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Social Determinants Predicting the Community Pharmacists' Workforce Preparedness for, and Response to, the Public Health Emergencies

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Original Research

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Abstract

Objectives: To identify the predicting factors that contribute to preparedness for public health emergencies among community pharmacists in India.
Methods: Multistage cluster sampling was done. The geographic breakdown was done based on villages and areas and used as clusters. A simple random method was done in the first stage to select the villages as clusters. From each selected village, a simple random method was done in the second stage to select the areas. From each selected area, all the community pharmacies were selected. The survey questionnaire had 3 sections with 43 items: (A) demographic information, (B) preparedness, (C) response toward infectious diseases. The participants chose "Yes/No", in sections B and C. A score of 1 was given for "Yes", and a score of zero was given for "No".
Results: Multiple correlation analyses were conducted between participants' preparedness and response (PR) scores and independent variables. The independent variables such as "More than one Pharmacist working in a pharmacy", "Pharmacists who are trained more than once on disaster management", and encountered more than 1 patient with the infectious disease were positively and significantly correlated with the dependent variable (PR scores).
Conclusions: Community pharmacists were aware of the issues they may face in their community concerning public health emergencies. They believed that the medications available in their pharmacy are sufficient to face any emergency. They could identify the clinical manifestations of public health emergency conditions and provide counselling to the customers toward them. Community pharmacists who were trained more than once in disaster management were the strongest predicting factor.

According to the World Health Organisation (WHO) declaration, public health emergency is a public health concern.[1] The threat posed by recent public health conditions like coronavirus disease 2019 (COVID-19) highlights the need to reinforce preparedness throughout the world.[2] The Centers for Disease Control and Prevention (CDC) has described a response plan for locally acquired cases in the continental.[3] The response activities outlined in this plan are based on currently available knowledge about COVID-19 and its transmission, and these activities may change as more is learned about COVID-19.[4] During this muddled pandemic, health-care professionals are endangered.[5,6] Front-line health-care workers are continuing their care toward the surge of infectious disease patients.[7] Community pharmacists can be significant professionals to embark on various types of disaster management, including pandemic situations, such as preparedness, response, recovery, and prevention.[8] Community pharmacists, being the front-liners, have indulged in the early detection of infectious diseases cases, ensuring the medicines supply is stable and appropriate referral.[9] As the scope of community pharmacy professionals is considered significant, it is necessary to assess the ways these professionals may assist in public health emergencies.

Public health emergency situations have rapidly spread to most countries and the trajectory of COVID-19 and its transmissibility, and severity pyramids have led the health system to focus more on the containment of public health conditions.[10,11] The COVID-19 pandemic is yet another reminder to intensify commitment toward global health emergency preparedness.[12] Emergency preparedness encompasses the planning and response to disasters. It can be defined as a reduction in morbidity and mortality from large-scale transmission, and response plans based on public health capacity that include individual health-care facilities.[13,14] Most of the strategies by the world health authorities during this pandemic followed the CDC prevention and precautions of infectious disease transmission.[3] To slow down the global spread of any infectious diseases, every country is hastening to detect the infection early and contain the affected people to minimize the further spread of infectious diseases. However, the ability to limit and prevent the further spread of infectious diseases depends on the application and

execution by health-care professionals and support from the public. Community pharmacists are increasing their working hours to deliver basic services to infectious disease patients.[9,15] Patients with infectious diseases may be asymptomatic,[16] and these asymptomatic carriers may confer a particular risk to pharmacists in community pharmacies.

In India, as community pharmacists are working along with the Ministry of Health (MOH), their preparedness and response (PR) when they encounter infectious disease patients should be ensured. However, their emergency preparedness to handle the situation is unknown; therefore, this study is aimed to assess their preparedness and their response to public health emergency situations. This research seeks to highlight the operational readiness of community pharmacists to support the MOH, and other regulatory bodies to combat infectious diseases. This information could help to make future decisions on community pharmacists' emergency preparedness for public health disaster management.

Methods

Informed Consent and Ethical Approval

This study went through the Independent ethical committee (AIMS/IEC/907/2020). The participants completed a written consent form.

Study Design

This was a cross-sectional study conducted in Mandya district, Karnataka, India. A self-administered questionnaire was used. This study was conducted between June 2020 to Jan 2021. From each community pharmacy, 1 community pharmacist was included in the study.

