along with the recordings. Two members of the research team agreed on coding framework to create the main themes. Codes were refined and organized into emerging themes and sub-themes. NVivo software was used to manage the data.

The flowchart of the interview process is provided in Fig. 1.

The study is reported in accordance with the Consolidated criteria for Reporting Qualitative research (COREQ) checklist [Appendix C].^[10]

3. Results

Among the 12 pharmacists, 8 were included in the study and 4 did not turn up. The characteristics of the study participants is as shown in Table 1. The interviews lasted between 22 and 40 min.

Upon analysis of the telephonic interviews, 7 main themes namely challenges in the work environment, medicine supply management, medication dispensing, barriers to provision of services, arranging for unavailable medicines, adverse drug reaction (ADR) management, and pharmacists inputs on the various challenges, containing sub-themes emerged as given in Fig. 2. Themes and sub-themes along with the supporting quotes from the participants are provided in Table 2.

3.1. Theme 1: Challenges in the work environment

Pharmacists faced several challenges in the workplace during the pandemic period. Being healthcare professionals, pharmacists could freely travel with proper identity cards issued by the government. Some of the pharmacists had their own vehicle so it was easier for them to commute, whereas their employee's faced difficulty in travelling as they lived far away and there was no transportation available for commute.

The working hours of the pharmacies were different from the usual during the period of lockdown, as there were strict regulations and restriction implemented. The pharmacies were either open for 12 h or only for half a day.

Dealing with the pandemic situation was challenging to the pharmacists, as they were coming in contact with several customers. The pharmacies adapted proper precautionary measures like maintaining

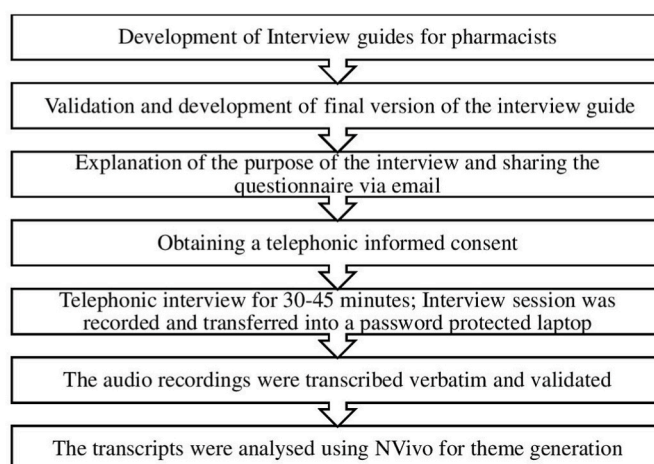


Fig. 1. Flowchart of interview process.

Table 1
Characteristics of the pharmacists.

PARTICIPANT	AGE IN YEARS	GENDER	QUALIFICATION	NUMBER OF YEARS OF EXPERIENCE
Pharmacist 1	51	Male	B Pharm	28
Pharmacist 2	46	Male	B Pharm	10
Pharmacist 3	40	Male	D Pharm	20
Pharmacist 4	49	Male	B Pharm	14
Pharmacist 5	57	Male	D Pharm	35
Pharmacist 6	25	Female	Pharm D	1
Pharmacist 7	43	Male	D Pharm	21
Pharmacist 8	26	Female	M Pharm	1.5

social distancing, wearing mask, frequent usage of sanitizer for maintaining hand hygiene, creating awareness among the public about COVID-19 and the various precautions to be taken in order to prevent the transmission of the infection.

Managing the staffing situation was very challenging. As some of the staffs lived far away, they were unable to travel due to the unavailability of transportation facilities. In the event of such scenario, they managed with the existing manpower in the pharmacy and sometimes they had to work overtime. But as the number of customers visiting the pharmacy was less, they were somehow able to manage with the remaining workforce.

The pharmacists felt that sales were unaffected during the COVID-19 lockdown period, however their profit margin shrank, as the expenses in

procuring medications and delivering the medications to home had increased. Due to the various restrictions, they also lost some of their customers as older people were not coming out, there were no follow up patients coming to the hospital, people coming from far places discontinued and used to buy medicines next to their homes.

