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LETTERS TO EDITOR

A pandemic 'to be or not to be'- we should still be ready for monkeypox

The world had barely come out of the COVID-19 pandemic when another disease, primarily restricted to Africa, appeared in the West, almost explosively. Even though monkeypox had occurred outside Africa since 2003, it had not affected multiple countries in the way it has been seen recently.[1] The previous occurrences in the west had a clear history of travel to endemic African countries or exposure to animals imported from Africa.[2,3] The recent occurrences in Europe were unusual, with human-to-human transmission, absence of travel history, and a lack of contact with travelers or animals from endemic countries. This shows that the zoonotic infection, which was supposed to be limited to the tropical rainforest areas of Central and West Africa, is now adapted to survive and transmit beyond the traditional milieu. In the way it has suddenly appeared simultaneously in several countries, monkeypox may be another disease of concern for public health. The World Health Organization (WHO) is rightly deliberating whether to declare monkeypox as public health emergency of international concern.[4]

Monkeypox is a viral disease caused by orthomyxovirus that closely resembles smallpox. The reservoirs for the virus are known to be monkeys, rodents, squirrels, etc., It is transmitted through eating improperly cooked meat and contact with or bites of animals. From the cases, it transmits via respiratory droplets and fluids and scabs of the skin lesions. The incubation period ranges from 5 to 21 days, and the smallpox like rash is preceded by a prodrome of about 1–4 days. The rash predominantly occur on the face and limbs. They take 2–4 weeks to resolve. Complications can be varied from secondary bacterial infection of the lesions to bronchopneumonia and encephalitis. Treatment is mainly supportive, but Tecovirimat (ST-264), which has FDA approval for the treatment of smallpox, is also being used for monkeypox. Smallpox vaccine with new vaccinia virus has been approved for the prevention of monkeypox.[5]

As of June 17, 2022, from the beginning of the year, there were 2103 confirmed, one probable case, and one death reported to the WHO from 42 countries.[6] The cases predominantly occurred among men who self-reported having sex with men. Only one death was reported. The cases have resulted from human-to-human transmission. This contrasts with how the cases started and were transmitted in the African countries from 1970 onward. The first case of monkeypox was in a 9-month-old boy in Zaire.[7] From 1970 to 1979, there were only 48 cases of monkeypox in Africa and eight deaths in children aged 7 months to 7 years. There were only four person-to-person transmissions among the 48 cases. At the time, two clades were reported to exist, the West African clade and the Congo Basin (CB) clade. The latter has been known to be more severe and caused around a 10% case-fatality rate compared to the west African clade, which is less severe and showed 3% mortality.[1] The recent outbreak in the western hemisphere is attributed to the West African clade. The occurrence of the first and the subsequent cases in Africa was attributed to the cessation of smallpox vaccination, which led young children to be susceptible to monkeypox as they were born after smallpox was eradicated. It was correctly postulated that as the immunity to smallpox wanes in the population, the susceptibility to monkeypox and its occurrence would increase, which is being witnessed at present.

Whether monkeypox will be another milestone in the world health scenario is yet to be established. However, one can observe that the epidemiology of the disease has shifted enough to cause outbreaks with the sustained human-to-human transmission in the erstwhile naïve countries. And with the reproduction number of 2.13, the possibility of a widespread disease cannot be ruled out. The change in the pattern of occurrence due to reasons hitherto unknown, the virus has started affecting the specific demographic group resulting in human-to-human transmission. This raises the possibility that the disease may transmit to more countries, which will be amplified by air travel and lack of evidence to know if the person may be in the incubation period. Currently, the disease is primarily in the African continent, Europe, and North America. However, if it manages to enter the developing countries in Asia, the Middle East, and Western Pacific regions, the cases may rise alarmingly. Infection control measures may not be enough, and the vaccination is not available readily. Vaccine production at only a few places may not be feasible enough to supply such countries. In developing

countries where chickenpox is common the rashes in mild monkeypox may be mistaken for chickenpox rash. These could make transmission easier and cause more outbreaks.

However, the infection's characteristics could deter widespread infection and help prevent or contain the outbreaks. The monkeypox virus is not known to be transmitted during incubation period, which is beneficial in contact tracing and quarantine implementation. Another positive aspect is the absence of asymptomatic cases. The typical lesions of monkeypox are quite different from the rashes that occur in the exanthems of the currently prevalent diseases; hence, they are easily identifiable so that isolation can be initiated on time. Due to the COVID-19 pandemic, the infection control measures are almost impeccable in majority of the healthcare settings, and knowledge of the population about it is also very good. This would also help in the prevention of monkeypox as the measures are the same for respiratory droplet transmission. Even though accessibility may not be universal now, vaccination can be improved by equipping laboratories worldwide for vaccine production. The mortality rate seems to be low at present with the West African clade, which means that the outbreaks would not be as devastating as would have been with the CB clade.

Is India prepared? The Ministry of Health and Family Welfare, Government of India website, has a document, "Guidelines for management of monkeypox disease" . There is no other information, document, or guidelines in other apex government portals. Considering that it has spread to several European and American countries, it is only a matter of time before we start seeing cases in India. We need to brace ourselves for monkeypox infection in the country. Rather than firefight after it arrives, it is better to take preemptive steps to battle the disease before it reaches the country. Irrespective of what potential it has to cause large outbreaks and deaths, the outcome will be better if the country is well prepared for it in advance. Formulating guidelines for prevention and control, including framing case definitions, equipping laboratories for diagnosis, and strengthening vaccine production capacity, would all be essential strategies to cope with the inevitable. Risk communication and accurate information for the public should also be part of the strategy. Liaison between the center and the states and international collaboration should also be pursued to make the best out of the available logistics, capacity, and human resources. A separate budget should be earmarked for the same so that there is no scrambling for funds in the hour of need. Hoping that the country is not taken by surprise and that monkeypox (or whatever name the WHO gives it) does not cause significant damage to population health.

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Community medicine - A specialty of choice?

INTRODUCTION

In India, yearly, more than 80,000 students are enrolled in the course of MBBS. The course offers 5½ years of training in all the core medical specialties. After completion of undergraduate medical education, most of our young budding doctors opt for specialization. For majority, it would be core clinical subjects such as surgery, medicine, or orthopedics. The founding root of decision making for choosing any speciality is the 1-year period of compulsory internship. Regardless of significant time being allotted for the specialty of community medicine during internship and undergraduate education, students who prefer it as their first choice are very few.[1] It somehow fails to have the charisma and glamor the clinical specialties offer. From the data available from counseling for postgraduate seats of Institutes of National Importance, it was seen that of 66 eligible seats, nine seats remain vacant even after open round of counseling.

During the undergraduate training, in most of the colleges in India, students are exposed only to the tip of the iceberg when it comes to community medicine.[2] The dilemma of what the subject actually tries to do stay unanswered. Hence, how do we address this issue? Change has to be brought about from the beginning itself when the subject is first introduced in the undergraduate days. The concept of community medicine and community health needs to be introduced in such a way that the students remain connected to the subject. Here, we are trying to discuss how we could bring about a change in the perception regarding the subject and what all it offers as a career.

EMPHASIS ON REAL-TIME EXPOSURE

For a subject that is deep rooted in the community, the specialty has remained to be more of a theoretical subject with more emphasis on the classroom learning. To understand the subject in its true sense, the teaching should be practical oriented through community and field visits. Students should understand the concept of primary health-care (PHC) and should be involved with the activities based on PHC right from their undergraduate days.[3] They should have integrated knowledge and understanding of basic health-care needs of the community so that it aids in framing appropriate plans and managing health services needed for the community. Moreover, this will give the students an opportunity to work closely with the community as well as to make changes within the community, which will in turn leave an impact and keep the students connected with the specialty.

WHY YOU SHOULD NOT HESITATE TO CHOOSE COMMUNITY MEDICINE AS A CAREER?

The options are numerous following your postgraduation in the subject. The subject offers you opportunities with regard to what you want out of it. Your work could be based on administrative, research, or teaching specialties. You could be a part of remarkable work carried out by renounced nongovernmental organizations. In case you are interested in teaching as well, you could join a medical college. Other numerous opportunities offered include working as a medical officer, or programme officer/policy maker of any national programme or as administrative cadre. If research is your arena, then you could join research centers such as the Indian Council of Medical Research. You could also very well work as an independent researcher. Hesitancy with recognition of the subject should never be one of the sole reasons for moving in opposite direction while selecting the subject. The level of satisfaction obtained when you see the change you wanted in the life of the people of your community from whom you learned it all gives all the more different dimension to the specialty indeed.

WAY FORWARD

The scope of community medicine is not limited to the four walls of the classroom. From an academic point of view, along with strengthening existing infrastructure, the focus should also be in engaging young and dynamic brains in the subject as well. The design should be in such a way as to generate interest and enthusiasm regarding the subject in maximum number of students and to make them opt for it. With the advent of the COVID-19 pandemic, people have started looking up to public health specialties with much interest. The subject is now brought back to the limelight, and so now, the time has arrived to take a decisive step in investing our resources in a meticulous way for the specialty which has given us a lot.

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Review Article

Psychological impact of disease outbreaks on healthcare workers: A narrative review

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Abstract

Disease outbreaks can have an impact on one's mental health. A comprehensive knowledge about the psychological state of healthcare workers (HCWs) during disease outbreak is limited. This review aims to present HCWs' psychological issues due to multiple outbreaks in the past and present, including SARS, MERS, Ebola, and COVID-19. The results indicated the presence of affective symptoms, paranoia, and decreased trust among HCWs. The review reveals the need of research to understand strategies and interventions that can enhance the well-being of HCWs.

Keywords: Disease outbreak, healthcare workers, psychological issues

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INTRODUCTION

The psychological impact of epidemics or pandemics on the public has been largely explored. Epidemics such as severe acute respiratory syndrome (SARS), Ebola, H1N1, and Middle East respiratory syndrome (MERS) have had a significant impact on the public,[1] with people showing symptoms of panic, anxiety, depression, stress, hypochondriasis, and cyberchondriasis amid a pandemic. Considering the present COVID-19 pandemic, studies have substantiated that the public has shown increased anxiety,[2] depression,[3] phobias and obsessive–compulsive disorder (OCD),[4] acute stress and posttraumatic stress disorder (PTSD),[5] health anxiety, and cyberchondriasis.[1] However, another emerging concept in this pandemic is the understanding of psychological distress among healthcare workers (HCWs). Healthcare professionals have also been seeking to psychological therapy, taking breaks using hobbies and music, looking for greater communication within the team, and looking for peer support to cope with anxiety and depression due to COVID.[6] There is no available review which has addressed the effects across epidemics and pandemics. The present narrative review strengthens the understanding of the psychological impact of the epidemics and pandemics on HCWs and its implications for improving their resilience.

MATERIAL AND METHODS

This narrative review was used to understand the effects of disease outbreaks such as SARS, Ebola, MERS, and COVID-19 on HCWs. Research papers explored using various search engines such as PubMed, NCBI, ResearchGate, Google Scholar, and RefSeek.

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Inclusion criteria

The review included all the studies published between 2004 and 2020. The keywords such as psychological impact, disease outbreaks, healthcare workers, hospital employees, Ebola, SARS, and COVID-19 were used.

Exclusion criteria

Dissertations, pilot/protocol/prototype studies, and studies published in a language other than English were excluded.

STUDY SELECTION AND DATA EXTRACTION

To assist in the database screening for inclusion criteria, Rayyan software was used.[7] All the articles were reviewed, and those articles that did not meet the inclusion criteria were excluded. Cross-referencing of the excluded and selected studies was done by agreement of the co-authors.

A total of 34 papers were found as a result of the search. Identified studies were independently reviewed for eligibility in a two-step process: a first screening was performed based on the title and abstract, and then, full-texts were retrieved for a second screening. At both stages, data were extracted based on the inclusion criteria.

RESULTS

The common effects of disease outbreaks were of stress and Post Traumatic Stress Disorder (PTSD), anxiety and depression, and health anxiety. Other additional findings were the prevalence of Obsessive Compulsive Disorder (OCD), fatigue, loss of sleep, and paranoid ideation.

Stress and posttraumatic stress disorder

During disease outbreaks, HCWs have been found to be stressed and have PTSD as evident in multiple studies. During the SARS outbreak, the stress and PTSD levels among high-risk HCWs were much higher than those among low-risk HCWs, and other findings indicated that doctors were 1.6 times more likely to manifest PTSD symptoms than other HCWs.[8-12] Other research found that approximately 11% of HCWs in a nursing community hospital had signs of stress reaction syndrome (anxiety, depression, somatization, and hostility),[13] PTSD symptoms, and increased alcohol consumption.[14] During the SARS epidemic, HCWs also had intrusive symptoms, avoidance symptoms, and elevated hyperarousal symptoms.[15]

Researchers corroborate that findings by the reporting during the MERS outbreak, HCWs had significant degrees of avoidance, intrusion, numbness, and hyperarousal symptoms.[16] The HCWs who were isolated at home experienced a lot of numbness and insomnia. During the MERS outbreak, they also felt a great deal of anxiety and distress.[17] The COVID-19 pandemic had a psychological impact on HCWs in the form of stress and emotional distress. Stress symptoms were seen in 34.3%–57% of HCWs, whereas PTSD symptoms such as extreme emotional weariness and depersonalization, as well as clinical manifestations, were seen in 7.7%–36.7%.[18-20]

Anxiety and depression

During the SARS epidemic, HCWs reported depression (77.2%), anxiety (as high as 77.4%) in certain studies, and exhaustion with reduced sleep (52.3%).[10,21,22] It is also possible that their elevated levels of concern and panic are related to the disease spreading to their loved ones.[12] HCWs who had interaction with patients were also found to have a high rate of OCD, depression, and paranoid ideation.[23] During the Ebola outbreak, HCWs lost faith in one another due to fear of getting the disease, and they also felt disconnected from their coworkers. Increased isolation and stigmatization frequently result in sadness, fear, and a lack of respect.[22] During the MERS outbreak and COVID-19, a similar pattern was seen. It not only made HCWs anxious and depressed,[17] but it also made them feel uncomfortable, anxious, frightened, and threatened.[5,24-26] During COVID-19, studies in China, Singapore, and the United States found high levels of psychological distress, anxiety, depression, lack of appetite, poor sleep quality, fatigue, and stress among HCWs.[27-31]

Health anxiety

HCWs experienced increased somatization as one of the acute symptoms of stress during the SARS outbreak. The fear of contracting COVID-19 was found to be amplified among healthcare professionals by media and news reports.

DISCUSSION

The narrative review revealed the presence of anxiety, depression, health anxiety, stress, and PTSD among HCWs during disease outbreaks [Figure 1]. Other common psychologically distressing symptoms also revolved around like OCD, paranoid ideation, loss of sleep, reduced trust, and fatigue.

Hypochondriasis and cyberchondriasis become highly common during disease outbreaks, according to several research.[32,33] However, because the focus of symptom manifestations such as health anxiety in HCWs could be particularly important due to their proximity to patients, more research is needed. Similarly, OCD and paranoid symptoms in HCWs need to be better understood, particularly in light of the ongoing COVID-19 pandemic.

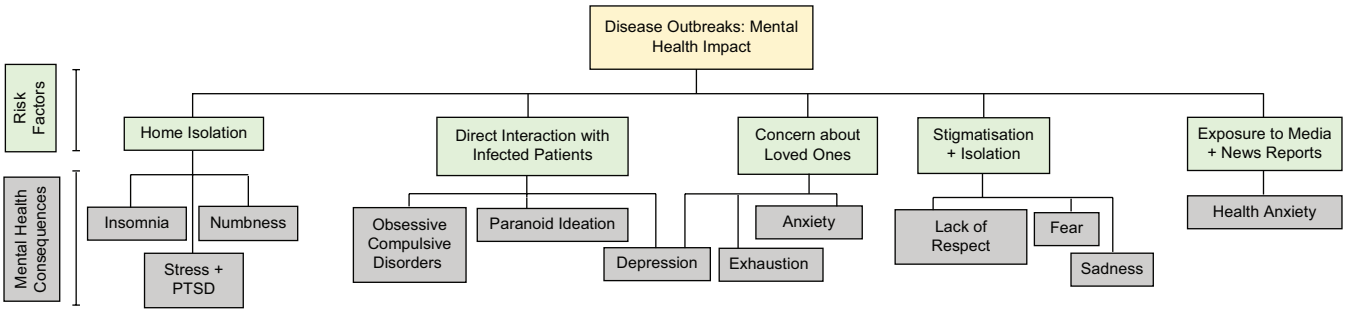

Figure 1: Common issues faced by healthcare workers during a disease outbreak: A concept map

The strength of this study is that it helps understand the psychological state of HCWs from a more holistic perspective, taking into account several recent and past public health epidemics. This will allow HCWs to learn from past outbreaks, understand the current situation, and develop plans for the COVID-19 pandemic. There are several drawbacks to this study as well. Some online studies on the COVID-19 pandemic could have had methodological issues due to bias. There are also no studies that are thematically based. Despite the fact that there are very few articles highlighting HCWs' coping strategies during the pandemic, there is not enough formal research on the topic. It is important to focus on the measures that HCWs can use to improve their well-being.

CONCLUSION

With most sources of support being channelized toward patients and the general public, it is essential that HCWs also be made aware of the varied number of coping strategies one can employ, such as physical activity and exercise, resilience-building,[19] positive thinking,[34] and clear communication.[35] Future research can be directed toward understanding what kind of interventions can be employed (both at the individual and organizational level) to help HCWs cope with the stress associated with the current pandemic. It is also important to help HCWs by conducting well-being interventions that can encourage positive thinking and resilience building, as the same can encourage better mental health in the current scenario.[20,34]

The review also implies that HCWs are at risk of developing physical and mental health problems as a result of their interaction with COVID-19 patients. Protecting the health and safety of HCWs through adequate measures is a critical modality in the public health response to outbreaks. If prompt action is not taken, the disease outbreak will eventually subside, but a new group of people suffering from psychological morbidity will arise.

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Conflicts of interest

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Review Article

Horizontal unidirectional airflow for reducing cross-infection of COVID-19: A narrative review

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Abstract

Recent decades have witnessed the emergence of many airborne diseases such as severe acute respiratory syndrome, Middle East respiratory syndrome, and COVID-19, which have highlighted the importance of effective ventilation in residential, work, or hospital premises. Ventilation which plays an essential role in reducing or diluting the airborne contaminants. However, it is not always easy to achieve by natural ventilation as it depends on many other factors such as temperature and climatic conditions. (wind velocity, wind direction, and housing pattern/design). Horizontal unidirectional airflow (HUAF) is one such method that can be achieved at low cost and can reduce cross-infection of COVID-19 to much extent. Hence, this narrative review aims to bring some insight into what is HUAF, how it can be achieved, and what are its possible implications in preventing COVID-19 transmission.

Keywords: Airborne diseases, coronavirus infections, COVID-19, cross-infection, ventilation

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INTRODUCTION

COCID-19 has affected many countries around the globe with ongoing emergence of new variants. The disease which was thought to spread because of droplets or fomites generated by infected persons is now being considered airborne.[1,2]

With the current development in research and recent in Lancet, evidence is strong enough for aerosols as a major mode of COVID transmission, mostly occurring in indoor premises.[3] Several preprints have also demonstrated the presence of RNA of severe acute respiratory syndrome-CoV-2 in the air of various indoor settings through the air-sampling technique. This evidence has raised concern among several doctors, scientists, and policymakers regarding preventing the spread of this disease.[4-7]

There are various methods to keep indoor air clean and protecting the occupants from indoor pathogens, i.e., dilution, filtration, ultraviolet germicidal irradiation, photocatalytic oxidation, desiccant rotor, plasma cluster ions, essential oils, and silver nanoparticles. These methods are effective in cleaning indoor air, but each has its advantage and disadvantage with major concerns regarding their affordability in many scenarios.[8]

Keeping indoor environment virus-free plays a key part in reducing or slowing the transmission of various airborne

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infections. Ventilation which is a key factor in keeping the indoor environment virus-free may not be easier to achieve in all settings but still is currently of prime importance. There are different types of ventilation such as natural, mechanical, or hybrid ventilation. Natural ventilation depends on factors such as temperature and climatic conditions such as wind velocity, wind direction, and housing pattern/design which makes it difficult to achieve in many scenarios and settings, thus giving rise to the need for mechanical ventilation.[9-11]

The horizontal unidirectional airflow (HUAF) is one such method of mechanical ventilation that can be utilized in where natural ventilation is not possible. Thus, this narrative review aims to bring some insight into what is HUAF, how it can be achieved, and what are its possible implications in preventing COVID-19 transmission.

AIRBORNE TRANSMISSION

Airborne transmission in terms of COVID-19 is the spread of virus particles caused by the circulation of respiratory droplets or nuclei (aerosols) that remain infectious and suspended in the air over long distances and time.[12,13]

This type of transmission generally occurs in indoor places or poorly ventilated spaces such as lifts, closed rooms, and work premises. The virus particles are spread by the infected person, and travel from one person to other with the help of turbulence or air vortex created by ceiling fans and indoor exhaust with closed windows.[14,15]

FACTORS AFFECTING VIRAL LOAD IN RESIDENTIAL OR WORK PREMISES

According to a report published in Lancet by Greenhalgh *et al.* in 2021, the viral load and risk of infection for COVID-19 increase drastically when the one who is infected exhales, speaks, shouts, sings, sneezes, or coughs [Figure 1].[3,16]

According to a featured news topic on COVID-19 published in May 2020 by the Center for Infectious Disease Research and Policy, the viral load in any public building can be reduced by effective utilization of engineering techniques such as proper ventilation, prevent overcrowding, regular air filtration and disinfection of air [Figure 1].[17]

CRITERIA OF EFFECTIVE VENTILATION

According to the Occupational Safety and Health Administration guidelines of the United States, proper

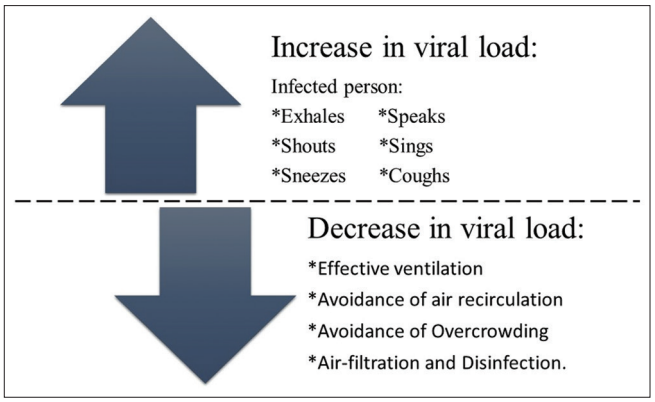

Figure 1: Factors with viral load in residential or work premises depends

ventilation improves and maintains the quality of air in the occupational work environment. In a simpler term, it is a method by which we can control proper airflow in environment.[18]

The ventilation of any premises can be determined based on the three criteria, namely ventilation rate, airflow direction, and airflow distribution or pattern.[19]

"Ventilation rate" depends on quality and quantity of the air being delivered to the premises, whereas "airflow direction" deals with the direction of air being delivered which should ideally be from a fresh zone to a contaminated zone. "Air distribution or pattern" deals with how effectively the air is being delivered, and how effectively it eliminates the contaminants from the contaminated zone. A balance between these three creates effective ventilation.[19]

ROLE OF EFFECTIVE VENTILATION IN CROSS-INFECTION

Effective ventilation is believed to decrease the risk of cross-infection (i.e., any infection which a patient contracts in a health-care institution) of any airborne viral or bacterial disease, by either removing the contaminants completely or by diluting the suspended airborne contaminates, or infected droplet nuclei to an extent where it fails to reach a threshold level to initiate disease. A higher ventilation rate can dilute the contaminated air inside the space more rapidly and decrease the risk of cross-infection. A higher rate and more organized ventilation reduced the risk of cross-infection to a large extent which can be well explained by Wells–Riley equation.[20]

According to Wells–Riley equation: $P=C/S=1-\exp(-Iqpt/Q)$[20,21]

where P = Risk of cross-infection

C = Number of cases to develop infection

S = Number of the susceptible

I = Number of infectors

p = Pulmonary ventilation rate of each susceptible (m^3/h)

Q = Room airflow rate (m^3/h)

q = Quanta produced by one infector (quanta/h)

t = Duration of exposure (h).