Sample Size

Raosoft calculator was used to calculate the sample size with a 95% confidence interval and a 5% margin of error. Approximately 761 community pharmacies were there, out of which pharmacists from 256 pharmacies were minimum required. A total of 602 pharmacists in community pharmacies were approached. Pharmacists from 545 community pharmacies completed this study; hence, the results can be generalized in this geographic segmentation.

Sampling

Multistage cluster sampling was done. The geographic breakdown was done based on villages and areas and used as clusters. A simple random method was done in the first stage to select the villages as clusters. From each selected village, a simple random method was done in the second stage to select the areas. From each selected area, all the community pharmacies were contacted in the third stage. From each pharmacy, 1 community pharmacist was included.

Study Questionnaire

The questionnaire was designed from literature and the WHO Resource pack,[17–19] which assessed the PR of the community pharmacists. The questionnaire had 3 sections with 43 items: (A) demographic information, (B) preparedness, (C) response toward infectious diseases. The participants chose "Yes/No", in sections B and C. A score of 1 was given for "Yes", and a score of zero was given for "No". The participant's PR was determined by the sum of positive responses and percentage scores were attained. The participants' PR was considered "good" or "poor" based on a 50% cutoff point.[17,20,21]

Study Questionnaire Validity and Reliability

For face validity, 3 experts went through the questionnaire, and their inputs on the questionnaire were incorporated. For content validity, 5 subject matter experts were measured, and the content validity ratio was 0.78. To determine the reliability, the questionnaire was piloted on 20 community pharmacists. The Cronbach's alpha value was determined as 0.76 for preparedness, and 0.72 for the response. Pilot data were not included in the final analysis.

Data Analysis

The participants' socio-demographic characteristics were determined by descriptive analysis. The associations between PR scores and participants' socio-demographic characteristics were determined by the chi-squared test of independence. A Bonferroni correction was used as the post-hoc test. A Spearman rank correlation was used to determine the relationship between each independent variable and the dependent variable (PR scores). The effect size was determined by Cohen's correlation coefficient. To identify the predictor variable, regression analyses were done. Multicollinearity was checked before conducting regression.[22] Scatter plots did not show any significant correlations among independent variables. The Kolmogorov-Smirnov test was used to verify the normality of the residual. The values were below 0.05, suggesting there were violations of the assumption of normality.[22] Hence, the skewness of the data was examined. The z-value for skewness was less than ±1.96. Therefore, the data distribution was judged normal.[23]

Results

Table 1 showed the participants' socio-demographic characteristics. Of 545 participants, 287 (52.7%) were aged between 18 and 30 y, 427 (78.3%) were male, and 339 (62.2%) were diploma graduates. Approximately 512 (93.9%) participants were from independent pharmacies, and 333 (61.1%) pharmacies had more than 1 working pharmacist. More than half of the participants 288 (52.8%) were never trained in disaster management. More than 50% of the participants (306) have encountered at least 1 infectious disease patient at their pharmacy.

Table 2 represented the participants' infectious disease preparedness. Most of the participants knew the issues they may face in their community concerning infectious diseases. Participants knew whom to contact in a dreadful situation in their community. Participants agreed that the travel history of the patient should be taken based on the exposure criteria. However, most of the participants were not acquainted with triage principles used in emergencies. Most of the participants do not read research papers related to infectious diseases. Most participants mentioned research papers are not accessible in their pharmacy setting.

Table 3 represented the participants' public health emergency responses. Most of the participants can identify the clinical manifestations of infectious diseases. Participants mentioned that they can respond by providing counseling on public health emergencies to customers. Participants mentioned that sufficient medications are available in their pharmacy to handle public health

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Table 1. Socio-demographic profile of the participants

Characteristics	*N*	%
Age (in years)		
18-30	287	52.7
31-40	213	39.1
41-50	34	6.2
>50	11	2.0
Gender		
Male	427	78.3
Female	118	21.7
Experience in years		
5 or less	144	26.4
6-10	238	43.7
11-15	121	22.2
>15	42	7.7
Education qualification		
Diploma in Pharmacy	339	62.2
Bachelor of Pharmacy	206	37.8
No. of pharmacists working in a pharmacy		
1	212	38.9
>1	333	61.1
Trained in disaster outbreak management		
Never	288	52.8
At least once	199	36.5
More than once	58	10.6
No. of infectious disease patients encountered		
None	244	44.8
1	225	41.3
>1	76	13.9
Type of pharmacy		
Chain	33	6.1
Independent	512	93.9