In this crucial period of COVID-19, the pharmacists overcame the various issues in the work environment by adapting a systematic approach towards work. Different procedures were in place for carrying out their day-to-day activities which helped them to overcome various difficulties and to ensure they did not catch the infection. It was seen that initially the public were not adhering to the rules like wearing mask and following social distancing and often got into arguments with the pharmacists but later they became more disciplined and obeyed the rules.

3.2. Theme 2: Medicine supply management

The participants observed that during the pandemic period there was deficiency in medication supply and had hard time procuring these medications. It was also observed that patients were in a panic mode and were stockpiling the medications. Pharmacists were the most accessible and easily approachable medical staffs for the patients, as they were facing lots of trouble to seek medical attention for non-emergency complaints.

Pharmacists reported that they faced shortage of medications which were used for chronic illness like diabetes, hypertension, HIV and

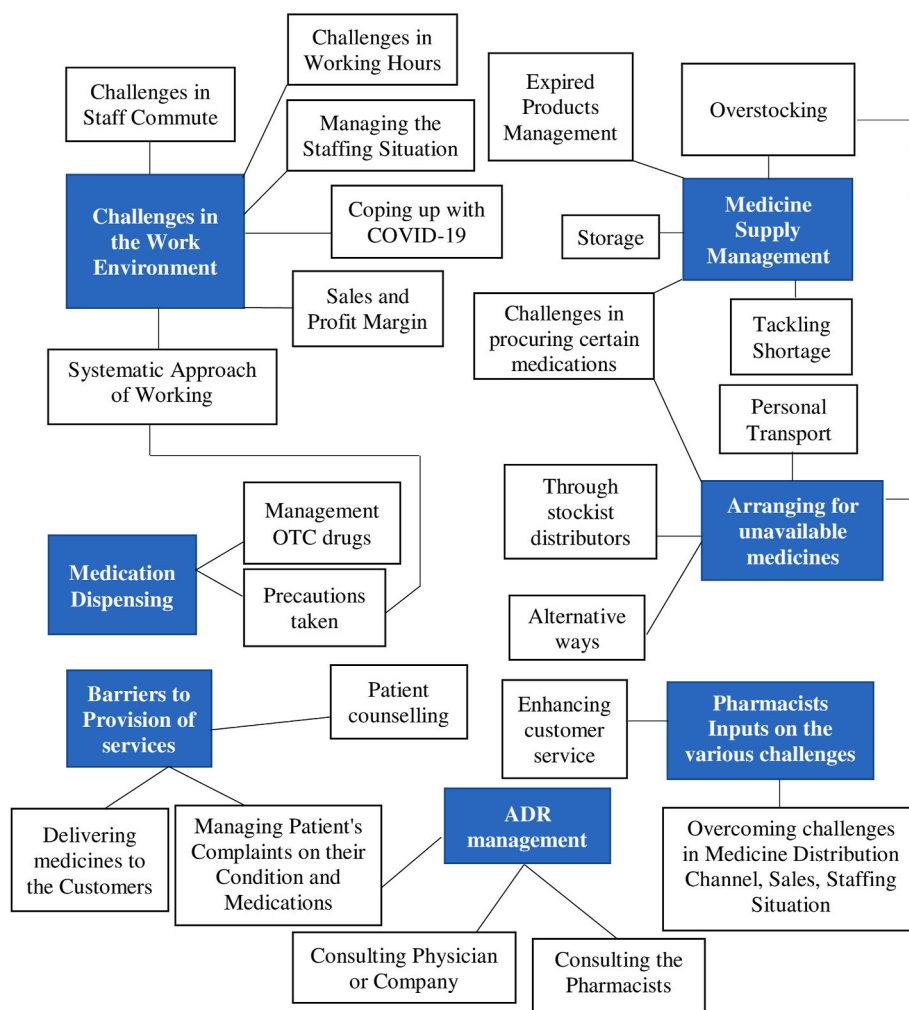


Fig. 2. Flowchart of themes and sub-themes.