ROLE OF HORIZONTAL UNIDIRECTIONAL AIRFLOW IN EFFECTIVE VENTILATION

Unidirectional airflow in residential or work premises ensures that the airflow is only in one particular direction. In unidirectional airflow, the air in the room moves in parallel streamlines with uniform velocity over its cross-section in the entire room. This parallel stream of air prevents turbulence in the air in the room. Air enters from one side and leaves the room from the other side, thus reducing the chance of viral particles jumping around and landing in areas where they are not supposed to land. Thus, HUAF can control contaminant transport among different places.

The entire unidirectional airflow method is based on the concept that air should make a single pass through the room, removing as much contaminated air as possible. When this concept is applied in regular residential or work premises, air enters through one wall and exits through the opposite wall. It can be referred to as HUAF.

ACHIEVING HORIZONTAL UNIDIRECTIONAL AIRFLOW

An effective HUAF between fresh and contaminated zones can be achieved by pressure difference. This pressure difference can be achieved by utilizing exhaust fans of different volumes and velocities in opposing walls, such as using low-volume and low-velocity exhaust fans to throw air in the inward direction, whereas high-volume and high-velocity fans remove air in the outward direction from opposing wall. This imbalance of airflow rate thus helps to create HUAF with the added advantage of preventing air turbulence.[20]

IMPLEMENTATION OF HORIZONTAL UNIDIRECTIONAL AIRFLOW IN REAL-LIFE SETTINGS

While most hospital premises are constructed keeping in mind the effective ventilation to reduce air contamination, this may not be true for other residential premises, work premises, retail shops, schools, offices, restaurants, or movie theaters.

In circumstances of unaffordability for costly equipment and its maintenance to filter indoor air, HUAF may prove to be useful in reducing cross-contamination. During current COVID-19 pandemic, HUAF can also be utilized in newly converted exhibition centers and stadiums as COVID care centers and residential premises.

LIMITATIONS OF HORIZONTAL UNIDIRECTIONAL AIRFLOW

HUAF in real-life settings has some limitations, such as it can only be implemented in settings with enough room for single row sitting arrangement for the employees, students, or other individuals. This method can also increase the power consumption but not to an extent of professionally designed ventilation systems.

RECOMMENDATIONS

1. HUAF can be achieved using different volume and velocity exhaust fans in opposing walls depending on the type and volume of rooms [Figure 2].
2. While achieving HUAF, ceiling fans or other sources of air should be avoided as they may create air turbulence and disruption of HUAF, thus spreading contaminants [Figure 3].
3. A single row of individuals should sit or work in a room preferable at 90° to prevent cross-infection. Any addition of rows will expose one or the other to the contaminant zone in HUAF [Figure 2].
4. The windows or any other opening for natural air ventilation in adjoining walls should be closed to prevent disturbance in HUAF.
5. The outward exhaust should be placed such that to face open space or in direction of a nearby building with 12-feet distance.

CONCLUSION

It should be realized that natural ventilation or engineered ventilation system cannot be practiced in all settings due to different designs of buildings or premises, and the affordability of the residents or individuals. Simpler methods of ventilation should be developed considering the laws of physics and microbiology. HUAF, although not full proof, can reduce the spread of COVID-19 in indoor premises to much extent at a relatively low cost and with ease of implementation. Further research should be carried out to test such cost-effective models in real-life scenarios.

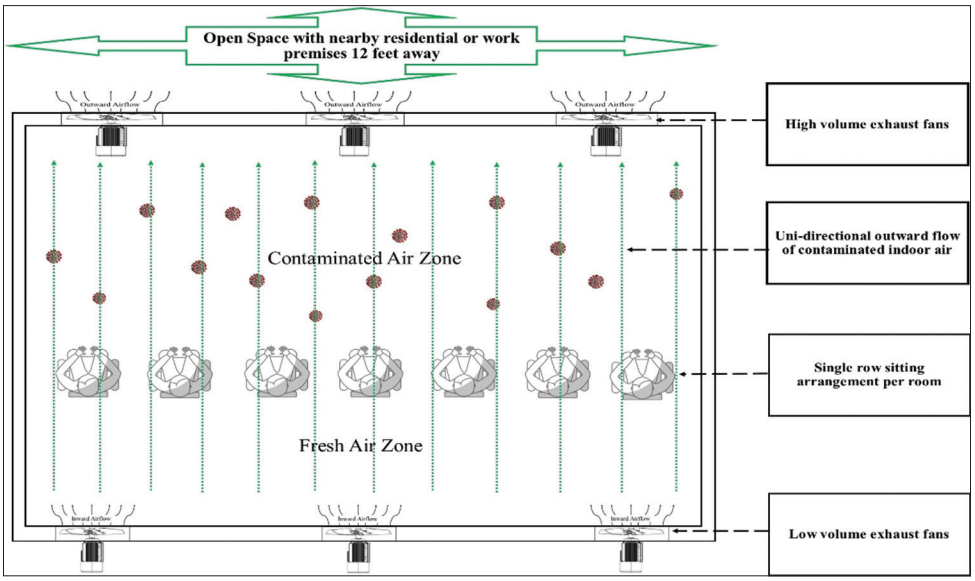

Figure 2: Concept of HUAF in residential or work premises. HUAF: Horizontal unidirectional airflow

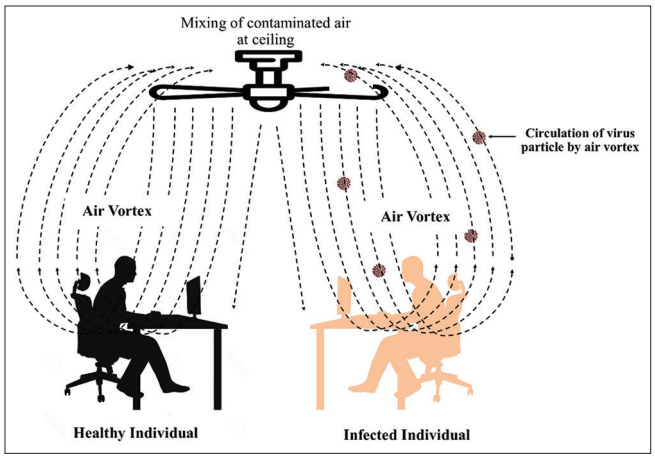

Figure 3: Air vortex circulating virus particles from an infected person to a healthy person

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Conflicts of interest

There are no conflicts of interest.

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Original Article

Gender of the baby and its impact on the health-related quality of life of postpartum women

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Abstract

Introduction: Health-related quality of life (HRQoL) is a multidimensional concept and is relatively neglected in both research and practice. Gender equality is a crucial measure of human rights for millions of women and girls around the world. Most postpartum researches have focused on physical complications. This study was conducted to analyze the impact of gender of the baby on the HRQoL of postpartum women at 6 weeks.

Material and Methods: The study was conducted in a resettlement colony, Kalyanpuri, located in Delhi, India, with a sample size of 330 postpartum women. The data were collected in the 6th week of postpartum period using the Medical Outcomes Study Short Form 36 Health Survey for HRQoL.

Results: The findings showed that the birth of a male baby led to a significantly ($P < 0.05$) better mean HRQoL score than the birth of a female baby. The mean scores of general health, vitality, social functioning, and mental health domains were significantly less in the case of a female newborn child.

Conclusion: The male dominance in the Indian society which leads to financial supremacy and coercion for continuation of family lineage was an important predictor of lower HRQoL of the women in the postpartum period. This demonstrates the need for risk factor for gender equity to and achieve universal health coverage.

Keywords: Gender discrimination, health-related quality of life, postpartum women, gender, quality of life, sociocultural factors, universal health coverage

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INTRODUCTION

Gender equality is a crucial measure of human rights, and millions of women and girls around the world still continue to face gender discrimination.[1] The preference for a male child is found to be deeply rooted in the Indian society, and this study evaluates the gender of the baby as a predictor affecting the quality of life which might open realms of social, maternal, and child health interventions. health-related quality of life (HRQoL) of postpartum mothers is relatively neglected in both research and practice as most researches have focused on physical complications in the postpartum period. The postpartum period is a time span of 6 weeks after childbirth and is a period of great happiness for the mother and the entire family, and it marks a transition phase in the life of the mother at physical, mental, social, and emotional levels, especially of an underprivileged community, which needs to be addressed for the health of the mother. This research aims to study the impact of gender of the baby on the HRQoL of postpartum women at 6 weeks. The World

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Health Organization describes the postnatal period as the most critical and yet the most neglected phase in the life of women where most maternal and newborn deaths occur during this period.[2] De Tychey *et al.* in France (2003) studied quality of life, postnatal depression (PND), and gender of the baby using Medical Outcomes Study Short Form 36 Health Survey and found that PND and male baby strongly reduce all dimensions of quality of life in postpartum women.[3] In a country like India where prevalence of malnutrition, poverty, illiteracy, and poor health-care services is common, providing postpartum support to the mother is of utmost importance. HRQoL is an important indicator of the quality of health care.[4] Quality of life is a broad and a complex concept which is defined as an individual's perception of their position in life in relation to the culture and value systems, their goals, expectations, standards, and concerns.[5] A systemic review done in South Asia showing higher mortality among female neonates due to differences in care-seeking behavior as socioeconomic and cultural norms give greater preference to boys over girls.[6] Moreover, women who already have a female child face greater stress because of male child preference in the family and thus putting the mother at risk of depression in the postpartum period. This study aims to evaluate the gender of the baby as a predictor affecting the quality of life of postpartum women. Furthermore, paucity of literature and dearth of community-based research in the aspects of quality of life among postpartum women in the study area and largely in India is also one of the major concerns being addressed through this study.

MATERIAL AND METHODS

A community-based cross-sectional study was conducted in a resettlement colony located in Delhi, India. The area is divided into 11 blocks with a total population of 25,754 with 4596 eligible couples in 4302 households. The study was carried out from November 2018 to March 2020 postpartum women in the age group of 15–49 years who delivered in the year 2019 were the study participants. The study subjects were asked questions, and the data were collected in the 6th week of postpartum period. The study area was visited before planning the study, and it was observed that the blocks of the area had multifarious distribution of population according to social class, religion, economic standards, health perceptions, and health-seeking behaviors.

Enrolment of study subjects was started by registration during antenatal period during the third trimester from the registers of ASHA/Anganwadi workers. The sample size was calculated within 95% confidence limit, where N is the required sample size, σ is the standard deviation (SD), and d is the precision. Based on SD of HRQoL = 22,[7] precision (d) = 2.5 at 95% confidence interval, and power of 80%, calculated sample size is 298. While calculating the sample size, the non response rate or loss to follow up rate was taken as 10%. The calculated minimum sample size is 328. A total number of 330 study subjects were included in the study.

A predesigned, pretested, and semi-structured interview schedule was used in the form of a questionnaire in the study. The questionnaire consisted of three parts. Part I included general information of the subjects. Part II consisted of maternal and child health factors in antepartum, intrapartum, and postpartum periods. Part III included a standardized questionnaire, namely the Medical Outcomes Study Short Form 36 Health Survey that was used in this study for information related to HRQoL, followed by general physical examination of the study subject. The scoring of SF-36 was done according to the SF-36 Health Survey Manual and Interpretation Guide.[8]

Data analysis and interpretation

Data collected in the proforma were coded, entered, and analyzed using the IBM SPSS Statistics 25 SPSS Inc. released in 2017. All quantitative observations were analyzed using the Chi-square test, unpaired *t*-test, and analysis of variance (ANOVA), and $P < 0.05$ was considered to be statistically significant.

Ethical considerations

The study protocol was approved by the Institutional Ethical Committee, Lady Hardinge Medical College, New Delhi. Written consent was taken from the study subjects in the language that they understood before the administration of the study questionnaire. The privacy and confidentiality of the study subjects was maintained.

RESULTS

Among the 330 women taken as study subjects, 50.9% of women gave birth to male babies and 49.1% delivered female babies in the present pregnancy and the study subjects with birth of a male baby had a better mean HRQoL score of 66.9 ± 19.1 in comparison to the birth of a female baby (61.8 ± 19.4). The difference was found to be statistically significant, unpaired test ($P < 0.05$) [Table 1].

Among the study subjects, 64 subjects had male preference for their child in the present pregnancy while 80.6% had no gender preference [Table 2].

The mean score of 8 domains of HRQoL using SF-36 (8) for male and female genders of the baby was observed

in postpartum women at 6 weeks. The study subjects who delivered a male child had a higher mean HRQoL score under all the domains as compared to a female baby. The mean scores of general health (72.3 ± 23.5), vitality (56.6 ± 15.0), social functioning (64.3 ± 16.9), and mental health (70.5 ± 14.7) were significantly less in the case of a female newborn child. The abovementioned associations were statistically significant, ANOVA ($P < 0.05$) [Table 3].

DISCUSSION

Women form an important pillar of society, and they are the primary caretaker of children in every country of the world. Therefore, improving the well-being of women is an important public health goal for India. The preference for a male child and the gender issues are found to be deeply rooted in the Indian society which is ideologically motivated and has started shedding its presence off lately. The socioeconomic stigma attached to the birth of a female child is a matter of concern because it impacts the quality of life of a new mother. The male preference in the family and such socio-cultural issues and gender biases often make pregnancy a stressful experience as well as stress in the postpartum period. It affects the mental health domain of health related quality of life score, as in the present study. The findings of the current study showed that the birth of a male baby had a significantly ($P < 0.05$) better mean HRQoL score in comparison to the birth of a female baby. The male dominance in the Indian culture is often associated with financial supremacy of the males along with the system of family lineage culture leading to a gender based risk factor leading to poor health related quality of life. In a similar study by De Tychey *et al.*[3] in 2003 using SF-36 in France, the findings were incongruent with our study as these countries have sociocultural, economic, and demographic differences. They observed that the birth of a boy reduced several dimensions of the mothers' quality of life which was opposite to the results of our study. The birth of a male baby showed a significant effect on the domains of HRQoL of the mother in the postpartum period at 6 weeks in our study. Significantly reduced scores of vitality, social functioning, and mental health are evidence of the reality of sex bias among the people which these child mortality, education, health, and nutrition among the female gender.[9] Patel *et al.* (2002) interviewed postpartum women at 6–8 weeks and 6 months after childbirth in Goa, India, and observed that the gender of the infant was highly related to PND and the risk was significantly greater on the birth of female gender. According to a study on gender discrimination in India[1] (Parvathi S, 2020), the preference of a male child among the Indian population is not only averting a female child from being born but also causing higher mortality among the newborn girls as the death rate among the girl children under 5 is more than that of the male child. In spite of advancements in the world, even today, the girl child is discriminated in most of the Indian families. Following the sociocultural norms, the birth of a male child is celebrated with boundless enthusiasm whereas the birth of a girl child is received with consternation and distress among the family members. Women are usually blamed for the birth of a female child which eventually adversely affects their quality of life and health. In our study, the presence of male preference among the study subjects was 19.4%, but there was also a significant effect of gender of the baby on the quality of life of the mother as birth of a male baby had a better mean HRQoL.[9] Patel *et al.* (2002) also concluded that the women who already have a female child face greater stress because of their wish that their new infant should be a boy. Male preference could also be related to the fact that mothers are usually blamed for the birth of a female child, which explains our study where the mental health, vitality, and social functioning scores were reduced, thereby reducing the quality of life of the

Table 1: Distribution of mean health-related quality of life score of the study subjects according to the gender of the baby

Gender of the baby	Frequency (%)	HRQoL (mean±SD)
Male	168 (50.9)	66.9±19.1
Female	162 (49.1)	61.8±19.4
Total	330 (100)	64.4±19.4

SD: Standard deviation, HRQoL: Health-related quality of life

Table 2: Distribution of the study subjects according to their male preference in the present pregnancy

Male preference	Frequency (%)
Yes	64 (19.4)
No	266 (80.6)

Table 3: Distribution of average health-related quality of life scores of study subjects for various domains and modes of delivery

Domains of HRQoL (SF-36)	Gender of the baby (score at 6-week postpartum period), mean±SD		*P*
	Male	Female	
PF	66.3±28.0	61.2±28.5	0.104
RP	50.7±41.3	42.9±42.5	0.09
BP	59.0±22.4	55.6±21.2	0.159
GH	78.4±21.7	72.3±23.5	0.015
VT	60.6±14.9	56.6±15.0	0.015
SF	68.4±16.7	64.3±16.9	0.025
RE	77.0±39.9	70.6±42.7	0.16
MH	74.7±13.9	70.5±14.7	0.008

SD: Standard deviation, PF: Physical functioning, RP: Role physical, BP: Bodily pain, GH: General health, VT: Vitality, SF: Social functioning, RE: Role emotional, MH: Mental health, HRQoL: Health-related quality of life, SF-36: Short Form-36

mothers. The stress due to cultural norms of the society, marriage expenses in future, and social pathologies such as dowry and violence against women also possess as a stressor to the new mothers and the family members. The perinatal period is considered to be the most vulnerable and critical and yet the most neglected phase in the lives of mothers and babies which, on the other hand, is the most suitable for impactful interventions. It can be used for creating awareness, imparting knowledge regarding the importance of quality of life, meaning of quality in health care, availability and utilization of health-care services, and rising against various social concerns and issues faced by this vulnerable gender during pregnancy and the postpartum period. Early age marriages and pregnancies have always posed a threat to the health and development of a female which affects their quality of life and thus needs an advocacy by not only health-care providers but also the social sector leaders and experts. These factors and expectations for a particular gender usually result in poor quality of life of a female which is purely based on societal and cultural pressures. Our study thus demonstrates the need for further consideration of sociocultural factors across communities and cultures for equity among all the genders.

CONCLUSION

This study demonstrates the need for further consideration of socio-cultural factors across communities and cultures for quality in health among all the genders to achieve universal health coverage.

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Nil.

Conflicts of interest

There are no conflicts of interest.

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Original Article

What brings people to government urban primary care facilities? A community-based study from Delhi, India

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Abstract

Introduction: Mohalla or Community Clinics of Delhi, India, provides free primary care services to the general population, with special focus on the underserved and marginalized. This study was conducted to analyze the perception and experience of target beneficiaries and to understand and document the determinants of people visiting these clinics.

Material and Methods: A community-based study was conducted from October 2019 to April 2020. A semi-structured questionnaire was used for data collection. Correlation and comparative analysis were used. Thirty-seven Mohalla Clinics and their catchment areas were visited. A total of 391 respondents (including 35 health staff and 356 community members) were included.

Results: Proximity of clinics, waiting times, age, perceived quality of treatment, and cleanliness at facilities were the factors that influenced the usage of clinics. Lack of first-aid facilities and long waiting time (at a few facilities) were identified challenges. There is a need for wider publicity and awareness about the clinics and regular analysis of data to determine an appropriate mid-course action to further increase utilization.

Conclusion: Community Clinics of Delhi, India, have brought people back to government primary healthcare (PHC) facilities. The popularity of these clinics has encouraged a number of Indian states to set up similar facilities. The factors behind their success need to be studied in detail to derive lessons for making urban PHC accessible in other low- and middle-income countries.

Keywords: COVID-19, India, Mohalla Clinics, primary healthcare, public health, universal health coverage

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INTRODUCTION

Mohalla or Community Clinics were launched in Delhi, India, in July 2015, with one of the stated aims to provide quality primary care services to poor and underserved urban population communities closer to their doorsteps.[1,2] Soon after the launch, these clinics witnessed higher footfall of target beneficiaries than the other existing health facilities.[3] The details on design and concept behind have already been published in peer-reviewed journals in the past.[1,2,4] Encouraged by the response, the state government of Delhi had expanded the facilities in 4½ years after the launch of the first clinic. By the beginning of 2020, before COVID-19 pandemic-related disruption of health services started, there were 480 functional Mohalla Clinics

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in Delhi, India.[5] By early 2020, more than a dozen Indian states or cities had either started or were planning to set up community clinics.[6,7] As the state governments were planning to scale up and launch similar clinics, this study was planned to understand the perception and experience of target beneficiaries (about these facilities) and to analyze and document the learning for further improvement.

MATERIAL AND METHODS

This was a community-based cross-sectional study conducted from October 2019 to April 2020, with primary data collection in October–November 2019. Eight of the 11 administrative zones in Delhi were selected purposively. To ensure representativeness, five sampling units from each of eight zones were included. Within each zone, the study units were purposively selected to ensure a mix of both densely and sparsely populated areas. In each zone, urban localities within proximity (i.e., within a 1 km radius) to a Mohalla Clinic were selected. In each sampling unit, 10 respondents were interviewed.

Data collection and study tools

Two separate questionnaires – one for the residents and another for the doctors/healthcare workers staff – were developed and pretested in the study settings. The questions were focused upon health conditions for which people were seeking care, on time taken to reach the clinic and being attended by a doctor, whether medicines were dispensed, and other related aspects, in line with the objectives of the study. All interviews were started with informed consent of the respondents, and anyone who refused to participate was excluded. Data was entered in Microsoft excel sheet and analysis was done using IBM SPSS version 21. The study was approved by Institute Ethics Committee of the research institute.

Statistical analysis

Averages, percentages, correlation, and comparative analysis were used for data analysis, as per the stated objectives.

RESULTS

A total of 391 respondents (356 community members and 35 were doctors and other health staff at Mohalla Clinics) included in the study. The average age of the respondents was 41.6 years, 49% were males, while 82.2% were from the low-income groups [Table 1]. Ninety three percent of the respondents were aware of the location of Mohalla Clinics and 73.5% of the respondents had ever visited a clinic at least once. Awareness about the clinics increased with the age of the respondents, and around 97% of the respondents aged above 40 years were aware of these facilities [Table 2]. Most reported to have received services within 1 h, and around 17% of the respondents reported waiting time between 1 and 2 h.

Nine of every 10 respondents found doctors to be cooperative and gave an average rating of 4.1 out of five. Forty-nine percent of the respondents had at least one test conducted from these clinics, and more women were advised to undergo a test than men (55% for women vs. 41% in men). Three-fourth of all respondents reported that they had access to clinics within 10 min of walking distance.

The government had announced providing a tablet to each Mohalla Clinic for record-keeping; however, only 18% of facilities had any such tablets. Majority of these clinics maintained a register for record-keeping. Cleaning and sanitation of facilities was rated as good, by respondents, in most of the clinics; with the exception of a few clinics that were poorly maintained. At a few places, toilet facility for patients was not available. It was noted that the poorly maintained clinics had lower average daily visits having a negative correlation. The average waiting time decreased considerably, with an increase in the staff having a negative correlation of −0.632. Even the slightest difference in average staff strength resulted in a dramatic change in the waiting time. Around 90% of the zones which had an average staff strength of 4 had average waiting times between 15 and 20 min, while all zones with average staff strength less than 4 had waiting times upward of 25 min. The average age of the patients was found to be positively correlated with the number of visits [Table 3].

DISCUSSION

The provision of primary healthcare (PHC) services through community clinics with doctors, nurses, and other staff as health team, for every 2000–7000 population, is a widely practiced norm in many countries.[4,8-11] However, in India, one urban PHC facility is located or available for every 50,000 people.[8,12] Therefore, setting up Mohalla Clinics in Delhi increased the availability of health facilities with doctors fivefold. The selection of the sites for these clinics was also in those areas which were underserved till then. This increased the availability and accessibility of health services by poor and underserved people. This indicates that the provision of the health services as per the needs of the population and closer to the people can result in increased utilization and bring people back to government healthcare facilities.