Table 2. Participants' preparedness toward Public Health Emergencies

Items	Yes (%)	No (%)
I have all the information related to the needs of my community regarding public health emergency	66.0	34.0
I am aware of the challenges that I need to face from my community regarding public health emergency	71.7	38.3
I know where to get the resources/materials needed for my community in public health emergency situation	66.0	34.0
I am aware of the programs regarding public health emergency preparedness and management that are offered by the Ministry of Health	78.3	21.7
I read journal articles related to public health emergency preparedness	35.0	65.0
In case of an emergency, there is enough support from local officials in my region	71.6	38.4
I know whom to contact (chain of command) in a disastrous situation in my community	89.3	10.7
I find that the research articles on infectious disease management are accessible in my pharmacy setting	27.0	73.0
I have participated in educational activities dealing with public health emergency preparedness recently (continuing education, webinars, or conferences)	62.0	38.0
I have participated in emergency plan drafting and emergency planning for infectious disease situations in my community	52.8	47.2
I agree that relevant exposure history should be taken including exposure criteria of whether the patient has resided in or travelled to a country	95.0	5.0
In case of emergency, I know how to use personal protective equipment	47.2	52.8
In case of emergency, I know how to execute decontamination procedures	46.1	53.9
I am familiar with accepted triage principles used in emergencies	39.5	60.5
In a case of emergency, I know how to perform isolation procedures to minimize the risks of community exposure	48.9	51.1
I am familiar with the local emergency response system for infectious disease outbreak	62.0	38.0
I would be considered a key leadership character in my community in this infectious disease outbreak	51.6	48.4
I consider myself prepared for the management of infectious disease outbreak	52.8	47.2
I am familiar with the scope of my role in public health emergencies as a health-care provider	66.0	44.0
I am ready for peer evaluation of my skills on public health emergency preparedness to infectious diseases	50.8	49.2

emergency situations. However, most of the participants were not familiar with the implementation of emergency plans, evacuation procedures, and similar functions. Most participants mentioned that they may not be able to respond to patients with worsening infectious disease conditions. Participants believed that there is not enough personal protective equipment (PPE) in their pharmacy to manage the public health emergency.

Table 4 showed the chi-squared analysis of socio-demographic characteristics concerning the scores of PR. The 3 variables "More than one pharmacist working in a pharmacy" ($P = 0.041$), "Pharmacists who are trained more than once" ($P = 0.034$), and "More than one infectious disease patient encountered" ($P = 0.038$) were significantly associated with the PR scores.

Table 5 showed the multiple correlation results. The variables (more than 1 Pharmacist working in a pharmacy; Pharmacists who are trained more than once in disaster management; Pharmacists who encountered more than 1 infectious disease patient) were positively correlated with the PR scores. The correlation was moderately positive between variables "more than one Pharmacist working in a pharmacy" and PR scores ($r = 0.48$; $P = 0.045$), strongly positive between variables "Pharmacists who are trained more than once on disaster management" and PR scores ($r = 0.56$; $P = 0.034$), and strongly positive between variables "Pharmacists who encountered more than one infectious disease patients" and PR scores ($r = 0.51$; $P = 0.036$).

Table 6 showed the stepwise regression for the strongest predictor. Two variables "Pharmacists who are trained more than once in disaster management" and "Pharmacists who encountered more than one infectious disease patient" predicted the PR scores significantly. In Model 1, the R^2 value accounted for 52.2% of the variance in PR scores. In model 2, the R^2 value accounted for 63.4% of the variance in PR scores, due to further change in the R^2 value that added 11.2% more variance. Hence, model 2 was selected in this study. The SPSS excluded the nonsignificant contributor automatically. Outliers were within the limit as Mahalanobis' Distance was 6.28. The variable "Pharmacists who are trained more than once in disaster management" was the best predictor as the beta value was 1.35.

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Table 3. Participants' response toward Public Health Emergencies

Items	Yes (%)	No (%)
I can respond by providing counseling on infectious diseases	79.0	21.0
I can identify the signs and symptoms of infectious diseases	84.0	16.0
I am confident that I can play my role in public health emergency as a member of a health-care team	66.0	34.0
I can respond as a direct-care provider or first responder in public health emergency	37.3	62.7
I can manage infectious disease patients independently without any supervision	35.0	65.0
I can respond to patients with worsening symptoms and reactions of infectious diseases.	28.3	71.7
I can implement emergency plans, evacuation procedures, and similar functions	10.7	89.3
There are enough medications needed to manage the public health emergency	63.0	37.0
There are enough PPE needed to manage the public health emergency	30.0	70.0
I personally have received clients needing help with infectious diseases	55.2	44.8
I can identify possible indicators of mass exposure evidenced by clustering of patients with similar symptoms	40.0	60.0
As a health-care provider, I am confident that I can face any disease outbreak in future	31.0	69.0
I am ready for peer evaluation of my skills on responsiveness to infectious diseases	36.0	64.0