Table 2

Themes, Sub-themes and Verbatim quotes Themes and sub-themes are summarized below along with the supporting quotes from the participants which have been coded as a Pharmacist (P), Male (M) followed by two numbers that indicate their age.

Themes	Subthemes	Verbatim Quotes
Challenges in the Work Environment	Challenges in staff commute	“Commute through my car every day, I didn’t have a problem as such to travel. My employees faced a little bit of trouble because they don’t live here staffing situation was another issue because they were living a little far, further away. There was no bus, not all my employees have their own vehicle right so used to commute through bus also, so on certain days ah there was no transport for them. They couldn’t come over.” PM40
	Challenges in working hours	“We were actually 24 h but once COVID started we reduced to up to 11 o’clock night. We reduced the timing also. 11 p.m. we were closing.” PM49
	Managing the staffing situation	“We were able to manage since we were only open for half a day, plus we didn’t have a lot of walk-ins during lockdown so it wasn’t an issue as such. Yeah but even then on certain days it was difficult because we had to look at all our products and expiry had to be removed and all that.” PM40 “Yeah some of our staff were sick so we felt and some peoples were resigning so we felt like shortage of peoples but we managed with only 1 outlet was open so it was easy to manage with that with current staff.” PF25
	Coping up with Covid 19	“We locked the entrance as such otherwise you can just walk into my store and there is a counter, but during lockdown we locked the entrance, we had a table put in at the entrance itself, with a sanitizer. I also put out a notice which is still attached in front of my shop, to enter the shop only with a mask or with your face covered, and we ourselves had masks on and sanitizers. After every dispensing then we would sanitize our hands. We did tell them to get a masks otherwise not approach the counter at all. Sometimes we handed out mask to them, so that was only way to do it.” PM40 “yeah like I told you like we used, both consumer and the pharmacist was supposed to wear mask and gloves and all this stuff and we had social distancing and we could, we wrote all the dosage information on the cover and tried to explain them, like that.” PF26
Sales and profit margin	“Profit margin surely it has affected because the expense	

Table 2 (continued)

Themes	Subthemes	Verbatim Quotes
Medicine Supply management	Systematic approach of working	gone up since we had to give a home delivery and we had to give excess stocks all those things. But sales wise nothing has happened because the patients required it is there medicine is there. They unnecessarily will not take the medicine. Only thing is the some 10–20% locally they started buying.” PM46 “Like nothing has changed actually. No not much different. Only thing is it has been very systematic work now more than earlier. Earlier they should be randomly move around and bill it give it them. There was a crowd all 4, 5 together for me for me give prescription all those things. Now nothing they will all be in a queue. They have they know if they not maintained distance we will not give medicine. So they will be very systematic now approach. And very clean they also know, remove the medicine from the strip we will not take back. They made clear instructions and all those things. It is like a more systematic now.” PM46
	Challenges in procuring certain medications	“HIV drugs were hard to find, products like Tenofovir, Lamivudine, oncology medicines. HCQ yeah that was an issue. So a lot of patients were prescribed those medicine for pre lockdown pre COVID. For them it was a big issue because they were not handed out those medicines, in spite of us having the stock we were not allowed to give it out to them. Because they didn’t have a prescription since they couldn’t visit the doctor and in spite of having a prescription say about 3, 4 months before that which was a continuous drug for them. But I think they didn’t find it anywhere that was a big problem at that time.” PM40
	Expired products management	“Expired products, yes we (chuckles) personally had to go and give it back. Right now we have people coming from distributors who used to pick it up. On a daily basis they come here and if there’s any expiry they take it back. During lockdown we had to personally go to the distributors place and give it back to them, it wouldn’t go immediately it would take a couple of weeks. We were able to store it here that wasn’t an issue. We had separate box for it. We used to store it in that with the names of the company and the distributors. unlike now where we give it out, hand it out everyday or every other day,

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Table 2 (continued)