The study found sustained high attendance at nearly all the clinics. However, the sustained and high demand for

Table 1: Descriptive information and profile of respondents in the study

Particulars	North	South	East	West	Northeast	Northwest	Southeast	Southwest	Total
Number of localities visited	4	6	6	5	4	5	3	4	37
Total number of respondents	30	56	69	76	21	52	26	26	356
Number of males interviewed	12 (60)	12 (21)	44 (63)	37 (49)	7 (33)	19 (36)	20 (77)	9 (34)	169 (49)
Awareness about Mohalla Clinics	26 (86)	54 (96)	66 (95)	73 (97)	17 (81)	50 (96)	22 (84)	24 (92)	332 (93.5)
Respondents who visited a Mohalla Clinic ever	22 (73)	42 (75)	54 (78)	58 (77)	13 (62)	39 (75)	16 (61)	17 (65)	261 (73.5)
Average number of visits in a year	5.7	3.39	4.58	4.85	2.71	3.48	2.58	3.23	4.18
Average number of patients on each Mohalla Clinic per day	183	110	150	128	135	95	35	165	128

Note: Values in brackets represent the percentages

Table 2: Awareness and utilization of Mohalla Clinics by different age groups

Indicators	Gender	0-40 years	40-60 years	Above 60
Awareness about Mohalla Clinics	Male	88.79	96.77	100
	Female	92.98	97.82	95
Visited a Mohalla Clinic	Male	61.20	69.89	85.71
	Female	87.71	82.60	85
Average number of visits	Male	4.54	4.90	5.75
	Female	5.12	5.59	5.32
Most common Medical complaints	Both genders	Fever/cough/cold, thyroid, body ache	Fever/cough/cold, sugar/diabetes	Sugar/diabetes, fever/cough/cold

Table 3: Correlation between average age of patients and average visits

Zone	Average age of respondents (X)	Average visits/patient/year (Y)	X−x	Y−y	(X−x) (Y−y)	(X−x) ^{2}	(Y−y) ^{2}
North	36.67	7.75	−4.2163	2.535	−10.6882	17.7768	6.4262
West	36.67	6.09	−4.2163	0.875	−3.6892	17.7768	0.7656
East	46	5.78	5.1137	0.565	2.8892	26.1504	0.3192
South	40.25	4.43	−0.6362	−0.785	0.4994	0.4048	0.6162
Northwest	40	4.55	−0.8862	−0.665	0.5894	0.7854	0.4422
Southwest	35.5	4.82	−5.3862	−0.395	2.1276	29.0116	0.1560
Northeast	42	4.27	1.1138	−0.945	−1.0524	1.2404	0.8930
Southeast	50	4.03	9.1137	−1.185	−10.7998	83.0605	1.4042

The calculation for the correlation between average age of the patient and the average visits, where. x: Mean of X, y: Mean of Y;
Correlation: $-20.1240/(\sqrt{176.2067} \times 11.0226) = -0.4566$

services and the high average attendance at many of these clinics in due course meant that there was an increased waiting time for people attending the facilities. This had countered one of the advantages of these clinics, which was of reduced waiting time and early access. Recognizing the challenge, the state government made the facilities with average daily attendance of 150 or more per day into two shifts per day, with separate staff for each shift.[13] Such approach is indicative of responsiveness of policymaking to meet the needs of the people. The fact that majority of the people who started visiting a Mohalla Clinic were earlier attending private (formal or informal) healthcare providers indicates that if health services are provided by the government with assured provision and good-quality services, people would start the using these services.

The utilization of Mohalla Clinics has been higher among the older people as in line with the fact that majority of health conditions increase with age. Moreover, distance and long waiting time discourage older people from attending healthcare facilities. Therefore, these clinics are partly addressing health needs of elderly and women, who otherwise are dependent upon adult members of family for decision-making on health needs.

There is still untapped potential through these Mohalla Clinics. As an example, the need for mental health services in India is increasingly being recognized, which has been further increased after COVID-19 pandemic.[12] Most of the mental healthcare services are available at larger facilities and specialty centers in large towns.[14] In the absence of sufficient services, the pathway adopted by patient is long and start with informal and unqualified providers.[15] Similarly, the urban migrants and underserved have informal employment and are at risk of occupational and environmental health challenges.[16,17] Yet, services for these are not available closer to the people and primary care providers have not adequately been trained and equipped in offering such services.[18] A number of countries such as Thailand and South Africa in recent years have rapidly expended the delivery of occupational and environmental health services through primary care system services.[17] As other states consider such clinics, the provision of such

specialized services of mental health and occupational health should be considered through these primary care facilities.

One of the impacts of these clinics has been that a number of Indian states have started a variant of community clinics[3,4,19] or started on other initiatives to strengthen PHC.[20] As an example, soon after the release of India's National Health Policy 2017,[21] to strengthen PHC system, an initiative by the name of Health and Wellness Centre (HWC) was launched in April 2018.[11] This aims to extend the package of services and mental health services through PHC system.[11] Therefore, both HWCs and Mohalla or other community clinics in India are important opportunities to expand and deliver a wide range of occupational and environmental health-related services, as per the health needs of a specific population. Both initiatives also focus upon nonmedical needs such as cleanliness of facilities, proper waiting areas, running water, and clean toilets for use by the patients as well. This will make health services responsive and has potential to increase the use of government PHC facilities in India.[22]

Yet, community clinics are not without limitations and challenges. There are areas for further improvement, which should be given attention for corrective measures. These include the need for rationalization of workload, attention to improve the quality of service, wider publicity and awareness in local communities to increase the use, and regular analysis of data to determine an appropriate mid-course action.

While conducting a literature review, it was found that there is very limited primary research and assessments on Mohalla Clinics of Delhi and other community clinics in India. One aspect is that health systems and policy research in India are often underfunded, and at times, there is limited and insufficient expertise. This, on the one hand, underscores the need for establishing institutional mechanisms for such research. Alongside, it is proposed that while starting such clinics, the policymakers and program managers should proactively make provision of funding for conducting assessment and evaluation of new policy initiatives to support evidence-informed decision-making. The lack of research on primary care initiatives can also be due to the factor that most of the research capacity is based at tertiary-level facilities and academic institutions and the physicians working in PHC are not always involved in the health research. The capacity building of PHC providers in design and implementation of health services and research through institutional mechanisms needs to be streamlined and sufficiently funded.

The importance of the community clinics as hub for PHC services was further recognised when in the ongoing coronavirus (SARS-CoV-2) or COVID-19 pandemic has been extensively recognised. These facilities had played an important role and points of entry for many patients to healthcare services as well as to offer the COVID-19 testing services as well.[23] However, 2 years into the COVID-19 pandemic, as all other services had been disrupted, some of the functioning of Mohalla Clinics had been disrupted. This is a reminder that we also need rework and strengthen all type of health facilities and services.

CONCLUSION

Community Clinics of Delhi, India, are making health services available, accessible, and affordable for poor and marginalized. These facilities have resulted in increased utilization of government primary care facilities by many of the people who were earlier attending private (formal or informal) providers. Part of higher utilization of these government facilities can be attributed to these being responsive to the health needs of population. These facilities could be a good model for urban settings in other low- and middle-income countries.

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Conflicts of interest

CL was a staff member of the World Health Organization (WHO) at the time of completion of this study. The views expressed in this article are personal and do not necessarily represent the decisions, policy, or views of WHO. Other two authors (TA and SB) have no conflicts of interest.

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Original Article

Evaluation of palliative care training program for medical interns in a tertiary care teaching hospital, South India

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Abstract

Introduction: The Department of Community Medicine has been training medical interns for providing hospital-based palliative care (HBPC) and community-based palliative care (CBPC) services with an interprofessional team. This study was done to evaluate the training program on palliative care developed for medical interns.

Material and Methods: It was a retro-pre type of program evaluation done among 172 interns between January 2016 and December 2017. One day program was conducted for the interns by faculty trained in palliative care, followed by placement in HBPC and CBPC program. At the end of training, self-perceived improvement in knowledge was collected on a five-point Likert scale. Certificates were issued on completion. Data were entered and analyzed using Epi Info (version 7.2.2.6) software. Wilcoxon signed-rank test was applied between pre- and post-scores. Manual content analysis was done for open-ended questions.

Results: The mean age of the participants was 22.5 ± 0.8 years, with 76 (44.2%) males and 96 (55.8%) females. There was statistically significant improvement in perceived knowledge scores after attending the training. Areas of learning, values learned, and uses of learning in future career and suggestions for improving the training program were the categories obtained.

Conclusion: The training program improved the self-perceived knowledge on palliative care among medical interns. The exposure to HBPC and CBPC program had a positive effect on their attitude and perceived skills for caring of chronically ill patients. Such programs can be initiated by other palliative care providing institutions for training medical interns.

Keywords: Interprofessional team, medical interns, palliative care, training

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INTRODUCTION

Medical Council of India envisions that an Indian medical graduate should be able to provide palliative care along with preventive, promotive, curative, and rehabilitative care.[1] The training of medical interns is important since they are expected to function as primary care doctors, and they face challenges in managing chronic pain and in communication skills.[2] There is an avoiding attitude among them regarding death or breaking a bad news.[3] This is due to lack of formal training during the undergraduate period. The major domains proposed for palliative care training include basics of palliative care, psychosocial and spiritual,

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ethical and legal, communication skills, teamwork, and professionalism.[4] The Attitude, Ethics and Communication module introduced in the undergraduate curriculum has case-based discussions about terminally ill patients and death. It has been implemented from professional year 1 in many medical schools with protected time slots.[5] This has created an opportunity to train medical students on attitude, ethics, and communication skills for caring terminally ill patients and caregivers and discuss scope of palliative care.[5] This requires trained team of faculty to handle small-group teaching sessions. However there is no palliative care training and assessment available for medical undergraduate students routinely. Inclusion of palliative care education in the undergraduate period has shown to improve clinical patient care by imparting knowledge, attitude, and skills for caring of chronically ill patients.[6] We have been training medical interns on palliative care for the last four years. As a part of it, we wanted to evaluate the effectiveness of the structured training program on palliative care developed for medical interns in a tertiary care teaching hospital.

MATERIAL AND METHODS

This study was conducted in the Department of Community Medicine (DCM) in a tertiary care teaching hospital, Puducherry. We have been providing hospital-based and community-based palliative care (HBPC and CBPC) services with a team comprising trained palliative care physician, staff nurse, and medical social workers along with medical interns posted in the department. We provide care for elderly and chronically ill patients in hospital setting through palliative care clinic and in eight villages of our service areas through one home care team. The duration of the study was 2 years from January 2016 to December 2017. It was a retro-pre type of educational program design that evaluated the newly developed palliative care training program with Kirkpatrick level I evaluation framework.[7] In retrospective pre–post design, data are collected at the same point in time (i.e. at the conclusion of training); thus, the ratings of understanding before ("retrospective pre") and after ("post") the intervention use the same metric. This design takes considerably less time than traditional pre–post data collection and eliminates the impact of response-shift bias.[8,9] All the medical interns posted in the department underwent this mandatory training program during the study period of 2 years. Each batch consisted of 18–20 medical interns posted for 2 months. Twelve batches completed the posting in 2 years from 2016 to 2017. Out of the total 205 interns posted, 172 interns completed the training program. Remaining 33 interns could not join the training program. It was 1-day training program conducted in the 1st week of their posting in DCM as described in Table 1. The average attendance on training was 18 interns per batch excluding the absentees. The program consisted of four sessions: introduction to palliative care including communication skills, management of chronic pain, nursing care for bedridden patients, and community participation. Each topic was covered for a period of 60–90 min. The sessions were made interactive, with self-made videos, as well as group activities such as role-play and case-based discussions based on faculty experiences of providing care in hospital and community.[4] The sessions were facilitated by faculty who completed basic certificate course in palliative medicine at Institute of Palliative Medicine, Kerala, and who are involved in the provision of palliative care in the evaluation setting. At the end of 1-day training, a retro-pre feedback form was administered to the study participants. It consisted of six questions to be rated on a five-point Likert scale from 0 to 5 (0 being lowest score and 5 being highest score) before and after the training. It captured the perceived improvement in knowledge of each session before and after attending the training program. The feedback form also included two open-ended questions on what they learned from the training program and how they were planning to apply the learning in their future and suggestions for improving the training program. After attending the training program, the medical interns were placed in the hospital and community to learn the core skills in palliative care under supervision for two months. A completion certificate was given to interns who underwent the training program and the placement. The certification was done in collaboration with Sanjeevan (a joint venture of Sri Aurobindo Society, Puducherry, and Institute of Palliative Medicine, Kerala). Clearance was obtained from the SMVMCH Institution Ethics Committee.

The data were entered and analyzed using Epi Info (version 7.2.2.6) software (Developed by Department of Health and Human Services, Centers for Disease Control and Prevention, Atlanta, Georgia, U.S.A). Frequencies and percentages were calculated for sociodemographic variables. Mean ± standard deviation was calculated for continuous variables and median score for discrete variables. Wilcoxon signed-rank test was applied to find statistical significance between pre- and post-scores. Manual content analysis was done by first and second author for responses of the open-ended questions.[10] Codes were derived from significant text information, and similar codes were grouped together forming categories. Statements within double quotes indicate direct quotations mentioned by the respondents.

Table 1: Plan of the palliative care training program

Objectives of the program: At the end of the posting in the Department of Community Medicine, medical interns should be able to demonstrate basic core skills for providing palliative care in patients with incurable illness and elderly				
Domains of learning	**Teaching-learning methods**	**Assessment and feedback**	**Program evaluation**	**Certification**
Cognitive s	Interactive small-group sessions using videos, case discussions	History taking from patients followed by feedback	Retro-pre feedback	Issued in collaboration with Sanjeevan
Affective	Direct observation of care in hospital and community setting	Reflective writing at the end of the posting followed by feedback		
Psychomotor	Involved in providing CBPC and HBPC			
Training team: Interprofessional team trained at Institute of Palliative Medicine, Kerala				

CBPC: Community-based palliative care, HBPC: Hospital-based palliative care

RESULTS

A total of 172 students completed the training program. The mean age of the participants was 22.5 ± 0.8 years. There were 76 (44.2%) male and 96 (55.8%) female medical interns. The median (IQR) perceived score for knowledge on introduction to palliative care increased from 2 (1–3) before training program to 4 (4–5) after training program ($P < 0.05$). The median (IQR) score on chronic pain management was 2 (2–3) and 4 (4–5) before and after the training program, respectively ($P < 0.05$). There was a statistically significant improvement in the median score on knowledge about community participation ($P < 0.05$). The median score for knowledge on nursing care improved from 2 (1–4) to 4 (3–5), and the difference was statistically significant ($P < 0.05$). The pre- and post-median score for the overall usefulness of the training program was 2 (2–4) and 5 (3–5) which was statistically significant ($P < 0.05$) [Table 2]. Three categories emerged from the content analysis, namely, areas of learning, values learned, and uses of learning in future career and suggestions for improving the training program. The five codes under areas of learning were scope of palliative care, chronic pain management, nursing care, community participation, and communication skills. Regarding scope of palliative care, study participants mentioned that they learned the importance and need for palliative care, how to identify a patient who needs palliative care, and when to initiate care. They were able to understand the psychological, social, and spiritual problems faced by patients other than physical problems. The medical interns expressed the need for good pain management for patients with chronic incurable illness, and they said that they learned rational prescription of medications for the management of chronic pain according to the World Health Organization analgesic ladder. They felt happy that they were taught how to provide nursing care for bedridden patients and nursing care for fungating wound and ostomy. They understood the roles and responsibilities of the community in helping people with incurable illness and problems faced when working in the community. Under the code on communication skills, one participant said, "I learned that good words and care are more powerful than medicine." The study participants were able to appreciate the importance of communication skills while talking to a patient with incurable illness or their family. They could appreciate listening skills, value of spending time talking with patients, and ways to provide emotional support and breaking bad news. Attitude, empathy, and confidence were the codes derived from the category "values." They felt that they developed caring attitude toward old people and patients and willingness to help them. One participant mentioned that "I feel really guilty that what I have been prescribing for pain so far was not entirely right." They expressed that the training program enabled them to empathize with patients and made them confident to care for old people. There were six codes under uses of learning in future career, namely, to undergo further training, to offer financial support, volunteering, provision of palliative care, and caring family and friends. Many participants expressed their interest to attend further training in palliative care through workshops/courses/fellowship after their internship period. The participants were willing to offer financial support to patients and family facing difficulties in accessing their basic needs. A large number of them realized this opportunity as their social responsibility and willingness to volunteer to support patients in their own community. One participant mentioned that "I would like to spend some time with old age people as a volunteer" and another participant said that "I realized my responsibility as a human being now." The participants said that the

Table 2: Perceived improvement of knowledge on palliative care by medical interns before and after the training program, (n=172)

Variable	Median (IQR)		$P^{\#}$
	Before the training	After the training	
Introduction to palliative care	2 (1-3)	4 (4-5)	<0.001*
Chronic pain management	2 (2-3)	4 (4-5)	<0.001*
Community participation	2 (1-4)	4 (3-5)	<0.001*
Nursing care	2 (1-4)	4 (3-5)	<0.001*
Learning from this program will be useful for me	2 (2-4)	5 (3-5)	<0.001*

$^{\#}P$ value based on Wilcoxon signed-rank test, *P value statistically significant. IQR: Interquartile range

knowledge gained from this training program would help them to take care of their own parents, grandparents, and neighbors and would want to share this knowledge with everyone. The participants suggested for increasing the duration of the training program, to use more videos and pictures, to provide hand-outs/reading materials, and to introduce this training program before internship [Table 3].

DISCUSSION

The present study found perceived improvement in the knowledge of palliative care among medical interns after attending the training program. Analysis of qualitative data revealed that the program improved their knowledge, attitude, and percieved skills to care for patients with advanced diseases. The interns suggested that the training on palliative care should be introduced during the early undergraduate period, increasing the duration of the training, and providing them with reading materials. There was a self-perceived improvement in knowledge on palliative care among medical students who underwent the training program in the present study which was similar to the studies done in India and Western countries.[2,11-17]

The training program in the present study included group activities such as role-play and case discussions that were based on the cases seen in our context.[4] This helped them to appreciate the core skills in palliative care better as compared to large-group teaching. The reinforcement of knowledge gained by giving hands-on experience in HBPC and CBPC in the hospital and community, respectively, ensured a suitable environment for learning nursing care, chronic pain management, and communication skills from the home care team.[18,19] The exposure also positively influenced their attitude toward suffering people. They were exposed to work as a part of the interprofessional team in providing care for patients under supervision. This training program was later integrated with the mainstream orientation program conducted for medical interns in DCM. We have evaluated the CBPC services in our field practice villages 2 years after its implementation. The results showed that medical interns found the 1-day training program during the start of internship useful in providing care for patients needing palliative care. It was reassuring to learn that medical interns had gained hands-on experience in providing care, especially pain management, nursing care,

Table 3: Content analysis of responses for open-ended questions obtained from the medical interns

Categories	Codes	Statements
Areas of learning	Scope of palliative care	How to identify patients who need palliative care
		When to initiate care
		Importance and need for palliative care
		Psychological, social, and spiritual problems faced
	Chronic pain management	WHO analgesic ladder for chronic pain management
		Rational prescription of pain medications
	Nursing care	How to take care of bedridden patients, patients with fungating wound, ostomy care
	Community participation	Roles and responsibilities of community in helping people with incurable illness
		Problems faced in working in community
	Communication skills	Basic skills to talk to a patient/family caregivers
		Do's and don'ts while interacting with a patient
		Counseling skills
		Breaking a bad news
		Emotional support
		Spending adequate time
		Active listening to problems of patients/family
Values	Attitude	Developed caring attitude for patients with incurable illness and elderly people
		Got rid of fear towards such patients
		Kindled interest to learn more
		Willing to extend help in every possible way
		Regret mistakes in wrong pain medication prescribing practices
	Empathy	Able to understand the problems faced by patients/family
	Confidence	Developed confidence to provide care for geriatric patients
Use of learning in future career	To undergo further training	Interested to undergo further training/courses/degree in palliative medicine
	To offer financial support	Support patient/family financially for basic needs/medicines/medical care
	Volunteering	Willing to spend free time to help patients
		Provide basic medical and nursing care
		Social responsibility
	Provision of palliative care	Want to provide holistic care to all patients
	Caring family and friends	To learn more to provide palliative care to my family/relatives/neighbors
	Sharing experience	Want to share knowledge with my juniors/friends/community members
Suggestions for improving the training program	Time	Allocate more time for training program
		Use more videos and pictures
		Early introduction of training program before internship
		Provide handouts

and communicating with patients and family. The medical interns voluntarily contributed some items such as walking stick and bedpan for patients who could not afford. They were able to appreciate the role of community participation and emotional problems of patients while working with the home care team. The home care enabled medical interns to work as a part of an interprofessional team during home care visit.[18,19]

The strengths of the study were that the training program was followed by hands-on exposure in the hospital and community, sessions being handled by trained faculty, small-group activity on topics, and sharing real patient experiences. It was a one-time evaluation of the training program, and absence of objective structured clinical examination assessment for clinical competencies acquired were the limitations of the study. We also did not have a control group who did not attend the training program to help us compare the study findings.

CONCLUSION

Overall, the training program was well received by the medical interns. The results of this study helped us to refine the training program. This program can serve as a guide for other medical colleges providing palliative care to train medical interns for caring of elderly people and patients with incurable illness.

Acknowledgments

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Conflicts of interest

There are no conflicts of interest.

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Original Article

Study on occupational ventilatory defects among workers employed in cement factories of Darjeeling district, West Bengal, India

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Abstract

Introduction: Cement factory workers are at a high risk of exposure to crystalline silica-laden cement dusts and at a higher risk of developing chronic obstructive pulmonary disease (COPD), like chronic bronchitis, emphysema and restrictive lung disease like silicosis. This study was done to measure the extent of occupational ventilatory defect among workers employed inside cement factories.

Material and Methods: A cross sectional study was conducted among cement factory workers using questionnaire on respiratory symptoms 1986 and spirometry was done after seeking permission from the concerned authority and Institutional Ethics Committee. Logistic regression analysis was done to test for statistical significance.

Results: Ventilatory defect was present among one fourth of the factory workers. Obstructive type of lung disease was much higher (94.6%) than restrictive lung disease (5.4%). Almost half of the study subjects had presented with different types of respiratory symptoms. Breathlessness on exertion was commonest symptom, followed by cough day and night. Ventilatory defects were noted to be much higher (86.5%) among the workers working in the cement factories for more than 10 years and increasing trend was observed with increment in their age and years of working at the factory. Ventilatory defect were significantly high among smokers (29.5%), subjects who started smoking in early age (35.9%) and there is increasing trend of defects with a greater number of cigarettes intake.

Conclusion: Periodically awareness generation and mandatory use of personal protective equipment should be practiced among workers in cement factories.

Keywords: Cement factory, occupational, ventilatory defect

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INTRODUCTION

Cement factory workers are at high risk of exposure to silica-laden cement dusts during the processes of sanding, grinding, cutting concrete, and emptying of cement bags.[1] Cement particles are respirable and can cause occupational lung disease.[2] Prolonged and repeated exposure to cement dust predisposes workers to various debilitating ailments such as bronchitis, emphysema, and restrictive lung disease[3] and leads to silicosis which presents with

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sudden onset of fever and chest pain along with breathing difficulty,[4] further leading to significant morbidity after few years of exposure at higher concentrations.[5] This study was conducted to measure the extent of occupational ventilatory defect among cement factory workers and the associated factors.

MATERIAL AND METHODS

A cross-sectional study was conducted among purposively selected 150 cement factory workers involved in the processes of sanding, grinding, cutting of concrete, emptying of cement bags, as well as respective office staffs (50 from each) from the three cement factories of Darjeeling district from June to November 2019. Participants with documented clinical records of congenital anomalies and preexisting lung disease were excluded from the study. Information of seven participants was incomplete. The participants after fulfilling the inclusion and exclusion criteria were interviewed. Thus, the researchers could analyze the information retrieved from 143 study subjects.