Table 4. Contingency table analysis of socio-demographic profile to PR scores with Bonferroni correction

Socio-demographic profile	Adjusted Z score residual	Chi-squared value	Bonferroni corrected *P*-value
Age (in years)			
18-30	1.05	1.11	0.524
31-40	1.23	1.52	0.429
41-50	1.28	1.67	0.373
>50	1.82	3.39	0.423
Gender			
Male	1.35	1.80	0.336
Female	2.05	4.17	0.425
Experience in years			
5 or less	1.29	1.64	0.514
6-10	1.65	2.43	0.432
11-15	1.69	2.56	0.234
>15	1.73	2.58	0.352
Education qualification			
Diploma in Pharmacy	1.25	1.46	0.392
Bachelor of Pharmacy	1.63	2.19	0.371
No. of pharmacists working in a pharmacy			
1	1.43	2.81	0.178
>1	1.94	2.74	0.041*
Trained in disaster outbreak management			
Never	1.36	1.98	0.564
At least once	1.38	2.51	0.321
More than once	1.83	2.84	0.034*
No. of infectious disease patients encountered			
None	1.12	2.43	0.234
1	1.26	2.56	0.263
>1	1.35	2.58	0.038*
Type of pharmacy			
Chain	1.13	1.68	0.234
Independent	1.38	1.83	0.263

Discussion

Maximum efforts have been deployed in recent times to break the COVID-19 chain in India. Despite so much effort in the Indian health system, there are challenges in pandemic preparedness and public health emergency.[24] The results of this study provided detailed information on social determinants and predictors contributing to community pharmacists' public health emergency preparedness. The response rate of 90.83% ruled out the participation bias. Most of the pharmacists were diploma graduates, which are sufficient to be a community pharmacist in India.[25] In this study, independent pharmacies are more than chain pharmacies. Generally, in the Indian retail pharmacy sector, independent pharmacies are higher than chain pharmacies due to various reasons such as regulatory bodies, customer satisfaction, and regulatory efficiencies.[26] Most of the community pharmacists have mentioned that they were never trained in disaster management. Training through continuing professional development programs is necessary to keep the community pharmacists updated to be prepared and respond during disaster management.[27] Many community pharmacists have encountered at least 1 infectious disease patient in their pharmacy. This indicated that community pharmacists are at a higher risk of getting COVID-19. Hence, health-care agencies should enforce stringent occupational guidelines during public health emergencies for community pharmacists.[28]

Most of the community pharmacists anticipated the challenges they may have to face from the public and hence were prepared. Pharmacists were aware of the local contact person in case of an emergency. This showed the community pharmacists' readiness to face unprecedented events. Most of the community pharmacists considered taking the travel history of patients coming to their pharmacy as this will help in identifying the clusters. Though community pharmacists were prepared, they were struggling with the triage principles used in emergencies. This may be due to the lack of exposure to disaster management programs. It is high time pharmacists should be trained by The National Disaster Management Authority (NDMA) along with the National Disaster Response Force (NDRF). There are many reports on the pharmacists' role in triage and disaster management.[29–31] Many community pharmacists do not read the journal articles, and they have mentioned that research articles are not accessible in their pharmacies. Community pharmacies in India do not access digital databases[32] as most journal databases need subscriptions; hence, it may restrict the pharmacists from reading full-text journal articles. At least community pharmacies can arrange facilities for the pharmacists to access the free database to read the free journal articles. Currently, community pharmacists are obtaining public health emergency information through media; hence, the information's legitimacy is not guaranteed.[33]

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Table 5. Correlation results of independent vs dependent variable

	More than one Pharmacist working in a pharmacy	Trained in disaster outbreak management more than once	Encountered more than one infectious disease patients	PR scores
More than one Pharmacist working in a pharmacy	1	–	–	–
Trained in disaster outbreak management more than once	0.34	1	–	–
Encountered more than one infectious disease patients	0.39	0.15	1	–
PR scores	0.48*	0.56*	0.51*	1

* $P < 0.05$.