Themes	Subthemes	Verbatim Quotes
Medication Dispensing	Overstocking	that time yes only once in 15 days or probably once a month we were giving it out." PM40 "It was little challenging as the distributors were not coming and collecting. I had to go and give it. So it was little problematic." PM43 Chronic medications also because they want to because sometimes depending on their budget also they were buying the weekly or once in 15 days. But during COVID, they were purchasing, for 1 month, 2 months particularly diabetic and ah antihypertensive medicines. Then some ayurvedic medicines which boosts immunity those things they were buying and keeping excess at their home." PM49 "They were like most of the patients they came for like, like usually patients they buy for 1 month or 2 months but then some of the patients came for more than like they came to purchase the medicines for 3 or 4." PF26
	Storage	"Storage problem there was no any problem as such, only see ah we run with the AC here. Temperature is concern but for some days our authorities didn't allow to put AC. But otherwise there is no any problem of storage." PM49
	Tackling Shortage	"Whenever it was not available we were hmm talking to doctors, that such and such medicines not available and alternative medicines they were telling and it was available. So we substituted the medicines." PM49 "Our Drug control department there were some norms like dispensing of febrifuge drugs like paracetamol and pain killers, we used to report to the government with a app. They have provided app bearing the doctors name and prescribers name and address and telephone numbers of the patient and we used to do that every day. We used to educate the medicine ah the patients to get the prescriptions from the doctors." PM57
	Management of OTC Drugs	"Usual procedure, we used to keep distance follow the norms. One is keeping distance and using sanitizers, mask and all precautionary requirements." PM57
Barriers to provision of services	Delivering medicines to the customer	"Delivery department, from pandemic periods they gave special permission to deliver the drugs home means their home. So, we used to take that advantage. They, they used to call our telephone and we used to give delivery to their home,

Table 2 (continued)

Themes	Subthemes	Verbatim Quotes
Arranging for unavailable medicines	Managing patients complaints based on their condition and medications	prescription we used to demand at home." PM57 "We were telling them to go to doctors. Initially everything was confused you know. Slowly system, uh came to streamline. In front of our pharmacy they put a fever clinic. Doctor sitting outside only, so we are directing them to go there. So immediately they will check them. No need to go to inside the hospital, outside only they put a camp. Yeah we are directing them to the doctors." PM49
	Patient counselling	"During that time actually we were not talking much actually, one or two words only. Much counselling we were not doing yeah. And even patients also hesitant, they were not waiting much time like as fast as they are getting the medicine and they are going out. So there was no much counselling."PM49 "We used to substitute some of the brands by the consent of the doctors and we could manage it." PM57
	Alternate ways	"During lockdown as buses were not there, uh yeah our own vehicle with special permission we got a permission from the authority to transport the medicine, on that van we were supplying the medicine." PM49
	Personal transport	"With my personal vehicle I used. In the afternoon during lockdown the shop was closed, in the evening we used to get from the distributor and open the shop." PM43 "We used to call up the stockist here local and outside and, there was no such serious shortage" PM57
ADR management	Through stockist distributors	"Frankly speaking ah no patients were reporting that to us that they having adverse reaction, very rare case. Sometimes they may be going back to the doctor regarding same problem. But rarely they come to us." PM49 "If it's a new case we will directly talk to the company persons this is a problem is facing and you give a solution." PM46
Pharmacists inputs on the	Consulting Physician or Company	Yeah we have a 24 h phone call service, We ask them to remember every time either they have to store in a phone or they have to keep the prescription. And they immediately they should call. Any side effects any adverse effects they will immediately stop the medicine we see if it's a known side effect we change the medicine." PM46
	Consulting the Pharmacists	"It has to be in particular for medicine different medical

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Table 2 (continued)