After getting approval from the institutional ethics committee and from competent authorities, data were collected after obtaining informed consent, maintaining anonymity and confidentiality of the study participants by interview of the participants using Questionnaire on Respiratory Symptoms 1986.[6] Information related to their sociodemographic and personal habits (age, years of working, whether they smoke or not, age when smoking started) was collected.

Spirometry

All spirometry measurements were performed by a trained pulmonology clinical technician. Spirometry test was completed using Spirolab II (Spirolab II, SDI, USA) autocalibrating device. The study participants were first introduced regarding the spirometer principal, operation, and procedure for carrying lung function testing (LFT). Before the test, individual was seated upright in a chair with arms, feet flat on floor with legs uncrossed. Tight-fitting clothing if any was loosened because tight cloth can give restrictive pictures on spirometry (give lower volumes than are true). Dentures were normally left in, unless very loose.[7,8]

A nose clip was used to minimize the loss of air through the nose during the maneuvers. All pulmonary function tests were carried out indoors, between 12:00 and 15:00 h to minimize diurnal variation. The apparatus was calibrated daily. The precise technique in executing various lung function tests for the present study was based on the operation manual of the instrument with special reference to the official statement of the British Thoracic Society of Standardization of Spirometry.[9]

Forced vital capacity (FVC), forced expiratory volume in 1 s (FEV1), FEV1/FVC ratio, and forced expiratory flow rates at different lung volumes (including FEF25%, FEF50%, FEF75%, and FEF25-75%) were measured. At least three acceptable spirograms per subject were collected. An acceptable spirogram was defined as good start of blowing without hesitation, smooth blowing curve without artifacts, and at least 6 s of expiratory duration, or with a plateau >1 s in the end expiration in the volume–time curve.

Calculation of FEV1/FVC allows the identification of obstructive or restrictive ventilatory defects. A FEV1/FVC <70% where FEV1 is reduced more than FVC signifies an obstructive defect. An FEV1/FVC >70% where FVC is reduced more so than FEV1 is seen in restrictive defects.[10]

Data were entered and codified in Microsoft Excel Spread Sheet. Calculation was done with the help of Excel datasheet from Microsoft Corporation and statistical software IBM SPSS version 22 made in Chicago. Relationship between ventilatory defect and its other associated factors was determined by doing multivariate logistic regression with 95% confidence interval, and $P \leq 0.05$ was considered statistically significant.

RESULTS

In the present study conducted among 143 study participants, ventilatory defect was found among 37 (25.9%) of the study participants. Obstructive type of lung disease was more (94.6%) than restrictive type of lung disease (5.4%) among these 37 subjects [Figure 1].

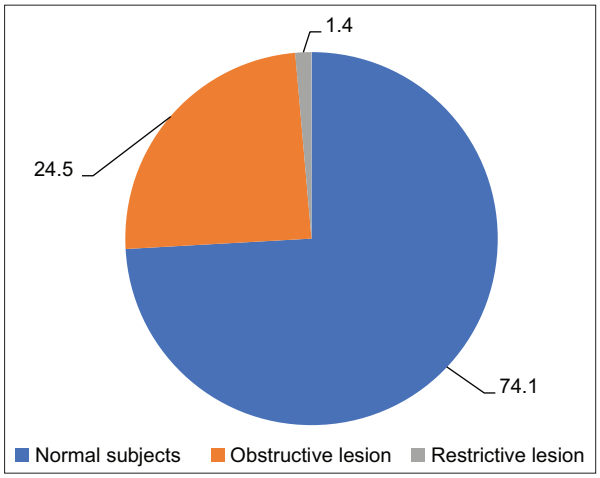

Figure 1: Distribution of the study participants according to their presence and type of ventilatory defect (n = 143)

Almost half (49.6%) of the study subjects had presented with different types of respiratory symptoms which they had faced in the last one year before the data collection period. Twenty two percent of the subjects had history of cough day and night, 21% had cough most of the days in year and had phlegm in winter morning, 37.1% had breathlessness while hurrying, 9.1% had attacks of wheezing in the last 12 months, 4.2 had history of bronchitis, 2.8% had history of pneumonia and pulmonary tuberculosis, and 3.5% had history of bronchial asthma [Table 1]. All these symptoms were found significantly associated with ventilatory defect [Table 2]. Ventilatory defect was noted in much higher proportion among study subjects with increment in their age group, working more than 21 years in the cement factories (48.3%), habit of smoking (29.5%), and started smoking before 20 years of age and who smoked more than 21 cigarettes daily (88%). Except the age group variable, all these variables were found statistically significant association with the presence of ventilatory defect [Table 3].

Table 1: Respiratory symptoms and lung disorders among the study participants (*n*=143)

Variables	Percent
Cough day and night	
Present	22.4
Absent	77.6
Cough most of the days in a year and phlegm in winter morning	
Present	21.0
Absent	79.0
Phlegm most of the days in a year	
Present	15.4
Absent	84.6
Breathlessness on exertion	
Present	37.1
Absent	62.9
Wheezing any time in last 12 months	
Present	9.1
Absent	90.9

TB: Tuberculosis

DISCUSSION

A large section of the labor force in the state of West Bengal is engaged in the cement industry. Most of these labors are casual in nature and are engaged in the industry throughout the year. Due to their type of occupation, they are exposed to high level of silica-laiden particles, causing ventilatory defect among them after long time exposures. It is very difficult to motivate these daily-wage workers for participating in any type of research activities. Even though the prevalence of ventilatory defect tends to vary across studies, determinants and patterns of ventilatory defect are almost similar. The prevalence of ventilatory defect could not be compared across different studies due to their varying nature of definitions used, different questionnaires used, region selected, and methodology adopted. In the present study, the proportion of ventilatory defect was observed among 25.9% of the study participants. Obstructive type of lung disease was more than restrictive type of lung disease. A study conducted in Iran during 2009 revealed significant reductions in FEV1, FVC, and FEV1/FVC among the cement factory workers who were chronically exposed to dust.[11]

Most prevalent symptoms in the current study was breathlessness followed by cough and phlegm.

A study in Ethiopia in 2014[12] revealed that the prevalence of respiratory symptoms was 66.2% in cement factories workers which was higher than the

Table 2: Association of ventilatory defect with various types of respiratory symptoms (*n*=143)

Variables related to respiratory symptoms	Ventilatory Defect		Total	Statistical test, AOR (95% CI)
	Present	Absent		
Morning cough				
Absent	7 (7)	93 (93)	100 (100)	1 (Referent)
Present	30 (69.8)	13 (30.2)	43 (100)	11.122 (2.43–50.95)*
Cough >3 months in year				
Absent	12 (10.6)	101 (89.4)	113 (100)	1 (Referent)
Present	25 (83.3)	5 (16.7)	30 (100)	6.444 (1.35–30.82)*
Phlegm in winter morning				
Absent	14 (12.4)	99 (87.6)	113 (100)	1 (Referent)
Present	23 (76.7)	7 (23.3)	30 (100)	8.484 (2.006–35.87)*
Phlegm most of the days in a year				
Absent	18 (14.9)	103 (85.1)	121 (100)	1 (Referent)
Present	19 (86.4)	3 (13.6)	22 (100)	10.249 (1.56–67.34)*
Shortness of breath on walking				
Absent	22 (17.9)	101 (82.1)	123 (100)	1 (Referent)
Present	15 (75)	5 (25)	20 (100)	11.522 (2.04–65.11)*
Total	37 (25.9)	106 (74.1)	143 (100)	

*Statistically significant. AOR: Adjusted odds ratio, CI: Confidence interval

Table 3: Association of ventilatory defect with profile and smoking related history of the participants (*n*=143)

Variables related to age and smoking history	Ventilatory defect		Total, *n* (%)	Statistical test, AOR (95% CI)
	Present, *n* (%)	Absent, *n* (%)		
Age (years)				
≤20	2 (25)	6 (75)	8 (100)	1 (Referent)
21–40	23 (25)	69 (75)	92 (100)	0.208 (0.01–3.17)
≥41	12 (27.9)	31 (72.1)	43 (100)	0.559 (0.13–2.41)
Years of working				
≤10	5 (7)	66 (93)	71 (100)	1 (Referent)
11–20	18 (41.9)	25 (58.1)	43 (100)	1.321 (0.27–6.42)
≥21	14 (48.3)	15 (51.7)	29 (100)	28.322 (3.98–201.40)*
Habit of smoking				
Absent	1 (4.8)	20 (95.2)	21 (100)	1 (Referent)
Present	36 (29.5)	86 (70.5)	122 (100)	0.029 (0.002–0.47)*
Age when started smoking				
≤20	28 (35.9)	50 (64.1)	78 (100)	1 (Referent)
≥21	9 (13.8)	56 (86.2)	65 (100)	0.138 (0.035–0.54)*
Number of cigarettes smoked/day				
≤10	4 (7.8)	47 (92.2)	51 (100)	1 (Referent)
11–20	11 (16.4)	56 (83.6)	67 (100)	49.748 (7.09–348.66)*
≥21	22 (88)	3 (12)	25 (100)	38.724 (6.48–231.08)*
Total	37 (25.9)	106 (74.1)	143 (100)	

*Statistically significant. AOR: Adjusted odds ratio, CI: Confidence interval

present study findings. Another study conducted in Srinagar revealed that 87%–90% workers of the three factories were found to be suffering from cough, had complaints of chest pains (50%-59%) were complained by 50%-59%, and 41%-51% had asthma.[13] This might be due to some extent of increased use of personal protective measures, geographical differences, and general health awareness.

Ventilatory defect was noted in much higher proportion among study subjects with higher age group, more years of working, and early initiation of smoking. Similar result was noted in the study done in Ethiopia,[12] where respiratory symptoms were higher in ≥45-year-old workers. Smoking was positively associated with respiratory symptoms in cement factories workers.

These results suggest that chronic cement dust exposure impairs lung function. Since protective gears were available, these findings suggest that either compliance to their use was poor or they were ineffective.

Limitations

Selection of participants by purposive sampling could have introduced selection bias. During interview, the participants had to recall few relevant clinical histories. Hence, even after researchers' utmost efforts to exclude bias, presence of selection and recall bias might be there in the present study.

CONCLUSION

Proportion of ventilatory defect was much higher in this part of the country. It is recommended that the cement factory management embark on health education, acquire effective protective gadgets, and enforce their usage. Further, there should be containment of dust emission by use of dust filters.

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Nil.

Conflicts of interest

There are no conflicts of interest.

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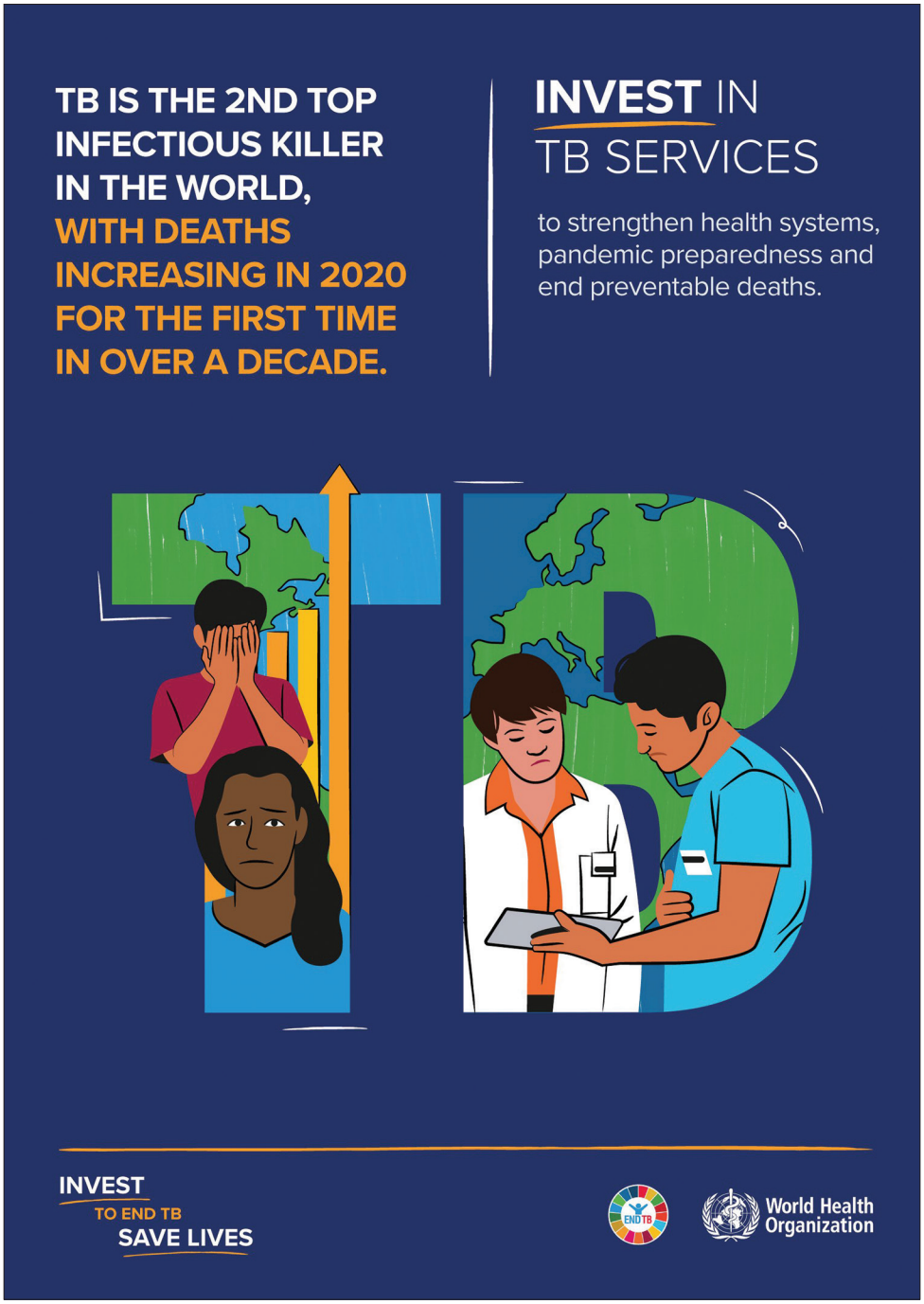

Original Article

Knowledge, attitudes and utilization of food labels among undergraduate medical students in a medical college in Chennai – A cross sectional survey

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Abstract

Introduction: Food labeling is an important method of providing food-related information on the package of food products, to facilitate people's choice of safe and appropriate foods. Medical students are potential agents of change in food label utilization behavior in the community. The objectives of this study were to evaluate the knowledge, attitudes, and utilization of food labels among undergraduate medical students in a medical college in Chennai.

Material & Methods: We conducted a cross-sectional survey of 200 students studying in the 1st to 3rd year in a medical college through an online Google Forms survey, self-administered by the students after online informed consent was obtained. We gathered information on their knowledge, attitudes, and utilization of food labels.

Results: Of 400 students approached, 200 responded to the online survey. They had good knowledge about food labels. Female students had 3.4 (1.59 to 7.25) times better knowledge compared to men. The students had a positive attitude toward food labels, and a majority thought that the food labels are useful. Utilization of food labels to understand the nutritive content (55%), additives (57%), and manufacturer details (47%) was poor. Utilization of food labels was 2.7 times more (1.142–6.587) among those who did regular exercise, and it was 0.2 (0.09 to 0.9) times less among those who were on a strict diet.

Conclusion: Medical students had a sound knowledge and good attitude toward food labels, but their food label utilization patterns were still poor. There is a need to incorporate food labeling in the undergraduate medical curriculum and inculcate better food label utilization behavior.

Keywords: Attitudes, awareness, food labeling, medical students, utilization

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INTRODUCTION

With the vast expansion of urbanization, long work hours, and adaptation to a sedentary lifestyle, there is a surge in the production and consumption of prepackaged foods.[1] Most of these food items contain food labels, comprising trademarks, brand names, nutritive information, pictorial matter, or symbols relating to the foodstuff that are placed on any packaging, document, notice, ring, or

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collar accompanying or referring to such foodstuff.[2] Food labeling is a community-based approach providing information about the nutrient content of a food allowing consumers to make better and healthy food choices. Food labeling is important as it contains all the details about the food item, including the nutritive values, the manufacturing/expiry date, ingredients, vegetarian/nonvegetarian, and the price which guides consumers in choosing the right foods.[3] In India, the Food Safety and Standards Authority of India (FSSAI) is the authority which is responsible for regulating and supervising food safety.[4] There is a global increase in prevalence of noncommunicable diseases such as diabetes, hypertension, and heart diseases.[5] Unhealthy food choices, including increased consumptions of prepackaged and refined foods, are important risk factors for noncommunicable diseases.[6] Food labeling can help consumers keep track of what they eat and hence prevent and control noncommunicable diseases.[2] A few studies have shown that although most consumers have a good knowledge and attitude toward food labels, they do not utilize food labels often.[7] Some consumers find it difficult and complicated to understand food labels.[8] This problem arises due to the lack of nutrition knowledge among the people and failure to use simple words to describe the food product in the labels. Consumers also prefer buying food products based on the taste, quality, convenience of use, and the price rather than on the nutritive value. A few consumers do not practice reading the food labels due to time constraint and desire for certain foods.[9] There are also consumers who believe that food labels do not make truthful claims about the nutritional value of the food products.[10] Studies also show that women utilize food labels more frequently than men.[11]

As future doctors, undergraduate medical students must have a sound knowledge and understanding about healthy eating, food labels, and appropriate utilization of food labels. This sound knowledge will help them advise appropriate utilization of food labels to their future patients and hence act as agents of change in the community. Appropriate utilization of food labels will also help them lead a healthy life. This study was designed to assess the awareness of medical students, their attitudes, and their utilization of food labels in a medical college in Chennai.

MATERIAL & METHODS

We conducted the study among undergraduate students studying in a medical college in Chennai, which is established as a part of an autonomous corporation under the Ministry of Labour and Employment, Government of India. The institution provides undergraduate courses, postgraduate courses, and research facilities. The participants involved in the study were undergraduate medical students in the 1st, 2nd, and 3rd years of M. B. B. S course. Food safety, food hygiene, and food regulation are taught as a part of Community Medicine curriculum across the 1st to 3rd year of MBBS. Therefore, these 3-year students were sampled.

Sample size was calculated as 280 participants, using the formula N = (4 × p × q)/d^2, where *P* = 40 (assuming that 40% of the students have a good awareness about food labeling in India[12]) and d = 15% of *P* for a 95% confidence level. We got a sample size of 266.6 which we rounded off to 280. We sampled the required students by convenient sampling method. We approached the students during their lecture with permission from the teaching faculty. We shared the link to the Google Form questionnaire with the class representatives of each class, after explaining the details of the study. The class representative then shared the link in the social media group of the class. Students were encouraged to respond to the questionnaire. We sent a reminder to the class representative after 1 week. We gave one more weeks' time for the students to fill out the questionnaire and then closed the data collection.

The questionnaire contained five sections:

1. Student information, including name, age, height, weight, year of study, any food allergies, and questions pertaining to lifestyle, i.e., whether they are trying to lose weight, doing regular exercising, and following a strict diet
2. Content and format of food label: There were questions formed based on the FSSAI packaging and labeling regulation (2011) to assess the general knowledge about food labeling and the FSSAI
3. Utilization of food label: A table was formed with details present in the label of the food product, and the student had to tick which of the details he/she practiced looking into and how often, for example, the expiry date, FSSAI logo, ingredient list, and nutritional information. Ticking was done under the headings "always," "often," "sometimes," "rarely," and "never"
4. Attitude: The questions framed evaluated the attitude of the student toward food labels. The Likert scale used allowed the student to choose the level of agreement he/she had with each statement, for example, whether one believes that food labels can help people with health conditions (i.e., hypertension and allergies) to look out for ingredients to avoid, regulate calorie intake, etc.

The questionnaire was reviewed by experts in community medicine and public health and content validation was done.

We analyzed the data using the Statistical Package for the Social Sciences (IBM SPSS Statistics for Windows, Version 21, Armonk, New York; IBM Corp) software.[13] We described the characteristics of the study population using frequencies and percentages. We computed scores of knowledge, attitude, and practices related to food labels by adding the individual responses to the questions under each domain. Based on the mean score, we categorized people as having good and poor knowledge, attitude, and practices related to food labels. We then used multiple logistic regression analysis to study the factors influencing good knowledge, attitude, and practices. We entered age, sex, body mass index (BMI), year of study, whether they were on a diet, whether they were exercising, whether they were trying to get into shape, and whether they suffered from any specific food allergies in the model to identify the factors influencing the knowledge, attitude, and practices. We used $P < 0.05$ to indicate statistical significance.

The study was approved by the Institutional Ethics Committee of the ESIC Medical College and PGIMSR, KK Nagar, Chennai, with the IEC No. IEC/2019/2/23 on October 30, 2019. Informed consent was obtained from all the students through the online Google Forms by clicking an icon to indicate consent to participate in the study. All personal identifying information related to the students were kept confidential. The digital data were saved in password-protected files, and only the researchers had access to the data.

RESULTS

We approached a total of 400 students through the class representatives. Out of this, 200 responded to the questionnaires with a response rate of 50%. The characteristics of the study participants are shown in Table 1. About 25% were below 19 years of age, and more than 60% were girls. There were more respondents from the 1st & 3rd year than the 2nd year. Only 21% were doing regular exercises and 9% were following a strict diet. About 17.5% were overweight and 3% were obese.

The participants had good knowledge regarding food labeling and the rules for appropriate food labeling followed by the FSSAI. Hundred twenty eight (64%) participants knew that health claims or risk reduction claims should not be present on the label of food packaging. A majority i.e. 171 (85.5%) participants have correctly picked out the color of the symbol on the food label which is green for vegetarian and brown for nonvegetarian. The knowledge on exact objectives of the FSSAI and the details of size of display of the food label details was poor, but all other aspects of knowledge regarding food labeling were good [Table 2]. Very few had negative attitude toward food labeling. Majority felt that food labeling is useful in choosing the right healthy foods and in regulating the diet. Majority of the participants felt that it is a good practice to regularly review food labels [Table 3]. The most frequently examined item in the food label was the expiry date, with more than 75% viewing it always. About 46% of the participants look for the veg/nonveg symbol in the food label. Nutrition information and information about food additives were viewed less frequently [Table 4]. It is seen that knowledge scores are normally distributed, whereas attitudes and practices scores were skewed, with more students having higher scores [Figure 1]. Female students had a 3.4 times greater odds of good knowledge (1.59 to 7.25) compared to the men, and students aged 21 years had 0.2 times lesser odds of good knowledge compared to students aged 17 years (0.054–0.832). Other risk factors such as BMI, year of study, and lifestyle factors did not influence knowledge on food labels. None of the above factors influenced the attitudes of the students toward food labels. While those who exercised regularly had a 2.7 times greater odds of utilizing food labels (1.142–6.587) well, those who followed a strict diet had a 0.297 times lesser odds of utilizing food labels (0.089–0.994) compared to those who did not [Table 5].