Table 6. Stepwise regression for strongest predictor

Model 2	b	Standard error	Standard Coeffient beta	*P*-Value
Trained in disaster outbreak management more than once	0.842	0.426	1.35	0.002*
Encountered more than one infectious disease patients	0.274	0.201	0.462	0.003*

*$P < 0.005$.

Most community pharmacists can respond effectively to infectious diseases, as they can identify the signs and symptoms and providing counseling to their customers. Medications are readily available too in the pharmacy to respond to the situation. However, pharmacists are unable to respond to patients with worsened infectious disease conditions due to risk factors.[34] Also, there is not enough PPE available in the pharmacy, which may further deteriorate the performance of the community pharmacists.

The association between the PR scores and the number of pharmacists working in a pharmacy suggested that, when the number of pharmacists in a pharmacy increases, the workload of pharmacists decreases which could increase the pharmacists' capacity.[35] The association between the PR scores and the pharmacists' training on disaster outbreak management suggested that disaster management training may increase the emergency PR level of the community pharmacists. This is demonstrated in the study as the strong positive correlation indicated that the pharmacists who had undergone disaster management training more than once had a better public health emergency PR toward infectious diseases. The association between the PR scores and the pharmacists attending infectious disease patients suggested that the PR of the community pharmacists may increase according to the infectious disease cases encountered by them. This is demonstrated in the study as the strong positive correlation indicated that the pharmacists who encountered more than 1 infectious disease patient had a better PR toward them. Although there were correlations among 3 independent factors and the PR scores, only 2 of them contributed to the PR scores, of which "Pharmacists trained in disaster outbreak management more than once" contributed the best. The next predictor is pharmacists who encountered more than 1 infectious disease patient.

In various countries, training and development for pharmacists' emergency preparedness and response to public health emergencies are done to manage the spread of infectious diseases. In Europe, a postdisaster review process is performed to learn from disaster situations.[36] In the United Kingdom, pharmacists received training described in various modes, ranging from lecture-style teaching and briefings, covering security and language, to more practical, simulation-based activities.[37] In Malaysia, disease outbreak management training was found to have a primary influence on the community pharmacists' preparedness and perceived response to the COVID-19 pandemic.[38] In Middle East countries, pharmacists were asked to share examples of strategies implemented within their health systems in response to the COVID-19 crisis.[39]

This study best predicted that community pharmacists who have undergone training on disaster outbreak management are prepared and can respond better to any public health emergencies. Hence, disaster management training is important for community pharmacists. The Government of India could come out with policies addressing the community pharmacists' triage. As a first step, the MOH with the Pharmacy Council of India prepared a list of pharmacists based on the state-wise to enroll to be the COVID warriors.[26] Triage during disaster management may include services and aid resources by doctors, paramedics or nurses, and other social workers. As such, training through continuing interprofessional development programs is needed to keep community pharmacists updated with such knowledge and practices. This training could include emergency PR covering medical waste management, minimizing infection, and providing precise information to the public. The inclusion of public health and emergency preparedness in pharmacy curricula will be an advantage.[40] Universities and educational institutions should consider including simulated learning[41] and interprofessional learning[42] in pharmacy curricula to address disaster management training during public health emergencies.

Strengths and Limitations

Multistage cluster sampling ensured that the sample is representative of the population under investigation, providing reliable and generalizable results. Self-administered survey reduced response bias and social desirability bias, as participants could complete the survey in a private setting, without pressure from interviewers or peers.

Self-administered surveys limited the collection of in-depth or nuanced data, and multistage cluster sampling could have limited the scope of the study to certain geographic areas or subpopulations.

Conclusions

The predicting factors that contribute to preparedness for public health emergencies among community pharmacists in India were

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those who were trained more than once in disaster management and those who encountered more than 1 infectious disease patient. Among these, community pharmacists who were trained more than once in disaster management were the strongest predicting factor. Community pharmacists were aware of the issues they may face in their community concerning public health emergency situations. They believed that the medications available in their pharmacy are sufficient to face any emergency. They could identify the clinical manifestations of infectious diseases and provide counseling to the customers toward them.

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Author contributions. K.R. and R.V. conceived the study design. M.A. and G.K. conducted the study and prepared the data set for analysis, performed the analysis, interpreted the result. R.V., M.A., and G.K. collated the data and drafted written the manuscript. K.R. revised the manuscript. All authors discussed the results and implication and commented on the manuscript at all stages and approved the final manuscript.

Competing interests. There is no competing interest among the authors.

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