Themes	Subthemes	Verbatim Quotes
various challenges	channel, sales, staffing situation	distribution channel has to be there. Right now what there is, it is distributor choice he put it in a bus and ask them to collect you, he put it in a auto rickshaw and he will deliver it. It is a medicine actually and he doesn't know the logic of cold chambers. that has to be done by district authority and nobody is bothered because person who know the medicine doesn't deal."PM46
	Enhancing customer service	"Customers were worried so much, and they are coming in a stressed manner, because they are under medications or some chronic illness, so we have to keep our self patient enough to talk to them and suggest some good examples regarding ah their illness or may be regarding COVID also. We give confidence to them definitely they will come to us. We should not show in front of them that show our panic to them"PM49

oncology drugs. Among the other drugs, HCQ was one of the drugs with great demand due to its prophylaxis use in the COVID-19. A lot of patients prescribed with the medications for their chronic diseases faced issues in obtaining their medications as they could not visit their doctor and did not have prescriptions to buy the medicines. Distributor channels were also blocked due to lack of transport facilities. Pharmacists handled the medication shortage issue by either overstocking the medications, substituting the brands by consulting the doctors or by arranging for medications from the stockists.

Expired products were usually collected by the stockists and returned to the manufacturers during the pre-COVID time. During the lockdown as there was lack on transportation, some of the pharmacists reported that they had to personally return the expired medicines to the stockists when they went to pick up the fresh stocks. However, other pharmacists reported that as they were procuring medications from the local vendors it wasn't difficult for them to return the expired products. They also stated that frequency of liquidating expired products was lesser as compared to pre-COVID times.

The respondents reported that the patients were panic buying during the onset of lockdown. Especially the elderly population was very much worried as they had no one to assist them. They feared medications going out of stock and also catching COVID-19. Pharmacists reported most of the elderly patients depending on their financial conditions were refilling their prescription especially diabetic and hypertensive medications for up to 3 months at a time if their children were staying away from them. The pharmacists also stated that during the 1st week of lockdown most of the patients were trying to stock the over-the-counter (OTC) medications like antihistamines, antipyretics and some immune booster preparations. Whereas in contrast some pharmacists also told that patients were not overstocking due to poor economic burden. It was challenging for pharmacists as some of them told that they would not give a single tablet more than mentioned in the prescription for narcotics and sedatives due to the risk of suicidal attempt.

Storage of medications was as such not a problem for most of the pharmacists. However, some reported that since they had to stock more medications especially injectable preparations, they had to make arrangements for extra cold storage. Some of the pharmacists reported that operation of air conditioners (AC) was prohibited by the authority due to the surge in COVID-19 cases.

3.3. Theme 3: Medication dispensing

Dispensing medications was one of the major issues faced by the pharmacists. Pharmacists were ordered by the ministry to dispense OTC medications like antipyretic, analgesic, cold and cough medications only with valid prescriptions. The pharmacists also fed the details of patients and doctor who prescribed these drugs on a daily basis to keep a track of patients in case they develop COVID-19. It was reported by the pharmacist that the patients were very furious and got into disputes when they were denied of OTC medications without valid prescriptions.

As one of the frontline workers, the pharmacists took proper precautions by maintaining hand hygiene after every dispensing and ensured that they came in minimal contact with the patients in order to prevent transmission of the infection.

3.4. Theme 4: Barriers to provision of services

During the COVID-19 pandemic lockdown, some pharmacists faced problems in providing services to the consumers like patient counselling, delivering medications as couriers and speed posts were shut, managing patient's clinical conditions. It was difficult for the patients to visit the pharmacy hence they were placing the orders telephonically. Patients were asked to share their prescriptions either on platforms like whatsapp before the medicines were dispensed or demanded at home. Some patients used to opt for home delivery whereas others used to come and collect it themselves. Patients who were staying in the nearby local areas' medicines were home delivered via a delivery boy which was also difficult as there were stoppages everywhere, whereas for the patients who stayed in faraway places medications were couriered.

In the event of any symptomatic complaints and other medication related issues, patients called up pharmacists telephonically. Some of the pharmacists advised the patients to consult with their doctors or seek medical attention from the nearest hospitals. Other pharmacists intervened only if they had knowledge and experience with respect to the medication related problems.