DISCUSSION

This study aimed at understanding the awareness, attitude, and utilization of food labels by undergraduate medical students in a college in Chennai. We found that students had good knowledge about the Food Safety and Standards Authority of India and their functions. They were familiar with most aspects of food labeling and the rules governing it. They had positive attitudes toward food

Table 1: Characteristics of the study sample

Characteristics	Categories	*n* (%)
Age (years)	17-18	51 (25.5)
	19-21	131 (65.5)
	≥22	18 (9)
Sex	Male	75 (37.5)
	Female	125 (62.5)
Year of study	First year	69 (34.5)
	Second year	54 (27)
	Third year	77 (38.5)
Are you trying to get in shape/lose weight?	Yes	92 (46)
Do you do regular exercise/gym visits?	Yes	42 (21)
Do you follow a strict diet?	Yes	18 (9)
BMI	<18 (undernourished)	22 (11)
	18.01-24.99 (normal)	137 (68.5)
	25-29.99 (overweight)	35 (17.5)
	≥30 (obese)	6 (3)

BMI: Body mass index

Table 2: Responses to questions on knowledge regarding food safety and food labeling

Question	Correct answer	Number of participants who got it correct, *n* (%)
The _____ is the supreme authority which is responsible for regulating and supervising food safety in India	c. Food Safety and Standards Association of India	189 (94.5)
The main objective of this supreme authority is_____	b. To maintain food quality levels in order to ensure safety and providing satisfaction to every customer	75 (37.5)
The material/container of the packaging_____	b. Must be aseptic, clean, and sealed properly	151 (75.5)
The label on the food packaging should not contain the following	b. Health claims or risk reduction	128 (64)
The color of the symbol ⊡ is	d. Green – vegetarian; blue – nonvegetarian	171 (85.5)
If the food product is imported, the importer's address must be mentioned	a. True	175 (87.5)
The particulars/declarations of labeling on a food product in Tamil Nadu should only use the following language	e. Both a and c	152 (76)
The size of the symbol should vary according to the size of the food package	True	56 (28)
If the food product contains food additives, the statement should be mentioned in	c. Capital letters only	112 (56)
The size of the Principal Display Panel (where all the information is grouped together) must vary according to the size of the package	True	132 (66)

Table 3: Attitude toward food labeling

Statement	Strongly agree (%)	Agree (%)	Neither agree nor disagree (%)	Disagree (%)	Strongly disagree (%)
I believe that food labeling can help people with health conditions (i.e., hypertension and allergies) to look out for ingredients to avoid	106 (53)	71 (35.5)	21 (10.5)	1 (0.5)	1 (0.5)
I believe that food labeling can help people regulate their calorie intake	69 (34.5)	91 (45.5)	34 (17)	6 (3)	0
People should take the time from their busy schedule to read the food label carefully before buying foods	69 (34.5)	83 (41.5)	43 (21.5)	5 (2.5)	0
People should not come to a conclusion that all FSSAI licensed products are "healthy"	69 (34.5)	73 (36.5)	48 (24)	7 (3.5)	3 (1.5)
Food labeling is easy to use as it provides all information of what the food product beholds within the package	58 (29)	102 (51)	26 (13)	13 (6.5)	1 (0.5)

FSSAI: Food Safety and Standards Authority of India

Table 4: Practices with respect to using the food labels

Food label use practices	Always (%)	Often (%)	Sometimes (%)	Rarely (%)	Never (%)
Checking "best before" date	152 (76)	37 (18.5)	5 (2.5)	1 (0.5)	5 (2.5)
Viewing the ingredients	68 (34)	66 (33)	50 (25)	11 (5.5)	5 (2.5)
Viewing the nutritional information	55 (27.5)	80 (40)	51 (25.5)	12 (6)	2 (1)
Viewing the name and address of manufacturer	47 (23.5)	45 (22.5)	61 (30.5)	35 (17.5)	12 (6)
Reading directions for use	76 (38)	62 (31)	48 (24)	10 (5)	4 (2)
Checking veg/nonveg symbol	92 (46)	47 (23.5)	26 (13)	17 (8.5)	18 (9)
Checking food additives	51 (25.5)	60 (30)	47 (23.5)	27 (13.5)	15 (7.5)
Checking country of origin	47 (23.5)	55 (27.5)	52 (26)	32 (16)	14 (7)
Checking the net weight of the food	92 (46)	44 (22)	35 (17.5)	17 (8.5)	12 (6)

labels and felt that they are helpful and useful. However, despite the good knowledge and positive attitudes, they did not utilize the food labels adequately to know about the nutritive contents of the foods, the additives, and the details of the manufacturer, with most of them only going through the expiry date of the product. Women had better knowledge about food labeling, and students who were regularly exercising utilized food labels appropriately. Those who were on diet regulation utilized food labels poorly.

We found that the medical students in this study had a sound knowledge about food labels and the functions of the regulatory authority in India. Previous studies among college-going students, both medical and nonmedical, have observed that both knowledge and utilization of food labels are high, with medical students having higher levels of knowledge than nonmedical.[14-17] A sound knowledge about food labels and the regulation of food and nutrition labeling is important for a medical student as it prepares the student to create awareness among the patients. It also is important for the medical students to practice appropriate use of food labels themselves in order to stay healthy. The current undergraduate medical curriculum does not include sections on food labels and counseling people on the appropriate use of food labels.[18] It may be useful to incorporate it in the curriculum under food

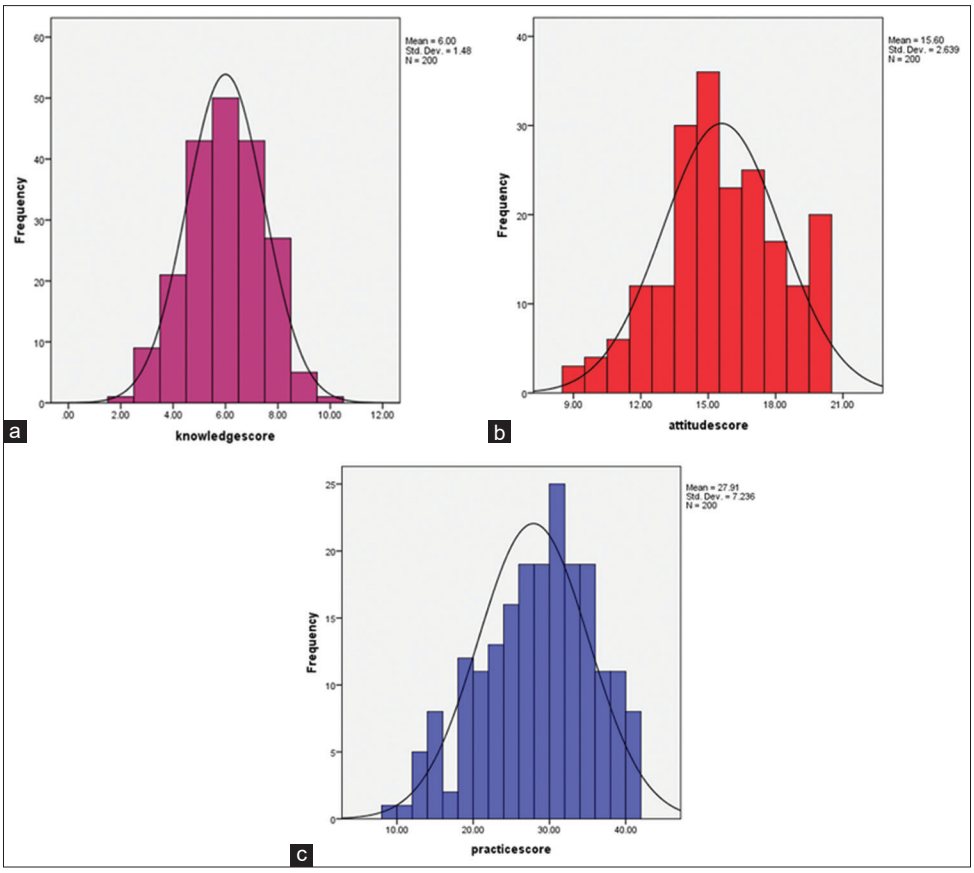

Figure 1: The distribution of the scores of knowledge (a), attitudes (b), and practices (c) regarding food labels among the surveyed medical college students

Table 5: Factors influencing knowledge about food labels

Characteristics	Knowledge about food labels			Practices related to food labels		
	OR	95% CI	*P*	OR	95% CI	*P*
BMI normal (reference underweight)	0.214	0.014-3.356	0.272	1.645	0.181-14.939	0.658
BMI overweight (reference underweight)	0.240	0.018-3.120	0.275	2.466	0.338-17.991	0.373
BMI obese (reference underweight)	0.440	0.029-6.641	0.553	1.628	0.198-13.406	0.650
Sex (reference men)	3.400	1.595-7.250	0.027*	1.292	0.663-2.519	0.451
Second year (reference 1st year)	0.396	0121-1.299	0.127	2.287	0.749-6.985	0.146
Third year (reference 1st year)	1.253	0.467-3.363	0.655	1.297	0.505-3.331	0.589
Age – 18 years old (reference 17 years old)	0.143	0.16-1.239	0.77	0.911	0.123-6.775	0.928
Age – 19 years old (reference 17 years old)	0.897	0.174-4.632	0.897	0.369	0.085-1.599	0.182
Age – 20 years old (reference 17 years old)	0.420	0.081-2.164	0.299	0.618	0.139-2.741	0.526
Age – 21 years old (reference 17 years old)	0.211	0.054-0.832	0.026*	0.545	0.160-1.858	0.332
Age – over 22 years old (reference 17 years old)	0.670	0.670-2.600	0.563	0.976	0.309-3.081	0.967
Are you trying to get in shape/lose weight	0.985	0.478-2.031	0.967	0.758	0.385-1.490	0.421
Are you doing regular exercise/gym?	0.826	0.344-1.987	0.670	2.742	1.142-6.587	0.024*
Are you following a strict diet?	0.821	0.206-3.273	0.779	0.297	0.089-0.994	0.049*
Are you allergic to any particular food item ingredient?	1.167	0.387-3.516	0.784	0.722	0.255-2.049	0.541

*$P<0.05$ statistically significant. OR: Odds ratio, CI: Confidence interval, BMI: Body mass index

safety and food hygiene. We found that students have a positive attitude toward food labels. They felt that food labels help patients choose their foods appropriately to prevent diseases and stay healthy. However, despite this good knowledge and attitude, their food label utilization was poor. While a majority of the students used the food label to check for "best before" date of expiry, they did not appropriately utilize the nutritive information, information about additives, and details of the manufacturer. This finding is similar to previous studies among medical as well as nonmedical students. Only 45%–50% of the medical as well as nonmedical students used food labels appropriately.[17] Previous studies have also shown that only about 30%–35% of the students use the information obtained from food labels to appropriately adjust their dietary intake.[14] We found that women had greater

awareness about food labels compared to men. Those who were 21 years old had lesser knowledge compared to those who were 17 years (in the 1st year of their undergraduate course). One of the possible reasons is that at 21, the students are very busy with no room for checking the label in their food. Those students who exercised or visited a gym regularly were utilizing food labels better than those who did not. This is probably because of the heightened awareness about healthy eating among those who are making efforts to lose weight or stay fit. None of the studied risk factors including year of study, age, sex, BMI, or lifestyle changes seemed to influence attitude toward food labeling, indicating that all the students had highly positive attitude. However, when it came to utilization of food labels, only the ones who were attempting to lose weight used it appropriately. It was also found that those who were on a strict diet had a lesser chance of utilizing the food labels appropriately. This is probably because when there is a strict diet control, the use of prepackaged and labeled foods in itself reduces.

This study has several limitations. The study was conducted in one medical college in Chennai, and therefore, the findings are not representative of all medical students of Chennai. The sample size is relatively small, and therefore, it is likely that the estimates are underpowered. There is a possibility of a socially desirable response in answering practice and attitude questions related to food labeling. However, despite these limitations, the study provides valuable information on levels of utilization of food labels among medical students.

CONCLUSION

Medical students had a sound knowledge and good attitude toward food labels, but their food label utilization patterns were poor. There is a need to incorporate "food labelling" as a topic in the undergraduate medical curriculum and inculcate better food label utilization behaviour.

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Conflicts of interest

There are no conflicts of interest.

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Original Article

Medical officer's perspectives and professional challenges in handling poisoning cases in rural India

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Abstract

Introduction: Poisoning is a significant public health problem in developing countries, more so in rural areas. Very little is known about the treatment available for poisoning cases in the context of rural health care provision in India. This study explores the perceptions of the primary health care medical officers regarding the management of poisoning cases.

Material and Methods: A semistructured, self-designed survey form was used to interview the medical officers in Pune district. The interview focused on understanding rural hospital settings in terms of infrastructure, available facilities, and medical officers' perception of professional challenges in the management of poisoning cases.

Results: Underreporting of poisoning cases in these primary health centers (PHCs) and transferring to higher hospitals without basic first aid provided was noted through interviews.

Conclusion: Medical officers in rural PHCs lack the necessary training and knowledge required for the management of poisonings which is further worsened by lack of resources. There is a need to focus on poison management in continuous medical education. Training programs and education for medical officers are needs of the hour.

Keywords: Medical officers, poisoning, primary health care, rural health

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INTRODUCTION

Being an agrarian country, the incidence of poisoning, both intentional and unintentional, has been increasing in the rural parts of India due to easy access to pesticides. Each year, poisoning results in significant morbidity and mortality. According to the World Health Organization, India's poisoning death rate is 31.3 per 100,000 people. In spite of that, in the community health-care settings, diseases such as tuberculosis, cardiovascular disorders, traumas, etc., have always been highlighted and given more importance.[1-3]

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The majority of patients with poisoning recieve their primary treatment in nearby Primary Health Centers (PHCs).[4] PHCs are the cornerstone of rural health services—the first port of call to a certified doctor of the public sector in rural areas for the sick and those who directly report are referred from subcenters for curative, preventive, and promotive health care.[5] Nonspecialist and sometimes relatively junior doctors staff these hospitals. The delivery of care is also greatly impacted by the availability of treatment resources such as poison antidotes, gastric lavage,

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and resuscitation facilities which play a key role in reducing mortality.[6,7] Although previous studies have examined clinicians' and nurses' perspectives toward poisoning patients in well-resourced tertiary care hospitals, there is no published research exploring medical officers' perspectives and expectations about the care and treatment of poisoning patients in rural, low-resource settings.[4]

Thus, the objective of the study was to explore the professional challenges faced by the medical officers for assessing and managing poisoning cases at the PHCs in the rural area of India. The study also assessed the availability of resources in PHCs from the medical officer's perspective.

MATERIAL AND METHODS

A qualitative and quantitative study was carried out in which semistructured face-to-face interview with PHC medical officers was conducted for 6 months from September, 2019 to February, 2020 in Pune district, Maharashtra, India. The study was approved by the Bharati Vidyapeeth (Deemed to be University) Medical College Institutional Ethics Committee (Ref-BVDUMC/IEC/100E).

A total of 67 medical officers completed the survey and interview [Figure 1].

Step 1: Survey questionnaires were filled by the medical officers, followed by segregating the PHCs into two: low incidence and moderate-to-high incidence of poisoning cases per month. Step 2: The faculty and Doctor of Pharmacy Interns of Department of Clinical Pharmacy, Poona College of Pharmacy, Bharati Vidyapeeth (Deemed to be University) conducted a semistructured face-to-face interview with the medical officers who reported moderate-to-high incidence of poisoning cases in their PHCs. Interviews were around 10–15 min in duration.

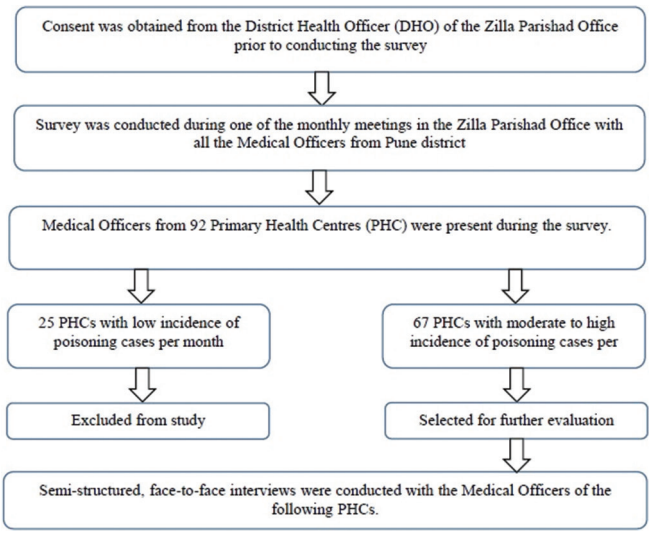

Figure 1: Methodology flow diagram

The survey and interview comprised questions regarding common poisonings and its prevalence, treatment facilities, resources and infrastructure facilities of the PHCs, and challenges faced by the physicians.

A qualitative examination of the interview data provided an exploration of the doctors' experiences and perceptions about treating poisoning patients.

RESULTS

Practice environment

Fifty-five percent (37) of respondents worked at Type A PHCs and 45% (n = 30) worked at Type B PHCs. PHCs with a delivery load of <20 deliveries per month fall under the category of Type A, whereas those with a delivery load of 20 or more deliveries per month are Type B. The bed occupancy rate was <40% in 18, 40%–60% in 23, and >60% in 26 PHCs. The majority of the respondents were PHC medical officers from the north region of Pune district (25), followed by the west (13), south (12), and east (9) [Table 1].

"We have PHC set up in an old building in a remote village. We are provided with basic supplies such as oxygen cylinder, atropine, and anti-snake venom. No other medications are provided." (MOS2).

The majority of the respondents (50) encountered around 1–5 poisoning cases per month at their PHCs. Ten respondents claimed that they get around 6–10 poisoning cases per month at their PHCs. Seven respondents answered that they encounter more than 10 cases per month. Animal bites and stings were the most commonly encountered poisoning cases, followed by pesticides, household agents, and drugs [Figure 2].

Table 1: Practice Environment of the primary health centers

	Frequency (proportion), *n* (%)
Entire sample	67
Type of PHC	
Type A	37 (55.23)
Type B	30 (44.77)
Bed occupancy rate (%)	
<40	18 (26.86)
40–60	23 (34.32)
>60	26 (38.82)
Region	
North	25 (37.31)
South	12 (17.91)
East	9 (13.43)
West	13 (19.40)

PHC: Primary health center

"I cannot give an exact answer regarding the frequency of poisoning cases as we refer most cases directly to government hospitals. In recent times we have had only two such cases for which we gave basic first aid and referred the cases to the government hospital." (MOW3).

Availability of resources

Majority of the physicians (30) claimed that antidotes are not regularly available for the management of poisoning cases at the PHCs. Sixteen respondents answered "yes," whereas the remaining did not provide any answer for this question. Basic clinical assessment facilities were also limited which usually determine the further treatment plan [Table 2].

"Resources like well-equipped ambulance should be provided. We have oxygen supply and anti-snake venom but transportation takes time. It will also be helpful while referring patients to higher hospitals." (MON2).

On being questioned whether the current availability of resources is adequate for management of poisoning cases, a doctor answered saying:

"Resources are limited but we can't expect much from a PHC. Even if better resources are provided, we need trained technical staff for proper handling of such resources." (MON5).

Table 2: Practice environment and resources available in the primary health centers

Sample (*n*=67)	Proportion, *n* (%)
Assured available services	
OPD	67 (100)
IPD	65 (97.01)
Emergency	66 (98.50)
Emergency laboratory services	
Urine test	42 (62.68)
Stool test	40 (59.70)
Blood test	45 (67.16)
Blood grouping	45 (67.16)
BT, CT	37 (55.22)
BSL	45 (67.16)
Pregnancy test	43 (64.17)
ECG	14 (20.89)
Serum cholinesterase	5 (7.46)

OPD: Outpatient department, IPD: Inpatient department, BT: Bleeding time, CT: Clotting time, BSL: Blood sugar level, ECG: Electrocardiogram

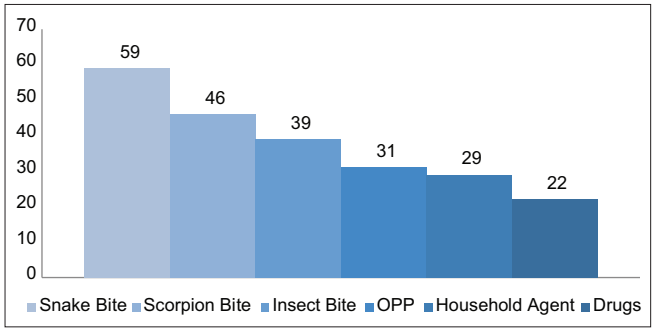

Figure 2: Commonly encountered poisoning cases

Other physicians stated that even when the health-care staff is well trained, limitations in physical settings such as insufficient equipment and medicine in the hospital constrained their ability to provide the necessary care to the pesticide poisoning patients.

"Resources are limited for sure. Gastric lavage facility should be made available. Suction machine is required so that we can at least perform first aid treatment and refer critical cases forward. If we have first aid-related medications and resources, it will be more than sufficient." (MOE4).

Knowledge of primary health center staff and future directions

When asked whether in their work setting, they agree with the statement that "further knowledge/training is necessary to facilitate the management of poisoning cases," 70% agreed, whereas 20% disagreed [Figure 3]. On being provided with various options for continuing education regarding the handling of poisoning cases, majority of the respondents preferred workshop, followed by lecture/online lecture, conference, modules, certificate programs, and newsletters.

"Workshop will work wonders and give our staffs the basic idea of first aid and handling of such cases. It will give us practical knowledge rather than just listening to online lectures. We will be benefitted by your workshop." (MOW6).

"Online lectures will be more beneficial as everyone will not be able to attend the workshop due to various reasons. It is difficult to gather everyone at the same place at one time." (MOE2).

Lack of trained staff at the PHC was also reported by most of the respondents.

"We are not trained specifically for handling poisoning cases as such, but by our experience we handle such cases. However, it will be helpful if we get training in this area to reduce the risk and this will ensure

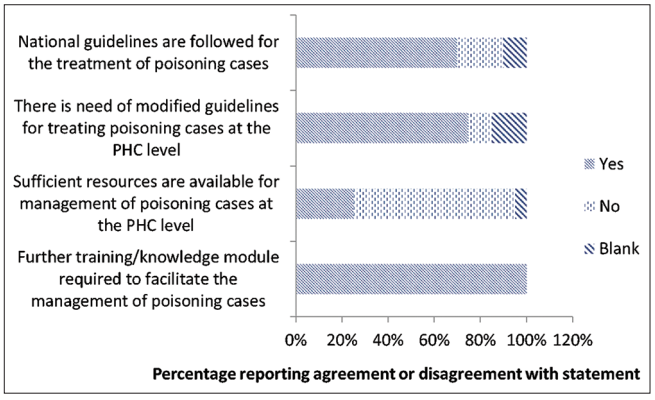

Figure 3: Physicians' perceptions about resources, treatment guidelines, and training programs

better handling as we are the first ones to handle these poisoning cases in the rural areas. Hence it is essential for us to know the do's and don'ts" (MON7).

Other respondents provided similar answers:

"Staff at our PHCs requires training for the very basic first aid that should be given when handling a poisoned patient. They can't handle critical cases. Regular training is necessary to constantly update our knowledge regarding this." (MOS1).

*MO: Medical officer; N: North; S: South; E: East; W: West

DISCUSSION

The study interview data were analyzed to help understand the strategies and practice of the rural PHC medical officers in regard to their practice environment, load of poisoning cases encountered by them in a month, availability of necessary resources for handling such cases, and the knowledge of the PHC staff.

The interview highlighted the lacunae in the working of the PHCs which are responsible for providing both preventive and essential curative services in rural areas. As per the Indian Public Health Standards, every PHC should have at least 4–6 beds for males and females. Fewer than 77% of Indian PHCs meet the minimum requirement of four beds.[5] A similar pattern was found in our study. Laboratory services are recommended as an essential component for the proper functioning of PHC. It was apparent that most of the PHCs have facilities for in-patient services; however, some important laboratory investigations to diagnose and understand the severity of organophosphate poisoning and snakebites, such as serum cholinesterase and bleeding time and clotting time were not available adequately. This indicates that despite the presence of in-patient facilities, poisoned patients would not be availed of the treatment required for their condition.

The most commonly encountered poisoning of snakebites and organophosphate in the study correspond to the farm workers' workplace having thick and dense grassland and occupational exposure to pesticides.[8,9] The reporting of 1–5 cases/month could underestimate the exact prevalence of poisoning cases due to underreporting.

The interviews also revealed that most of the poisoning cases brought to the PHCs are transferred to tertiary care hospitals for treatment. The fact is supported by a study conducted by Prasadi *et al*., which reported that the majority of poisoning cases coming to tertiary care hospitals are referred from PHCs.[10] In some cases, only basic first aid is provided before transferring to the higher hospitals. The patient transfer should be limited to cases in which the patient's acute medical condition has been resolved; the medical advantages of the transfer outweigh the potential risks, including informed consent of the patient and agreement between the transferring and receiving hospital to authorize the transfer within its available capacity. It is important that a systematic approach be followed in this process of patient transfer, beginning with the decision to move, via pretransfer stabilization and then the management of the transition itself. Moreover, such patients' transfer further increases the time lag between consumption of poisoning and receiving initial treatment, which is also responsible for high mortality.

The difficulties faced in diagnosis and treating the various cases of poisoning coming to the PHCs are usually attributed to a lack of specially trained medical and paramedical staff, specific antidotes, and lifesaving drugs.[11]

Respondents expressed how this significant shortage of trained professionals and other resources in the rural hospital setting will not help the professional growth of rural hospital physicians.

The physicians urged on the need for continuing medical education (CME) for understanding the recent advances in the management of poisoning cases. They also shared that CME does not adequately emphasize toxicology and its related advances. The obstacles in the way of continuing professional education could be seen as delivering treatment to poisoning cases in hospitals not only far from ideal but also leading to an inevitable transfer of poisoning patients to secondary and/or tertiary hospitals.

CONCLUSION

Understanding the lacunae and ground reality of functioning of PHCs in rural areas is vital to provide them with necessary and suitable resources for the management of poisoning cases. Poorly designed health systems and deficits of training and resources lead to the transfer of poisoning cases to secondary and/or tertiary care hospital which in turn increases the time lag between consumption of poison and receiving treatment. Regular refresher courses should be conducted for the medical officers working in the PHCs as a part of the CME program to update their knowledge regarding the toxicological crisis. The CME should focus on first aid and emergency management of poisoned patients.

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Conflicts of interest

There are no conflicts of interest.

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Original Article

COVID-19 pandemic: Probing the dynamics in the North Himalayan state

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Abstract

Introduction: Coronavirus disease or COVID-19 emerged in December 2019 in China and thereafter spread to all regions of the world including India. In the Himalayan state of Himachal Pradesh, India, the first case was identified in the month of March 2020. As the most populous district of the state of Himachal Pradesh, Kangra not only identified the first case in the state but also thereafter suffered disproportionately due to the virus causing severe health and economic disruption. The study was carried out to better understand the pattern and trends of COVID-19 pandemic in the district since its emergence, covering the first and the second wave to use the data to prepare the future course of action.

Materials and Methods: A robust database comprising real-time data in a line list format was created. The observations covered all confirmed COVID-19 cases in the district from March 20, 2020, to June 30, 2021, in terms of disease progression and distribution in time, place, and person, and the possible risk factors for severe disease.

Results: During the study period, 45,871 cases and 1030 deaths were reported in Kangra district, with a case fatality rate of 2.2%. Of the 12 districts of the state, Kangra reported the highest number of cases (22.6%) and deaths (29.7%). Ninety percent of all cases occurred during the second wave. While the first wave peaked in December 2020 with 2596 cases, the highest number of cases occurred in May 2021 when as many as 25,625 cases were reported. The test positivity rate of 15.2% during the second wave which was many times higher than that seen during the previous year. The case fatality rates during the first and second waves were 2.2% and 2.1%, respectively.

Conclusions: The study highlights an explosive surge in COVID-19 cases during the second wave, indicating the highly infectious nature of the virus. While absolute number of deaths was several times greater during the second wave, the case fatality rates did not differ greatly between the two waves.

Keywords: COVID-19 pandemic, epidemiology, India, Kangra, trends

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INTRODUCTION

Coronavirus disease or COVID-19 caused by SARS-CoV-2 emerged in December 2019 in Wuhan city of China and thereafter spread to all regions of the world including India. On January 30, 2020, the World Health Organization (WHO) declared it a public health emergency of international concern and later characterized it as pandemic.

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As a result, the global community has been living on the edge since the early 2020. The extraordinary impact of the COVID-19 disease has affected all aspects of human race and continues to expose our vulnerability and create uncertainty across economic, social, and medical fronts. It has caused the health system to breakdown. The pandemic response demands action on many fronts, from prevention to testing to treatment. To prevent the devastating health consequences in the future, there is an urgent need for evidence base for deciding how to enhance our preparedness and response capacity if the pandemic continues to evolve and pose a grave threat to the health and development. A well-coordinated approach is necessary to tackle this global crisis.[1]

The early studies have documented that the severe and life-threatening disease occurs more in the elderly as well as those suffering from chronic diseases with concomitant pathologies.[2] However, during the second wave of the pandemic, it was equally seen in the other age groups. The experts generally agree on the magnitude, potential for harm, and potential for the reduction with appropriate COVID-19 precautionary measures to lower the effect of the disease.[3] The exponential growth in the number of coronavirus cases has occurred worldwide.[4] Globally, as on July 12, 2021, there have been 186,638,285 confirmed cases of COVID-19 including 4,035,037 deaths reported to the WHO.[5] During the same period, India reported 30,874,376 cases, with 408,764 confirmed deaths.[6]

Himachal Pradesh with a population of 6.85 million is situated in the northern part of India in the foothills of Himalayas, and Kangra is the most populous among its 12 districts [Figure 1]. We describe here the epidemiological features of COVID-19 in the district including the disease pattern and trends over time.

MATERIAL AND METHODS

A case of COVID-19 was defined as a person with laboratory confirmation of COVID-19 infection by RT-PCR or a rapid antigen test, irrespective of clinical signs and symptoms. To capture the data on all cases and deaths in the district, a robust database comprising comprehensively collected data in a line list format was created by the district health authorities. The study participants were included based on the testing done at flu clinics across various subcenters, primary health centers (PHCs), community health centers, civil hospitals, and zonal hospitals and at medical colleges. Positives from both polymerase chain reaction and rapid antigen tests were taken into account which included testing for primary contacts, for symptomatic individuals from various organizations (tourism, banking sector, education, transport, and hoteliers), and further for other purposes such as travel and new appointments. The basic demographic and illness-related data were entered into Microsoft Excel 2010 and sorted and cleaned for errors. Results comprising descriptive data were obtained and expressed to compare in frequencies and percentages.

RESULTS

Between March 20, 2020, and June 30, 2021, Himachal Pradesh reported 202,123 cases with 3463 deaths. The first case in the state was a 63-year-old woman, a resident of Kangra district who tested positive on March 20, 2020, and had recently returned from Dubai. Since then, and as of June 30, 2021, a total of 45,871 cases and 1030

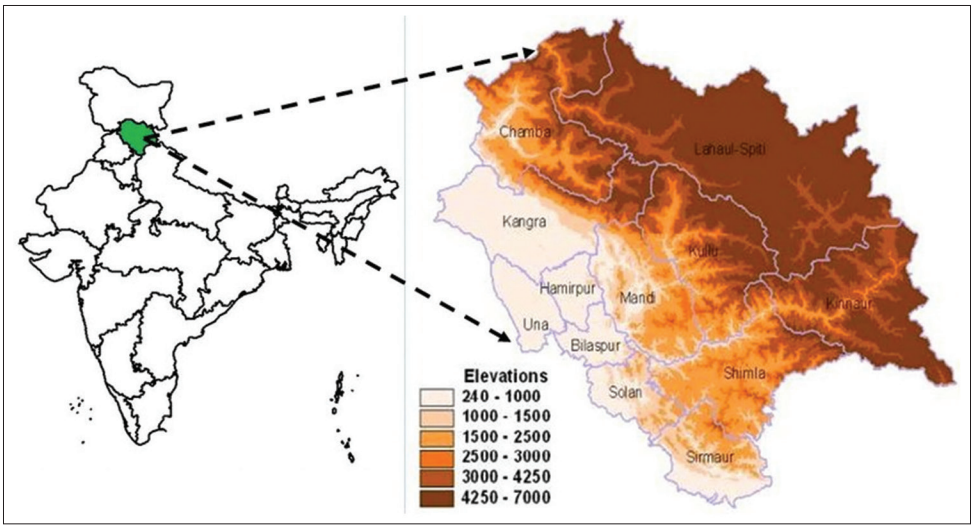

Figure 1: Map of Himachal Pradesh and district Kangra

deaths were reported in the district of Kangra with a case fatality rate of 2.2%. This represented 22.6% of cases and 29.7% of all deaths reported in the state of Himachal Pradesh. Since facilities for gene sequencing are not available at Kangra, the existence or extent of contribution by various variants in driving the pandemic surge was not possible.[7]

The pandemic however occurred in two waves [Figure 2]. The first wave began in March when the first case was diagnosed. Following a period of low occurrence, the cases began to rapidly increase in beginning of September 2020 and continued till it peaked in December. Thereafter, it showed a downward trend which lasted till the end of March 2021. During this period, the pandemic had accounted for 9578 cases and 225 deaths.

Following a short period of lull, the cases again began to increase from April onward signaling the heralding of the second wave. Thereafter, the cases increased quickly and in large numbers, with as many as 1605 cases being reported on a single day, on May 7, 2021. During a short period of 8 weeks, 36,293 cases and 805 deaths were reported during the second wave, which peaked in May, wherein the district witnessed a record number of cases and deaths (25,625 and 559) respectively. Nearly 90% of the total cases recorded in this pandemic period were during the second wave. While there was a three-fold increase in the absolute number of cases and deaths during the second wave, the case fatality rates were not significantly different between first and second wave (2.3% vs. 2.2%) [Table 1].

During the pandemic period, 298,884 samples were tested up to March 31, 2021, out of which 9578 were reported positive with a test positivity rate of 3.2%. Of 237,750 samples tested during April to June 2021, 36,293 (15.2%) showed positive results. While the number of samples collected was lesser than those collected in the past 1 year, the positivity shown was much higher. The test positivity rates started to increase from July 2020 peaking in September at 7% and thereafter started to decline which can be attributed to initiation of rapid antigen testing randomly among the population as well as primary contacts of confirmed cases of COVID-19. In February 2021, the rate was 0.74%. From March 2021, the test positivity rate shot up at an unprecedented rapid pace peaking at 27.8% in the Mid May 2021 and then began to decline sharply to 2.6% on June 30, 2021. The trend indicated that the test positivity rate preceded actual increase in cases at least by a few weeks, thereby providing a useful alert to health authorities of the impending increase in cases that may follow.

Of the cases, 56.6% were male and 43.4% were female, with a female: male ratio of 1:1.3. The difference in gender distribution was statistically significant, with $P = 0.006$ [Table 2]. Most (41.2%) cases among males were in the age group of 30–49 years, followed by 50–64 years (19.50%) and 18–29 years (19.26%).

In the peak days of both the waves, it was revealed that highest occurrence of cases was seen in males and in the age group of 30–49 years [Table 3]. In terms of clinical

Table 1: Some key epidemiological indicators as observed during the first wave (March 2020-March 2021) and second wave (April 2021–June 2021)

Indicators (cumulative)	First wave (March 2020-March 2021)	Second wave (April 2021-June 2021)
Samples tested	298,884	237,750
Found positive	9578	36,293
Test positivity rate (%)	3.2	15.2
Number of deaths	225	805
Case fatality rate (%)	2.3	2.2

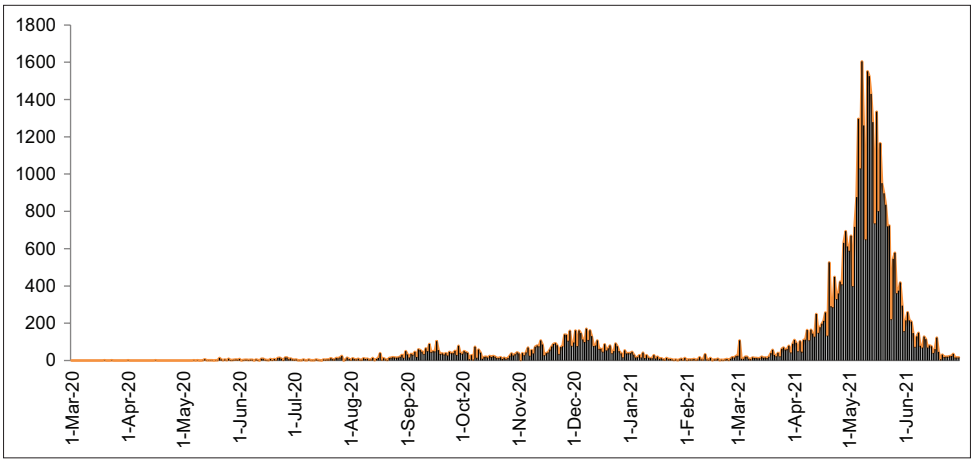

Figure 2: Distribution of COVID-19 cases from March 19, 2020, to June 30, 2021, Kangra district, Himachal Pradesh

presentation, Figure 3 reveals 37,167 (81%) persons who tested positive did not present with any symptoms or were asymptomatic, 1199 (3%) had mild illness, while 1872 (4%) had moderate illness, and 5633 (12%) were severely ill requiring medical attention in a hospital. The asymptomatic patients were managed at home and the ones who had issues such as inadequate space for isolation and mild illnesses were isolated in a dedicated COVID care center. Moderately ill patients were treated at hospitals notified as designated COVID hospitals, and the patients who were severely ill were managed at Medical College, Tanda, located about 15 km from the Kangra town. Pneumonia and acute respiratory distress syndrome were the most common complications associated with severe COVID cases; four cases of mucormycosis have been diagnosed so far in the district.

Table 2: Age and sex distribution of COVID-19 cases reported from March 2020 to June 2021, Kangra district, Himachal Pradesh

Age group	Total (%)	Males	Percentage	Females	Percentage
0-17	4605 (10.0)	2589	10.0	2016	10.1
18-29	8838 (19.2)	5160	19.9	3678	18.5
30-49	18,509 (40.3)	10,687	41.2	7822	39.3
50-64	8869 (19.3)	4688	18.0	4181	21.0
≥65	5050 (11.0)	2843	10.9	2207	11.1
Total	45,871 (100)	25,967	100	19,904	100

Table 3: Age and sex distribution between first and second peaks

Total positives	Peak-December 2020		Peak-May 2021	
	2596 (5.6%)		25,625 (55.8%)	
Age	Males	Females	Males	Females
0-17	86 (5.4)	55 (5.3)	1563 (11.2)	1279 (10.9)
18-29	263 (16.6)	160 (15.6)	2630 (18.8)	2023 (17.3)
30-49	601 (38.1)	384 (37.6)	5738 (41.1)	4713 (40.3)
50-64	390 (24.7)	250 (24.4)	2384 (17.11)	2405 (20.5)
≥65	235 (14.9)	172 (16.8)	1617 (11.6)	1273 (10.8)
Total	1575	1021	13,932	11,693

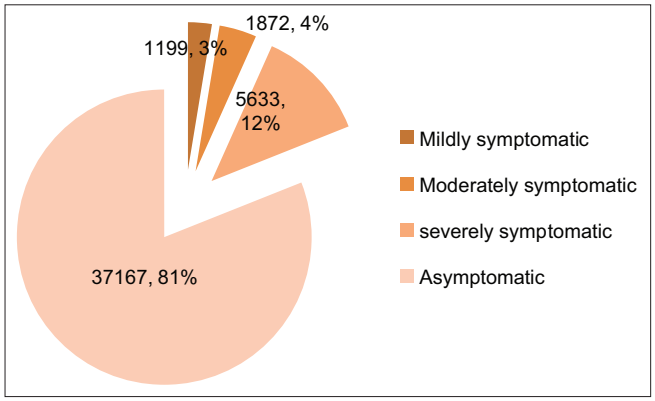

Figure 3: Clinical profile of Covid-19 cases. Data source: Available from District Database of Kangra. *Data also include cases reported from neighboring states/districts who have tested positive within the jurisdiction of District Kangra

DISCUSSION

Our data from district Kangra show that the COVID-19 pandemic consisted of two distinct peaks representing two different waves. There was an initial upsurge in cases beginning from September 2020 attributed to the rapid influx of Himachal citizens returning to their home state, leading to establisment of human to human transmission in the community. The health department took the lead in the establishment of quarantine centers on borders and COVID control rooms along with the effort of the district administration, which eventually helped in containing the spread of virus to large extent. Subsequently, surge of cases was seen in the 1st week of December 2020 marking as the peak of first wave in the district which corresponds to the mixing of people during social gatherings and to the exhaustive screening following the tourist influx in the winter season at all the major borders of the district and for that matter of the state.[8]

While cases during early part of the pandemic coincided with the cases having travel outside of the state, the subsequent surge of cases or the peak can be attributed to the fact that September to December has the largest number of cultural and religious gatherings. Further comparing the results to the data of Spanish flu 1918–1919, we can very well compare the peaks as the Spanish flu had the same trend in which the first peak had a fewer number of cases as compared to the second wave. The same has been the case with the number of deaths also.[9] Both the surges had peak of 10 days with gradual tapering off. Further, after the 10-day peak period in both the waves, the incidence reduced while the prevalence remained high.

With the remarkable decline in cases, at present, it appears that the worst is over as the number of cases and test positivity rates continue to decline in Kangra as well as across all districts of Himachal Pradesh [Figure 4]. However, the overall positivity rate has declined to less than 5% which were close to 40% between May 3 and 16. Nevertheless, keeping in mind the emergence of new variants such as delta plus, we must remain prepared for the next wave may seem likely, given the prevailing situation. However, we noticed that the increase in test positivity often preceded increase in actual cases, indicating that monitoring test positivity can help in providing a warning signal of impending increase in cases. Such a finding can help the health authorities with time to prepare themselves to respond effectively to a surge in cases that is likely to follow.

Interestingly, the Kangra district data also shows that the death rate was slightly higher in the 1st year of the disease

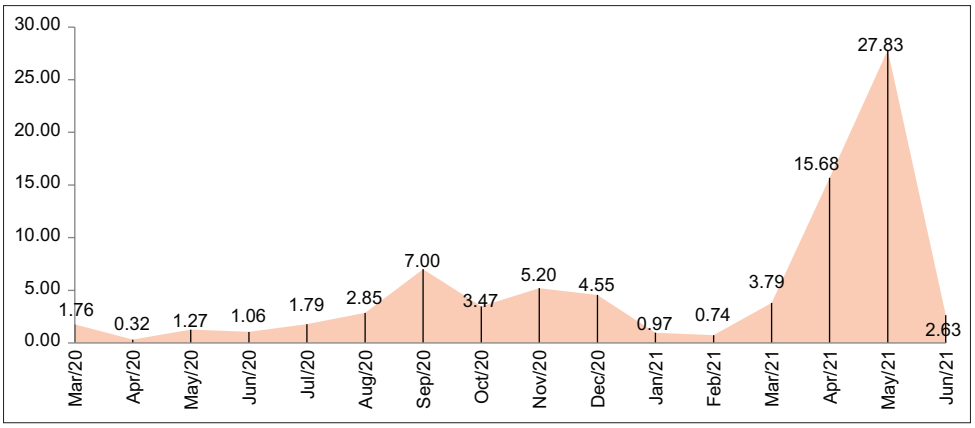

Figure 4: Test positivity rates over pandemic period (March 19, 2020, to June 30, 2021). Source: District database of Kangra, HP

in comparison to the 2-month analysis although positivity was much higher in the second wave, indicating that the second wave was driven primarily by new variant of the virus, which was at least 60% more transmissible than the original Wuhan virus. Sporadic distribution of other laboratory-confirmed strains of virus such as the UK and Delta has come to notice.

Further, the COVID-19 pandemic shows striking similarities to the Spanish flu pandemic of 1918 as well as H1N1 flu of 2009 in many ways. All three had viral origin, the etiology of them remains unknown till date although subsequent association to animals has been made but the causation still remains questionable, the clinical profile of the affected individuals shows similarity, the exceptional similarity in pathogenicity during second waves is some of the most striking similarity. In addition to that, it is a common finding that when one wave ends the level of disease spread falls to some extent which gives an immediate "at ease signal," which is generally premature which is followed by high positivity rate.[10-12]

The one overriding lesson from the pandemic is that it is exposed the stresses and weaknesses of our health systems. This highlighted the need for a strong and robust health system to tackle such health emergencies. As the government tries to instill the belief in testing, tracing, and treatment strategy, general masses have distanced themselves from undergoing repeated tests.[13] It has become challenging for the health personnel in the current times to undertake testing in the field robustly as the general population still struggles to overcome the barriers such as stigma associated with the disease. COVID-19 has exposed major gaps in the healthcare systems of even the advanced countries of the world. This requires a strong communication campaign to instill in general population, especial youth to practice COVID-19 appropriate behavior. Experience shows that behavior change is best achieved through interpersonal communication by involving the community-based organizations and social media.

The pandemic gives us an insight into the sectoral crisis where urgent and immediate action is needed. It is important to ponder on highlighted facts and develop baseline methods to assess the gaps and lacunae in the system and to timely devise strategies to overcome them.

CONCLUSION

The need to develop a decentralized system to achieve health security and sufficient infrastructure to save lives cannot not be underestimated. Investment in public health and primary prevention can deliver significant health and economic dividends. It is important to provide opportunities to youth involved in public health to bring high-quality and specialized care to previously underserved populations and nurture their use to disease. The health facilities at the grass root level such as subcentres, health-care workers, and PHCs need to be strengthened to keep up with the issues that can be dealt with so that tertiary care facilities can be available for the patients needing dire and urgent care.[14]

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Conflicts of interest
There are no conflicts of interest.

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Original Article

Multiplicity of noncommunicable diseases among the elderly in a suburban area of Delhi

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Abstract

Introduction: Continuing advancements in quality of health care has led to increased life expectancy over time. This in turn has resulted in increased prevalence of noncommunicable diseases (NCDs), especially among the elderly. An appropriate portrayal of its epidemiology is essential to adequately understand the health-care needs of the population. The evidence generated from the study will give us an incentive to address the rising burden of polymorbidities. We did the study to assess the prevalence and pattern of NCDs in the elderly above 60 years of age and to determine age- and sex-wise distribution of single and multiple NCDs.

Materials and Methods: A community-based cross-sectional study was conducted among 350 elderly participants over 60 years of age in Mehrauli area of Delhi. Data were collected using a semi-structured questionnaire. Detailed general and systemic examination was also done.

Results: A total of 87.4% of the study population were suffering from at least one NCD. The number of NCDs per person is 2.41. Overall, 80 out of the total 350 study participants (22.9%) had a single NCD, whereas 226 (64.6%) had two or more NCDs. Hypertension was the most prevalent NCD, followed by cataract, osteoarthritis, diabetes mellitus, and obesity.

Conclusion: The prevalence of NCDs was quite high among the elderly. Multimorbidity was more common among the oldest-old age group and elderly women. This calls for increased focus on timely and comprehensive screening for NCDs in adults and asserts the need to approach the screening and management of NCDs in a more holistic way and not as isolated health events.

Keywords: Elderly, India, multimorbidity, noncommunicable diseases

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INTRODUCTION

Aging is a natural process, associated with physical, physiological, and cognitive decline. Globally, the population of older persons is growing at a rate of 2.6%/year, considerably faster than the population as a whole which is increasing at 1.1% annually.[1]

The proportion of elderly in India and their rise in subsequent years is likely to follow a similar trend. India is in a phase of demographic transition wherein the elderly population, currently constituting 138 million (10.1% of the total population), has shown a sustained rise from 103 million (8.6% of the total population) in 2011 and a 35.8% increase in proportion of elderly as compared to

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12.4% in general population and is projected to reach 194 million (13.1%) by 2031.[2]

The increasing elderly population is posing its own challenges, of which one of the major challenges is having multiple chronic diseases. Polymorbidity or multimorbidity can be defined as "existence of multiple medical conditions in a single individual."[3] Some have tried to define it as an accumulation of two or more chronic diseases, whereas others have considered it to be the accumulation of three or more diseases.[4,5]

The problem of multiple noncommunicable diseases (NCDs) among Indian older adults is relatively underexplored primarily owing to the lack of nationally representative data on chronic diseases and associated factors. Furthermore, studies in the past have focused on multimorbidity as counts of conditions rather than specific combination of conditions.