Some of the pharmacists reported that they faced difficulty in counselling the patients as the patients were impatient and were in hurry to exit the pharmacy as soon as possible. Some of the pharmacists counselled the patients by either providing them a written note in a language that was familiar to them or telephonically.

3.5. Theme 5: Arranging for unavailable medicines

During the pandemic period, certain medications were unavailable. Some of the respondents reported that as they were availing medications from the local stockists, they did not have much difficulties, they used to get in touch with the local stockists for availing the medications that were in shortage. However, others felt it was challenging to procure the medications as there was lack of transportation facility and restrictions on travel.

As there was no transportation facility available, pharmacists reported that they arranged for transportation personally in order to procure the medications from various stockists available locally as well as from other districts after obtaining permission from the authorities in order to ensure uninterrupted supply of medicines. Even though they used their own transports, they faced issues as the vehicles were not allowed to enter due to various restrictions in place.

When a particular medication was unavailable in the pharmacy, the pharmacists generally substituted for an alternative brand of the medication after seeking the physician's permission.

3.6. Theme 6: ADR management

ADR management is very vital during the time of the pandemic as during the pandemic period only emergency services were available. Some of the pharmacist's responded saying that the patients may usually

consult their doctor with regards to ADR and some said if it is not a known side effect, they checked with the manufacturer to get solution.

Some respondents said that they had telephonic service where in the patients consulted with them on their ADRs. The pharmacists advised them to stop the medication and visit the nearest hospital to seek medical attention. Some reported that if it was a known side effect, they changed the medication.

3.7. Theme 7: Pharmacists inputs on the various challenges

COVID-19 lockdown affected the sales, customer service, staffing situation and also pharmacists faced many issues in delivering medicines. The respondents suggested that working confidently and showing up for work, motivated other employees to follow the same and hence staffing situation slowly resolved. In order to enhance sales, respondent suggested that the hospital should get in touch with the patients and once the fear of pandemic reduces the patients may start revisiting the doctors and the pharmacists. Respondent also suggested that a different distribution channel solely for medicine is a vital requirement which can enhance the medicine distribution system.

During the pandemic as everyone is stressed the customers must be handled with care and the pharmacist should boost the customer's confidence which will motivate them to get through the crucial period. Delivering the medicine to home was a very big task and hence participants suggested if there was a local person available for medicine delivery it could bring down the workload and also the courier services ban was hindering timely reach of medications to patients.

4. Discussion and conclusion

Even though social isolation and lockdowns in some locations helped restrict the spread of the virus, patient populations, such as those with chronic illnesses who are unable to access healthcare facilities for their usual care and medications, were impacted by the pandemic. During this COVID-19 pandemic, community pharmacists' assistance in managing medicine chain supply for chronic diseases will be crucial in relieving the burden on already strained healthcare services. In this study, community pharmacists' perspectives regarding the impact of the pandemic on medicine chain supply for chronic diseases is highlighted. Our study revealed that the pharmacists at the community level were taking necessary precautionary measures to cope up with the fear and to control the transmission of COVID-19. This is similar to the findings of qualitative studies conducted by Paudyal et al., and Kasahun et al., in European countries and Ethiopia respectively which reported that pharmacists were educating their customers on COVID-19 and the various precautionary measures to be taken to prevent transmission.^[1,3]

Pharmacists reported decline in their profit margin as a result of less number of customers, increased expense in procuring medication stock and home delivering medications due to the restrictions and lockdown measures. Similarly, a qualitative phenomenological study conducted in Namibia by Tirivangani T et al., also reported decline in the sales of most pharmaceutical items due to the lockdown measures.^[11] Our study disclosed that there was shortage of staffs in the pharmacy due to lack of transportation and fear of covid. This led to increased workload to compensate for the inadequate manpower available. A qualitative semi-structured interview conducted by Dwyer G et al., also revealed that particularly in rural regions, pharmacists may be short-staffed or working alone and unable to fill prescriptions, and provide services for managing chronic diseases including drug therapy review and lifestyle and medication counselling at the same time.^[12]