This study aims to assess the prevalence and pattern of selected NCDs in the geriatric age group, determine the age- and sex-wise distribution of single and multiple morbidities, and identify the common combination of NCDs.

MATERIAL AND METHODS

A community-based observational cross-sectional study was conducted among study participants in Mehrauli area of Delhi which is one of the field practice areas of a government medical college of Delhi.

The study was done among the elderly population over 60 years of age who had been residing in the study area for at least a year and were willing to participate. The study area has a mixed population with families belonging to all socioeconomic strata with people of local ancestry as well as migrant population coexisting homogenously. Those who were seriously moribund or bedridden or were unable to respond to the interview due to physically limiting disabilities were excluded.

The sample size was calculated using $N = Z^2 P q/l^2$. Taking 64%[6,7] as prevalence of NCDs, the sample size calculated for 95% level of significance, 10% allowable error, and design effect = 1.5 was found to be 337 participants that was rounded off to 350. Three out of eight wards of Mehrauli area were selected randomly and subsequently systematic random sampling was done. The collective approximate population of the selected wards was found to be around 34,000. Sampling frame that included the elderly >60 years was assessed using national population percentage of elderly (8.6% of total population). It was found that every eighth house needed to be visited in order to fulfill the sample size. The first house was decided by selecting a random number between 1 and 10 using lottery method. In case there were two or more elderly in a household, only one was randomly selected for the study. In case there was no elderly person in a household, the next house was selected. In case a house was found locked even after three consecutive visits, the next house was selected. Whenever a crossroad came up, the road to the left was taken. The interview and examination was conducted by the first author and the average time taken for it was around 30 min. The data collection was done from January to December 2019. Permission for conducting the study was taken from the Ethics Committee for Human Research, LHMC, New Delhi. Written informed consent was taken from the study subjects in the language they understood, and confidentiality of the subjects was maintained.

A self-designed, pretested, semi-structured interview schedule and screening questionnaire was used for data collection regarding sociodemographic particulars and selected NCDs (diabetes mellitus, hypertension, osteoarthritis, senile cataract, and obesity) on the latest documented investigation reports. Apart from this, information regarding other known NCDs that were diagnosed previously on the basis of medical records by a health practitioner was also taken. It was followed with detailed general and systemic examination. Laboratory investigation included measurement of blood sugar using glucometer. Operational definitions used for diagnosing new cases were as follows:

Diabetes mellitus

According to WHO, Type 2 Diabetes mellitus is diagnosed in asymptomatic patients if the fasting plasma glucose value is ≥126 mg/dl or if the casual plasma glucose value is ≥200 mg/dl. Symptomatic patients were those having increased frequency of urination, thirst, and/or hunger. First random blood glucose of the participants was measured. In case random blood sugar (RBS) ≤200 mg/dl, the individual was classified as normoglycemic. If RBS ≥200 mg/dl and symptoms were present, diagnosis of diabetes mellitus was confirmed. If RBS ≥200 mg/dl and symptoms were not present, fasting blood glucose was measured the next day to confirm the diagnosis. If FBS ≥126 mg/dl, diagnosis of diabetes mellitus was confirmed.[8]

Hypertension

According to JNC 8 Blood Pressure Guideline,[9] in people above 60 years, pharmacological therapy should be started at a BP of ≥150/90 mmHg. In diabetic

population aged 18 years or older, the target blood pressure is <140/90 mmHg. Average blood pressure higher than the aforementioned cutoffs was considered to diagnose hypertension. Blood pressure was recorded in the left arm with the subject in a sitting position. A digital sphygmomanometer was used to take two readings at an interval of 5 min. In case the difference in values was 10 mmHg or more, a third reading was taken and the average of the three was considered the final value.

Obesity

By measuring body mass index (BMI), participants were categorized as underweight (<18.5 kg/m^2), normal or lean (18.5–22.9 kg/m^2), overweight (23.0–24.9 kg/m^2), and obese (≥25 kg/m^2) based on the revised consensus guidelines for India.[10]

Osteoarthritis

History of any significant pain and restriction in movement of large joints was used to diagnose osteoarthritis. Severity was assessed using WOMAC[11] and KATZ[12] tool.

Senile cataract

Torch Light examination was used to assess the presence of senile cataract. Grayish-to-white discoloration of lens with or without iris shadow was considered positive for senile cataract.

Data collected from pro forma were coded and entered in IBM. SPSS statistics for Windows. Version 25.0. Armonk, NY: IBM; 2017. All quantitative variables were analyzed in terms of mean and standard deviation, whereas qualitative variables were analyzed through proportions. Student's *t*-test was used to determine a significant difference in average number of NCDs across gender and various age groups.

RESULTS

A total of 350 elderly above 60 years were enrolled in the study, of whom 191 (54.6%) were women and 159 (45.4%) were men [Table 1]. The mean age of the study participants was 68.26 ± 6.45 years (range: 60–86 years). Almost two-thirds (66%) of the study group belonged to youngest-old (60–69 years) age group. More than two-thirds (69%) were currently married; the remaining were widowed. More than one-third (33%) of the participants had no formal education, whereas 115 (32.9%) had completed at least high school. More than half (53%) of the study participants belonged to upper middle (52.9%) or upper (0.9%) class as per the Modified Kuppuswamy Scale with Consumer Price Index for Industrial Workers 2019. Majority of the study participants (71%) were living in joint families, whereas 2.9% were living by themselves.

A total of 306 (87.4%) of the study population, were suffering from at least one NCD [Table 2]. More than two-thirds (68%) of the study participants were having an already known NCD (s), whereas almost one-fifth (19.4%), though having an NCD, were not aware of it. The proportion of study participants having hypertension was 58% (n = 203), whereas 173 (49.4%) suffered from senile cataract; 115 (32.9%) had osteoarthritis, 106 (30.3%) had diabetes mellitus, and 96 (26.9%) had obesity [Table 3]. It was seen that 238 study participants with known NCDs had a total of 428 NCDs, i.e., 1.79 NCDs per patient. At the end of the study, it was found that the 306 participants had a total of 736 NCDs, that is, 2.41 NCDs per patient. Of these, the 238 participants with

Table 1: Gender-wise distribution of sociodemographic variables among study participants (*N*=350)

Sociodemographic character	Men, *n* (%)	Women, *n* (%)	Total, *n* (%)
Total participants	159 (45.4)	191 (54.6)	350 (100)
Age			
60–69	109 (31.1)	122 (34.9)	231 (66.0)
70–79	39 (11.2)	55 (15.7)	94 (26.9)
≥80	11 (3.1)	14 (4.0)	25 (7.1)
Level of literacy			
Illiterate	41 (11.7)	77 (22.0)	118 (33.7)
Primary school	26 (7.4)	38 (10.9)	64 (18.3)
Middle school	32 (9.1)	21 (6.0)	53 (15.1)
High school certificate	13 (3.7)	22 (6.3)	35 (10.0)
Higher secondary	17 (4.9)	18 (5.1)	35 (10.0)
Graduate	28 (8.00)	14 (4.0)	42 (12.0)
Postgraduate/profession	2 (0.6)	1 (0.3)	3 (0.9)
Socioeconomic status			
Lower and upper lower	12 (3.4)	27 (7.7)	39 (11.2)
Lower middle	42 (12.0)	81 (23.1)	123 (35.1)
Upper middle and upper	105 (30.0)	83 (23.7)	188 (53.7)
Type of family			
Nuclear	39 (11.12)	51 (14.6)	90 (25.7)
Joint/extended	119 (34.0)	131 (37.4)	250 (71.4)
Living alone	1 (0.3)	9 (2.6)	10 (2.9)

Table 2: Prevalence of common noncommunicable diseases among study participants (*N*=350)

NCD type	Males (*N*=159), *n* (%)	Females (*N*=191), *n* (%)	Total (*N*=350), *n* (%)
Previously diagnosed			
DM	33 (20.7)	55 (28.8)	88 (25.1)
HTN	52 (32.7)	95 (49.7)	147 (42)
OA	9 (5.6)	57 (29.8)	66 (18.8)
Cataract	31 (19.5)	51 (26.7)	82 (23.4)
Obesity	2 (1.3)	0	2 (0.5)
Others*	9 (5.6)	34 (17.8)	43 (12.3)
Newly diagnosed			
DM	3 (1.9)	15 (7.8)	18 (5.1)
HTN	24 (15.1)	32 (16.7)	56 (16)
OA	0	49 (25.6)	49 (14)
Cataract	21 (13.2)	70 (36.6)	91 (26)
Obesity	12 (7.5)	82 (42.9)	94 (26.8)

*Others included COPD, hypothyroidism, asthma, CAD, and schizophrenia. DM: Diabetes mellitus, HTN: Hypertension, OA: Osteoarthritis, NCD: Noncommunicable disease, COPD: Chronic obstructive pulmonary disease, CAD: Coronary artery disease

previously known NCDs were found to have 634 NCDs. Among them, 136 male participants had 263 NCDs (1.93 NCDs per patient), whereas 170 female participants had 473 NCDs (2.78 NCDs per patient). The ratio of NCDs to patients was highest in the oldest-old age group (3.32), whereas it was 2.68 in the oldest-old age group and 2.14 in the youngest-old age group.

The average number of NCDs in the total study group was significantly higher at the end of the study [Table 4] across all age and sex groupings.

Overall, 226 (64%) study participants had two or more NCDs [Figure 1], whereas less than a quarter of the total study participants had a single morbidity (n = 80 [22.8%]). Hypertension was the most common NCD in those having a single NCD (n = 38 [47%]) while being followed by cataract (n = 14 [18%]), diabetes mellitus (n = 10 [12%]), osteoarthritis (n = 7 [9%]), obesity (n = 4 [5%]), and asthma (n = 3 [4%]). Hypertension and diabetes mellitus together were present in 64 (18.3%) of the study population, whereas the combination of hypertension, diabetes mellitus, and obesity was seen in 33 (9.4%) of them.

DISCUSSION

The study was conducted to determine the prevalence of various common NCDs in the elderly population and analyze the existence of multiple NCDs among them.

Seven out of eight individuals, i.e., 87% of participants in our study, were having an NCD. The prevalence of common NCDs varied from 14.1% (Hegde *et al*.[13]) to 98.2% (Warbhe[14]) among studies conducted by other researchers in the past. However, studies from metro cities showed a similar prevalence of NCDs among the elderly – 87% in Chandigarh by Kaur *et al*.[15] and 84% in Shimla by Sharma *et al*.[16] This would be reflective of urbanization and its subsequent lifestyle changes, increasing the risk factor for NCDs.

The total proportion of women having at least one NCD (89.0%) was slightly higher than men (85.5%). Longer life expectancy resulting in increased probability of getting a chronic disease could be a reason for the higher proportion among women.

Multiple NCDs were found in 64.6% of the study participants. This was higher than what was found by Mini and Thankappan[17] in a study that evaluated multimorbidity among the elderly from seven states of India (Kerala, Tamil Nadu, Punjab, Himachal Pradesh, Maharashtra, Orissa, and West Bengal) and reported a prevalence rate of 30.7% among 9852 elderly. A review by de Melo *et al*.[4] reported that the prevalence of multimorbidity among the elderly from seven studies varied from 30.7% to 57%.

It was observed that the average number of illness per patient was 2.41. This was comparable to the findings by Niranjan and Vasundhra[18] (2.42) among the elderly population of Bangalore, India. Purty *et al*.[19] found that the average morbidity per person was 2.77, whereas Joshi *et al*.[20] found it to be 6.9 per person. A possible reason for these higher figures could be a relatively more comprehensive NCD assessment resulting in identification of a high number of previously undiagnosed NCDs.

The number of NCDs per patient increased as age progressed, and for each age group, it was higher among women. The age and gender differences of NCDs were

Table 3: Overall single and multiple noncommunicable diseases among study participants (N=350)

NCD distribution	Males (n=159), n (%)	Females (n=191), / (%)	Total (n=350), n (%)
Multiple NCDs			
DM + HTN + obesity ± others	7 (4.4)	26 (13.6)	33 (9.4)
DM + HTN only	20 (12.6)	21 (10.9)	41 (11.7)
DM + others (other than HTN)	11 (6.9)	17 (8.9)	28 (8)
HTN + others (other than DM)	24 (15.1)	42 (21.9)	66 (18.8)
Single NCD			
DM	4 (2.5)	6 (3.1)	10 (2.8)
HTN	24 (15.1)	14 (7.3)	38 (10.8)
OA	3 (1.8)	4 (2.1)	7 (2)
Cataract	8 (5.1)	6 (3.1)	14 (4)
Obesity	1 (0.6)	3 (1.6)	4 (1.1)
Asthma	2 (1.2)	1 (0.5)	3 (0.8)
CAD	2 (1.2)	2 (1.1)	4 (1.1)

DM: Diabetes mellitus, HTN: Hypertension, OA: Osteoarthritis, NCD: Noncommunicable disease, CAD: Coronary artery disease

Table 4: Age- and sex-wise noncommunicable diseases among total study participants (N=350)

Age (years)	Males		Females		Total		t-test, P
	Previously diagnosed	Overall	Previously diagnosed	Overall	Previously diagnosed	Overall	
60–69	0.71	1.39	1.45	2.11	1.09	1.77	<0.001 (S)
70–79	1	2	1.58	2.93	1.34	2.54	<0.001 (S)
≥80	1.54	2.81	2.35	3.71	2	3.32	0.001 (S)
Total	0.83	1.64	1.55	2.47	1.23	2.09	<0.001 (S)
t-test, P	0.000 (S)		0.000 (S)		0.000 (S)		

S: Significant

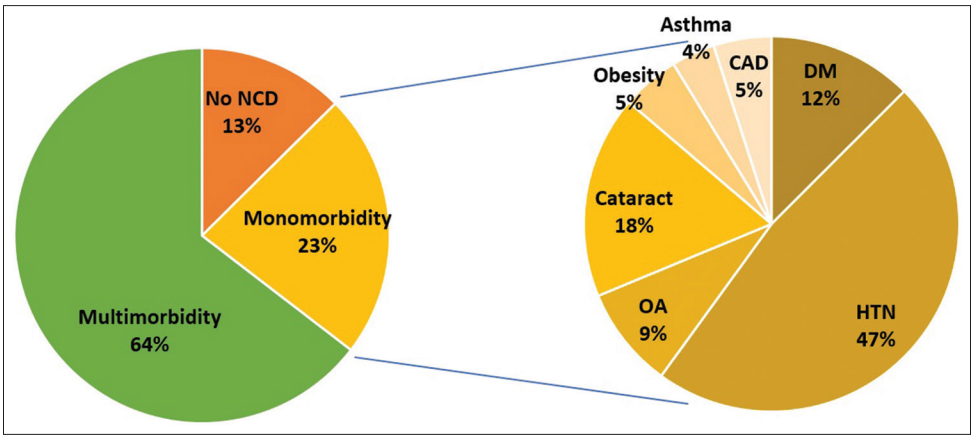

Figure 1: Pie charts showing the prevalence of single and multiple noncommunicable diseases

statistically significant. Similar results were observed by Talukdar[21] and Joshi *et al*.[20]

Among the elderly with polymorbidity, the most common clusters of conditions were hypertension with diabetes, hypertension with osteoarthritis, and osteoarthritis with cataract. Similar findings were found by Mini and Thankappan.[17] Hypertension was the most common monomorbidity as well followed by cataract, diabetes, and osteoarthritis. Close to one in five people in our study (n = 64 [18.3%]) had both diabetes mellitus and hypertension, whereas every tenth individual (n = 33 [9.4%]) had a triad of diabetes mellitus, hypertension, and obesity. This exponentially increases the risk of getting cardiovascular diseases and stroke in future. The findings in our study were higher as compared to Kapil *et al*.[22] who conducted the study in Nainital where 8.6% of the study participants had both diabetes mellitus and hypertension.

CONCLUSION AND RECOMMENDATIONS

The study found that the prevalence of NCD among the elderly was notably high and the majority among them had multiple NCD.

This emphasizes the importance of taking a holistic approach toward screening and management of NCDs. Patients suffering from a particular NCD should be routinely screened for other NCDs as well. Usually, multiple guidelines exist for the management of different chronic ailments and most of these guidelines focus on single morbidity. For the elderly who are frail and have cognitive impairment, independent management of NCDs can result in polypharmacy that in turn can lead to high chances of drug–drug interactions in the form of reduction in efficacy or accumulation of side effects.

There is a clear need for greater examination and understanding of the causal mechanisms that underlie multimorbidity toward supporting the development of cost-effective interventions. In addition, these results reiterate the need for preventive health care to move beyond targeting single diseases in favor of directing efforts toward reducing overall morbidity among this population.

Multimorbidity among the elderly often results in increased number of hospital visits, polypharmacy of medications, increased treatment costs, and aggravated burden on the families. It is thus important to identify types of NCDs that have similar environmental and host determinants to better understand the causal mechanisms and onus should be to focus on cost-effective preventive health interventions that have an umbrella effect on such diseases.

Limitations

The exact prevalence of some relatively common NCDs such as hypothyroidism, asthma, and chronic obstructive pulmonary disease could not be assessed due to diagnostic constraints.

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Conflicts of interest

There are no conflicts of interest.

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Original Article

Cost analysis of outpatient department prescriptions in the community pharmacies during the coronavirus disease-2019 pandemic in Maharashtra

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Abstract

Introduction: Community pharmacy is a place under the direct supervision of the pharmacist where the prescription orders are compounded and dispensed. In India, there are limited studies published on the economic evaluation of community pharmacy. This study aimed to conduct a cost analysis of outpatient department prescriptions in the community pharmacies during the coronavirus disease-2019 pandemic on various parameters such as the total cost, average cost/prescriptions, age-wise cost, prescribers, drug class, pharmacy wise, route of administration, and diagnosis cost.

Material and Methods: The analysis of total and average cost per prescription was conducted. The study was carried out for 6 months during. The number and type of drugs prescribed and the frequency and total cost of the prescriptions were noted. Statistical analysis was conducted for different demographics and various parameters.

Results: A total of 1166 prescriptions were analyzed in the study. Out of 3704 drugs prescribed 99.9% were branded ones. The average number of drugs/prescriptions was 3.17. The predominance of male patients (60%) was seen. On the overall cost of prescriptions the statistical significance of the overall cost was established at ($P < 0.00001$). The sum of all the prescriptions accounted for ₹.10, 86,504.65. The average cost/prescription was ₹.931.82.

Conclusion: The average total cost/prescription was found to be higher in our study. There is a need for further studies to be done in the field of community pharmacy.

Keywords: Community pharmacy, cost analysis, health economics, India, outpatient department

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INTRODUCTION

The World Health Organization announced the novel coronavirus disease-2019 (COVID-19), a pandemic on March 11, 2020.[1] In India, during March 2020, the number of infected cases was 62 which gradually attained its peak by April 2021.[2]

Cost analysis is a pharmacoeconomic evaluation in which the costs of two or more alternatives are compared without were the outcome.[3,4] About 60% of the population in India (499–649 million) do not have regular access to essential medicines.[5] The fact that India produces 8%

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of the medicines available on global markets in terms of volume and ranks 13th in terms of production value is not enough to explain this disparity.[6] In India, 80% of outpatient care is provided by the private health sector. Therefore, a cost analysis study is a significant and simple tool of conducting a pharmacoeconomic evaluation.[7]

The need of this study is the deficient or less number of research in community pharmacy, pharmacist's role, economic load, and its impact on the population during the pandemic. There are limited studies published in India on community pharmacy activities. A total of 30 papers in the duration of 10 years (1998–2008) on Indian community pharmacy topics (three papers per year) represent a very low rate of publication in this field.[8-14]

MATERIAL AND METHODS

This was an observational study. Conducted between September 2020–February 2021. The margin of error for the samples was calculated using the Raosoft calculator.[18] The error was 2.79% with a confidence level of 95%. Prescriptions were collected from three different pharmacies which covered a total of 18 prescribers. Convenience sampling method was used to select prescriptions.

Inclusion criteria

- Prescriptions from the community pharmacies, i.e., private medical shops located in vicinity of the hospitals.
- Patients visiting the community pharmacies to purchase medicines for various ailments.

Exclusion criteria

- Inpatient department prescriptions
- Follow-up prescriptions
- Medicolegal cases.

The prescriptions were collected were from three different pharmacies in Maharashtra as per our convenience. Prior consent from the pharmacy owners was obtained for data collection. Informed consent from all the patients willing to take part in the study was obtained. The outpatient department (OPD) prescriptions taken were from the community pharmacies which were located near the hospitals (as per the OPD timings) and clinics. These pharmacies were from Mumbai (Mulund and Kalyan) and Pune (Hadapsar) located in Maharashtra. Data were then entered into the logbook according to a predesigned pro forma which includes OPD No./Bill No., prescriber's name, patient demographics, suspected diagnosis, drug name (generic and brand), dose, and dosage form. The maximum retail prices of the drugs were used from www.1mg.com[15] while analyzing the cost. The costs of the medicines were calculated in Indian rupees.

The data of 1166 prescriptions collected were systematically entered into Microsoft Excel for calculating the total cost of each drug in a tabular form. The dose of each dosage form was maintained in mg unit for uniformity of the data.

For example, a dose calculation for Alkacip Syrup 1.53 g/5 ml in 100 ml bottle is calculated using simple cross multiplication, therefore the dose in 100 ml is 0.30 mg.

The total cost of the prescriptions was broken down based on each pharmacy, patient demography, diagnosis, drug class, route of administration, dosage forms, and cost on prescribers.

Statistical analysis

The statistical analysis was done using Microsoft Excel, Social Science Statistics,[16] and GraphPad Prism 9.2.0.[17] The cost of prescriptions was grouped from 1 to 500, 501–1000, >1000, and the statistical test was conducted. The statistical tool used to analyze the patient gender was Mann–Whitney *U*-test, while the other cost were correlated using Chi-square test for independence.

Ethical approval (BVDUMC/IEC/44) dated June 25, 2021, was obtained for the study by the Ethics Committee of Bharati Hospital and Research Center, Pune.

RESULTS

A total of (1166) prescriptions were collected for the study. The drugs prescribed in total were 3704, out of which 99.9% were branded drugs. The average number of drugs/prescriptions was 3.17. The overall total cost of the prescriptions was ₹.10, 86,504.65. The average total cost/prescription was ₹.931.82.

The majority of prescriptions were for between the age of 31–40 (27%) and 41–50 (22.8%) were the most likely to be prescribed. Males outnumbered females (60%). The overall cost of prescriptions was higher for age group of 51-60 years [Table 1].

It was observed that the prescriptions which were consisting of four drugs had the highest cost, while those prescriptions with 11 drugs were valued the least because the cost of some drugs such as paracetamol and metformin were low [Table 2].

The total cost of each prescriber varied with the number of prescriptions [Table 3].

Table 4 summarizes the distribution of total cost according to the drug class. The total cost of the prescriptions has a higher value because the drugs prescribed were from the class of cardiovascular systemic agent (17%), anti-infectives (13%), gastrointestinal agents (11%), nutraceuticals (11%), antidiabetic (8.69%), and nonsteroidal anti-inflammatory drugs (NSAIDs) (3.75%). The other classes such as immunosuppressants (steroids), central nervous system agents (antipsychotics), antihistaminic, respiratory agents (bronchodilators), vaccination, etc. costs were the lowest.