Shortage in medicine supply especially medications like antidiabetic, anti-hypertensives, HIV drugs, HCQ was one of the major findings in our study. Majority of the pharmacists reported that they substituted the brands with the permission from the doctors while others attempted acquiring the medications from their stockists and other pharmacies. Likewise, other studies conducted in European countries, Ethiopia,

Bangladesh, Kenya, Nigeria and Pakistan have also disclosed deficiency in medicine stock during the crucial periods of COVID-19 pandemic.^[1,3] It was also observed that common patients were overstocking the medications like antihistamines, paracetamol, and immune-boosters especially at the beginning of the lockdown which later due to the regulations were put forth by the health ministry. Studies conducted by Paudyal V et al., in European countries also revealed high demand for such medicines among the public.^[3] It was also observed that the elderly population were overstocking medications like anti-diabetics and anti-hypertensives by refilling for a greater number of months depending upon their financial conditions as they had no assistance and they feared contacting COVID-19.

During the pandemic period, telephonic mode of counselling was widely being used by the pharmacists to provide the information regarding disease and medication related queries. Correspondingly, studies conducted by Ahmed SAKS et al., and Paudyal V et al., showed that online platforms and telephone were becoming popular mediums for counselling the patients.^{3,4}

During the lockdown as there was lack of transportation facilities, the frequency of clearing out of expired products was decreased and it was disposed whenever the pharmacists went to collect fresh stocks. We also found that some of the pharmacists had issues with storage facilities, especially with cold storage. Additional refrigeration facilities were availed for storing the medications. We also found that most of the pharmacists were providing home delivery and courier services for their regular customers and patients who were unable to visit the pharmacies during the lockdown period which benefited many of the customers. A cross-sectional study was conducted by Akour A et al., which targeted the patients with chronic diseases, showed that about half of them utilized home delivery services to get their medications and one third of them relied on phone consultations.^[13]

Preserving the uninterrupted supply of medicines for chronic diseases in low resource settings are necessary during the pandemics to ensure better patient care. Healthcare systems may overlook individuals with chronic illnesses whose management may deteriorate as a result of the pandemic. To reduce the burden of disease on health systems, community pharmacists must play a crucial role in managing chronic conditions while other healthcare workers fight the COVID-19 epidemic on the front lines. This will assist the WHO's call for maintaining essential services to reduce the burden of non-COVID diseases on already overburdened health systems, especially in low and middle-income countries. To our best knowledge, this is the first study conducted in India to understand the impact of pandemic on medicine chain supply for chronic illness at the community level. The findings of this study will aid in developing robust protocols to enhance medicine supply for patients with chronic diseases during such future pandemics and other calamities. If more lives are to be saved both during and after the epidemic, it is critical for policymakers to prioritise investing in health systems ensuring continuous supply of the medicines for chronic diseases.

There are some limitations to our study. As the study participants are from a single location the situation cannot be generalized throughout India, however, impact of the pandemic situation was almost same in most parts of India.

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Author's contributions

Conceptualization: Girish Thunga (GT), Sreedharan Nair (SN); **Data curation:** Manasvini Ramakrishnan (RM), Pooja Gopal Poojari (PP); **Formal analysis:** RM, PP; **Funding acquisition:** None; **Investigation:** RM; **Methodology:** GT, PP, Muhammed Rashid (MR), Viji PC

(VPC), RM; **Project administration:** GT, RM, PP; **Resources:** RM, PP; **Software:** RM, PP; **Supervision:** GT, SN; **Validation:** GT, MR; **Visualization:** RM; **Writing original draft:** RM, PP; **Writing - review & editing:** RM, PP, MR, SN, GT, VPC; **Guarantor:** GT.

Ethics approval

This study was approved by the Institution Ethics Committee (IEC) of Kasturba Medical College and Kasturba Hospital, Manipal (IEC no. 613/2020).

Data availability statement

The data that supports the findings of this study will be available from the corresponding author upon the appropriate request.

Declaration of competing interest

The authors declare no conflicts of interest to disclose.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.cegh.2023.101243>.

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