There was a positive correlation between the cost and the number of drugs. The data were highly significant at $P < 0.00001$ in spite of having drugs that had a low cost [Table 5].

The three pharmacy sites were located across various sections of Maharashtra, with Site 3 being in the metropolitan area. As the number of prescriptions and medicines increased in each pharmacy, the overall cost of each site grew simultaneously. In comparison, with the total cost of Site 2, i.e., ₹1,25,785.11 (11.5%), the total cost incurred by Site 3 is ₹.5, 90,305.19 (54.3%) is the highest. The average total cost/prescription in Site 1, Site 2, and Site 3 was ₹.815.89, ₹.590.54, and ₹.1182.97, respectively, as shown in Figure 1.

Figure 2 illustrates the prescription-wise distribution of the various routes of administration, along with their overall cost. The frequency of prescriptions administered orally was 66.9%, and the total cost was 55.63%, with surgical prescriptions having the lowest total cost, i.e., 0.25%. Second, the total cost of the oral + topical combination is 6.7 times cheaper than the overall cost of the prescriptions (₹.10, 86,504.65).

The total cost evaluated on monotherapy valued more than that of the combination therapy of the specific dosage forms, as mentioned in Figure 3.

Figure 4 depicts that the majority of prescriptions ($n = 203$) being diagnosed were for infection and its total cost was 14% compared to the other prescriptions with ear, nose, and throat related diseases were 1%. There is a direct relation of the total cost with the number of prescriptions having the infection.

The GI agents, antidiabetic drugs, and NSAIDs were frequently prescribed in combination and it resulted in the total cost exceeding the monotherapy. The total cost of CVS agents in combination was on a higher side which was contradicting the total cost of rosuvastatin and atorvastatin as monotherapy in [Figure 5]. 1.83% of the total cost was spent on multivitamins, while Vitamin C, when prescribed alone, was 0.4%.

Table 1: Demographic descriptions of the patients

	Number of prescriptions, *n* (%)	Total cost (₹.), *n* (%)
Age		
0-10	24 (2.06)	59,214.63 (5.45)
11-20	24 (2.06)	22,272.81 (2.05)
21-30	210 (18.01)	136,866.98 (12.60)
31-40	317 (27.19)	197,678.74 (18.19)
41-50	266 (22.81)	229,149.05 (21.09)
51-60	203 (17.41)	309,299.13 (28.47)
61-70	73 (6.26)	94,299.71 (8.68)
71-80	49 (4.20)	37,723.60 (3.47)
Gender		
Male	686 (58.83)	654,482.41 (60.24)
Female	480 (41.17)	432,022.24 (39.76)

Table 2: Quantity of drugs prescribed per prescription

Quantity of drugs	Number of prescriptions, *n* (%)	Total cost, (₹.), *n* (%)
1-5	2607 (70.38)	838,303.35 (77.16)
6-10	1004 (2.71)	231,994.24 (21.35)
11-15	93 (2.51)	16,207.06 (1.49)

Table 3: Total cost distribution of prescriptions as per the prescribers

Prescriber	Number of prescriptions, *n* (%)	Total cost, *n* (%)
P1	206 (17.67)	194,597.55 (17.91)
P2	155 (13.29)	119,089.11 (10.96)
P3	133 (11.41)	116,008.30 (10.68)
P4	107 (9.18)	182,117.09 (16.76)
P5	102 (8.75)	92,295.31 (8.49)
P6	83 (7.12)	63,411.70 (5.84)
P7	81 (6.95)	54,968.10 (5.06)
P8	76 (6.52)	72,660.35 (6.69)
P9	39 (3.34)	35,417.75 (3.26)
P10	37 (3.17)	31,897.40 (2.94)
P11	36 (3.09)	29,885.54 (2.75)
P12	25 (2.14)	30,482.77 (2.81)
P13	24 (2.06)	9575.14 (0.88)
P14	22 (1.89)	11,312.06 (1.04)
P15	15 (1.29)	8721.77 (0.80)
P16	11 (0.94)	24,246.79 (2.23)
P17	8 (0.69)	6253.48 (0.58)
P18	6 (0.51)	3564.44 (0.33)
Total	1166 (100)	1086,504.65 (100)

DISCUSSION

Despite the fact that the study was done in three community pharmacies, a total of 18 prescribers, referring to 18 separate study locations and 1166 prescriptions were included in the study. The evaluation of prescription costs at the pharmacy level is focused on in this study.

Lower sample sizes were utilized in the research by Ashraf *et al.* ($n = 386$),[19] Vineeta *et al.*[20] ($n = 309$), Narwane

et al.[21] (n = 600), Shanmugapriya *et al.*[22] (n = 700), Upadhyay *et al.* (n = 182),[23] Atal and Atal[24] (n = 304), Rajathilagam and Sandozi[25](n = 130), and Aravamuthan *et al.*[26] (n = 1052). Prescription analysis was performed in a hospital setting in the above trials. Orzella *et al.*[27] conducted a research in Italy (n = 3,620,361) that evaluated a sample size of the complete population to calculate the overall cost.

The prescriptions belonging to the age group 31–40 (27%) were majorly seen in our study similar to <40 years (21.2%) by Shanmugapriya *et al.*,[22] but the study by Ashraf *et al.*[19] had the majority of the patients from the age group 11–25 years.

The predominance of males (60%) is higher in our study and the same was found in the studies by Vineeta *et al.*,[20] Ashraf *et al.*,[19] Narwane *et al.*,[21] Shanmugapriya *et al.*,[22] Upadhyay *et al.*,[23] and Rajathilagam and Sandozi,[25] etc. The comorbid conditions were mostly found in males which can be a cause for the rise in the prescriptions of males.

The total cost of pharmacy as mentioned in Figure 1 gives an insight of the average cost/prescription, but there are no supporting articles found to be compared.

Table 4: Total cost distribution of drug class

Class of drugs	Number of drugs, *n* (%)	Total cost (₹.), *n* (%)
CVS agent	171 (15.09)	183,550.75 (16.89)
Anti-infectives	323 (8.72)	135,220.96 (12.45)
GI agent	569 (15.36)	121,478.30 (11.18)
Nutraceuticals	549 (14.82)	114,960.44 (10.58)
Antidiabetic	267 (7.21)	94,433.72 (8.69)
NSAIDs	277 (7.48)	40,768.23 (3.75)
immunosuppressants	130 (3.51)	102,554.32 (9.44)
CNS agent	230 (6.21)	86,039.99 (7.92)
Antihistaminic	171 (4.62)	32,797.04 (3.02)
Respiratory agents	101 (2.73)	29,609.07 (2.73)
Vaccination	60 (1.62)	21,635.53 (1.99)
Muscle relaxant	42 (1.13)	9464.73 (0.87)
Antipyretic	65 (1.75)	2635.76 (0.24)
Others	361 (9.75)	111,355.81 (10.25)
Total	3704 (100.00)	1086,504.65 (100.00)

CVS: Cardiovascular system, GI: Gastrointestinal, CNS: Central nervous system, NSAIDs: Nonsteroidal anti-inflammatory drugs

Table 5: Factors associated with cost of prescriptions

Parameters	*P* (<0.05)	χ^2
Age-wise cost	4.09E-12	84.4
Gender-wise cost	0.02	*U*=151684
Diagnosis-wise cost	3.47E-19	153.04
Pharmacy-wise cost	2.48E-17	83.9
Route of administration wise cost	5.08E-149	714.6
Number of drugs per prescription-wise cost	<0.00001	*r*=0.236773 Pearson's Correlation

E-1=10^{-1}

The average cost/prescription on Site 3 was ₹.1182.97 which was slightly higher compared to the other sites due to the increasing demand for clinics and OPDs in the vicinity, while the average cost/prescription on Site 2 was less (₹.590.54) because it belongs to a retail generic

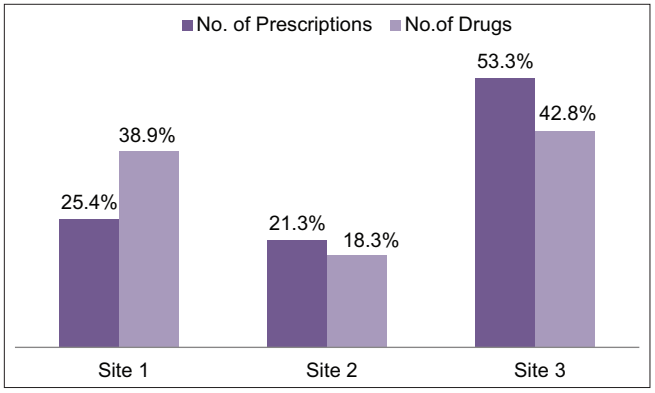

Figure 1: Proportion of prescriptions and drugs according to study site

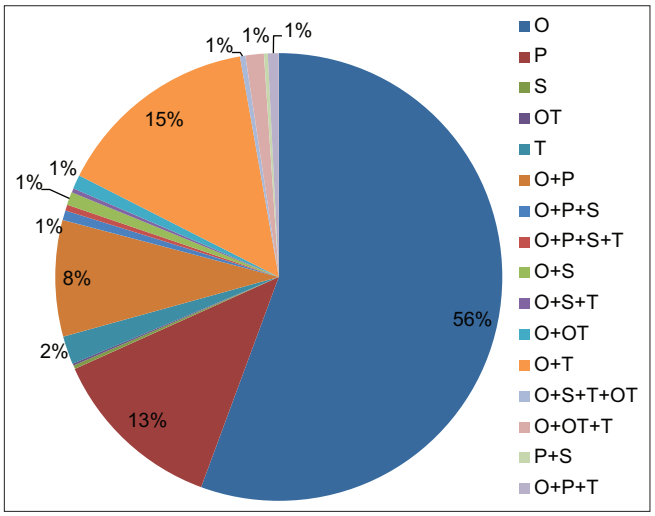

Figure 2: Total cost distribution according to the different routes of administration. (Oral – O, Parenteral – P, Surgical – S, Topical – T, Others – OT)

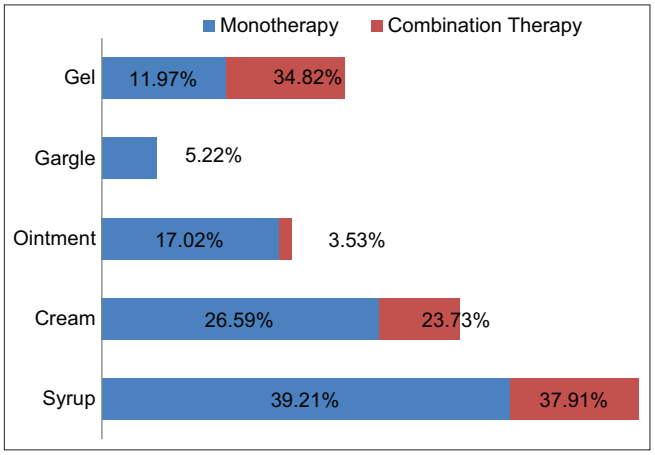

Figure 3: Total cost distribution according to specific dosage forms

pharmacy. The comparison was not established as there were no supporting articles on this.

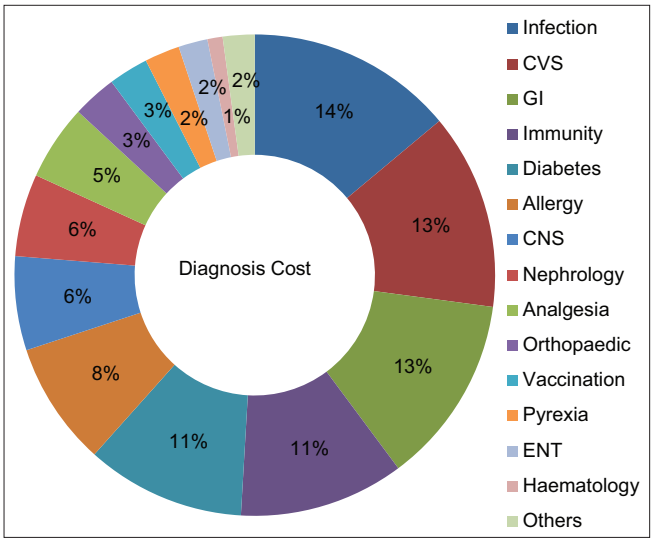

Figure 4: Total cost distribution according to systemic involvement and diagnosis.(CVS – Cardiovascular System, GI – Gastrointestinal, CNS – Central Nervous System, ENT – Ear, Nose, Throat)

The total cost of the 1166 prescriptions in our study was ₹.10,86,504.65 (Indian rupees), but the costs incurred in the other studies by Ashraf *et al*.[19] (₹.20,408.88), Atal and Atal[24] (₹.157867.2), and Rajathilagam and Sandozi[25] (₹6,66,510) were much lesser due to fewer sample size. Although the Indian government has said that generic drugs should be prescribed, 99% of the drugs in our survey were branded. This supports the idea that the sale of generic medications is not practised. The average cost/prescription by Atal and Atal[24] (₹.519.30), Upadhyay *et al*.[23] (₹.723.60), and our study (₹.931.82) was lower, the average cost/prescription by Rajathilagam and Sandozi[25] (₹.5127).

The total drugs prescribed in our study were 3704 which is higher compared to the other studies by Upadhyay *et al*.[23] (685 drugs) and Shanmugapriya *et al*.[22] (2069 drugs). In comparison to our study, a large number of drugs were prescribed by Aravamuthan *et al*.[26] (3936). In our study, the average number of drugs per prescription was 3.17 which was similar to the study by Atal *et al*.[23]

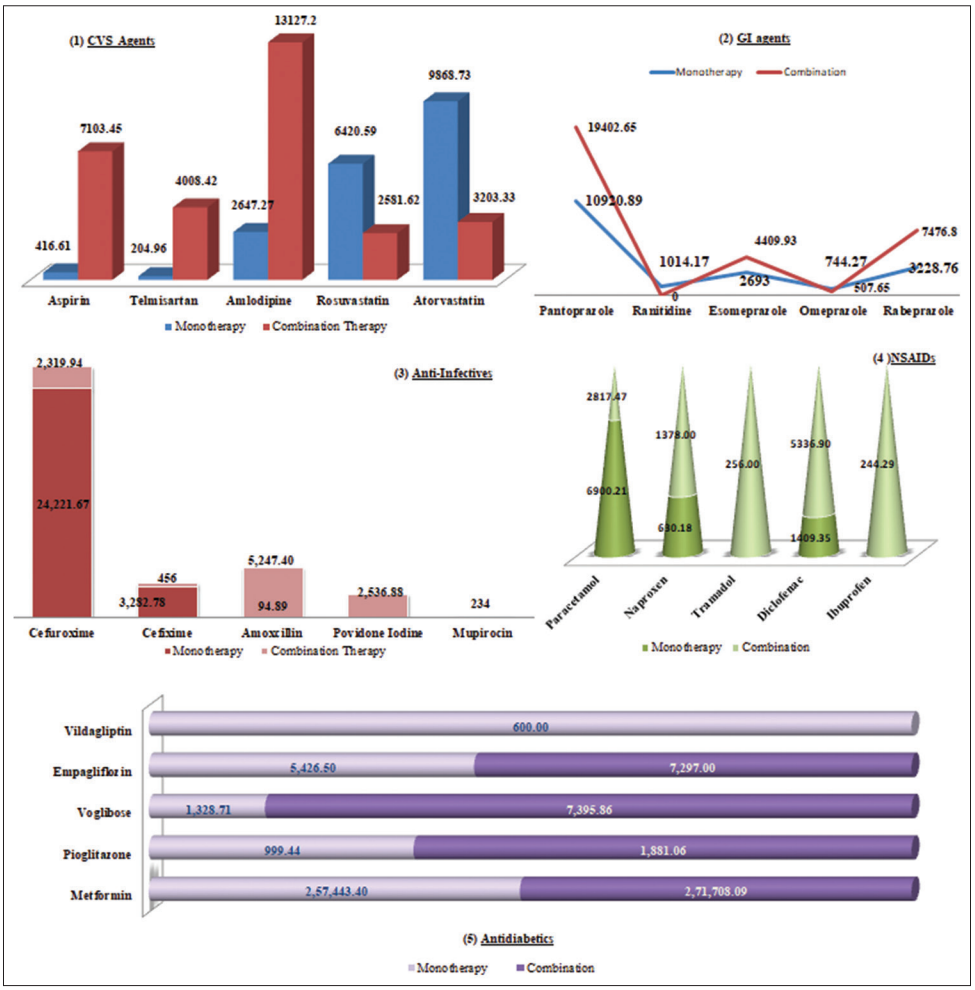

Figure 5: Total cost distribution of drugs in different drug classes (Monotherapy vs Combotherapy)

and Upadhyay *et al*.[23] (3.76) but was slightly less in a study by Shanmugapriya *et al*.[22] The highest average number of drugs was seen from the study by Rajathilagam and Sandozi[25] (11.8) and Singla *et al*.[28] (7.25). The total cost of prescriptions varies with the quantity of drugs and the number of prescriptions.

In our study, the major cost was spent on drugs consumed orally (60%), parenteral (12.64%), topicals (2.03%), surgical (0.25%), and others (0.14%). The majority of oral dosage was seen in the study by Ashraf *et al*.,[19] Narwane *et al*.,[21] Upadhyay *et al*.[23] (94.89%), and Singla *et al*.[28] (80%), while the total cost of syrups being prescribed as monotherapy (1.09%) was greater than its combination therapy. The reason behind this observation might be that syrups are more commonly available as combination therapy rather than monotherapy, which led to an increase in the cost of monotherapy.

Among the prescribers, the highest total cost was prescribed by the prescriber having 206 prescriptions which was ₹.1,94,597.55 (17.91%), while the least total costs by the prescriber having 6 prescriptions were ₹.3,564.44 (0.33%). In conclusion, as the prescriptions expand, the total cost by the prescriber also increases simultaneously.

The total cost of infection was higher than the other diagnosis, this was similar to the study by Aravamuthan *et al*.[26]. The total cost of infection could be risen due to the frequent episodes of having cough/cold/fever in the COVID scenario.

The drugs were classified as per the pharmacological drug classification. The costliest drugs dispensed were from the CVS (16.89%) drug class, while the least was from the class of antipyretic (0.24%). This finding is similar to the study of Rajathilagam and Sandozi[25] The cost of combination therapy is higher in the following drug classes: CVS agent, GI agent anti-infectives, antidiabetics, and NSAIDs since the combination therapy has a higher therapeutic effect and multiple pharmaceutical active ingredients.

Our study was done in the pandemic scenario where the demand for drugs was higher in the community pharmacy. The patient load in the OPDs was less in comparison to the pre-COVID situation. The surplus demand for multivitamin, CVS agents, and GI agents was seen. Each prescription had some nutraceutical and a prophylactic agent prescribed to combat the virus subsequently increasing the total cost of prescriptions. There are very few studies conducted on the cost analysis of prescription in the community pharmacy during the pandemic which made it difficult to compare the study.

Limitations

There are certain limitations to this study. For instance, the OPD prescriptions obtained were from community pharmacies in Maharashtra; hence, the data may not reflect the cost of prescriptions incurred both outside and within Maharashtra. Due to the time restrictions in the OPDs, there were only a few patients each day, and so, the prescriptions were limited. Prescriptions from the OPDs could be generic, but the community pharmacy dispensed them as brand medications. As majority of pharmacies dispense medicine at a lower rate compared to MRP, the amount quoted in MRP cannot be fully considered as the actual cost paid by the patients.

CONCLUSION

The key finding of our study denotes that the average total cost/prescription was ₹.931.82 which is comparatively high. The majority of drugs dispensed were branded which increases the total cost per prescription. In the pandemic scenario, the demand for drugs such as multivitamins, cardiovascular agents, gastrointestinal agents, and anti-microbials increased. The patient load in the OPDs decreased compared to the pre-COVID time period, but the pharmacies were crowded as they were considered as the primary source of treatment during the pandemic. The price in the different pharmacies of Maharashtra had a major difference. Further research is required for better understanding of the economics in a community pharmacy.

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Nil.

Conflicts of interest

There are no conflicts of interest.

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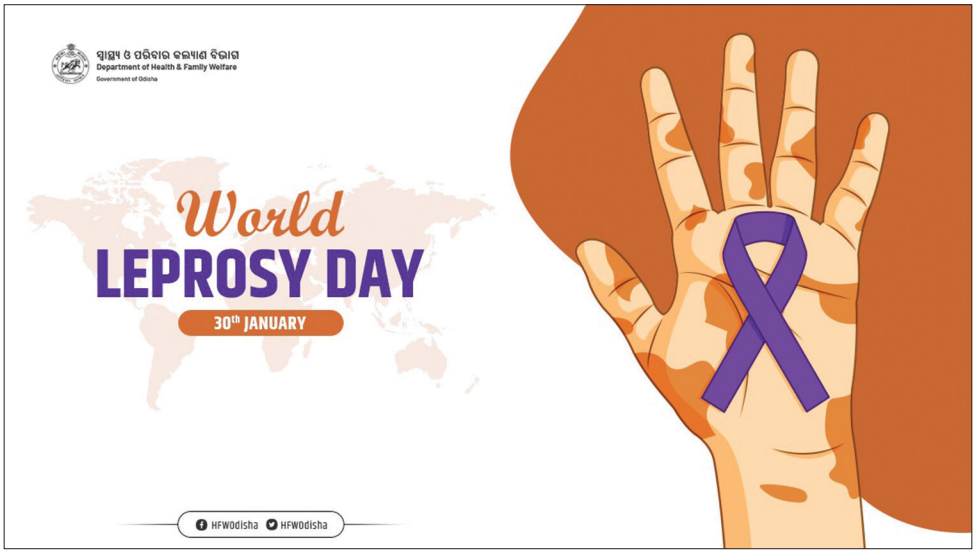

Short Communication

Parents' and teachers' perceptions of emotional and behavioral problems in school-going adolescents

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Abstract

Introduction: Parents and teachers are the primary consultants to understand the emotional and behavioral problems of school-going adolescents. The current study focuses on parents' and class teachers' perspectives of school-going adolescents' emotional and behavioral problems.

Material and Methods: A Cross-sectional questionnaire-based study was conducted among 19 schools from government-private and rural-urban schools across Kollam District, Kerala. Malayalam/English version of the strength and difficulties questionnaire was administered among a sample of 600 parents and 60 class teachers of school-going adolescents.

Results: Multiple linear regression analysis showed that parents' reports is significantly predicted by gender ($P < 0.01$), urban-rural settings ($P < 0.001$) and socioeconomic status ($P < 0.01$). Teachers' reports have significantly been predicted by urban-rural settings ($P < 0.01$) and socioeconomic status ($P < 0.001$).

Conclusion: More attention is needed for the protection of adolescent's mental health and fills mental health gaps in services.

Keywords: Emotional and behavioral problems, parents' and teachers' perception, school-going adolescents

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INTRODUCTION

Mental health is the ability to cope with stress, work productively and is an essential component of health.[1] A meta-analysis of epidemiological studies on child and adolescent psychiatric disorders in India found that the prevalence rate was 6.46% in the community and 23.33% in school.[2] A wide variety of mental health problems prevail among adolescents such as conduct problems, psychological distress, substance use, anti-social behaviour. All of these problems have been found to depend on sociodemographic factors.[3] Emotional problems such as anxiety, depressed mood, and behavior problems such as conduct problems, hyperactivity, and peer-related problems may lead to disturbance in personal, family, school, and social activities.[4] Epidemiological studies have found several emotional and behavior problems among adolescents in India.[5-7]

Emotional and behavioral problems cannot be understood from adolescents' self-reported status alone; therefore, it becomes imperative to take into account the perspective of parents and teachers on emotional

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and behavioral problems of school-going adolescents. The objectives of the study were to assess parents and teachers perception of emotional and behavioral problems among school going adolescents with regards to socio-demographic factors including type of school area.

MATERIAL AND METHODS

A cross-sectional study with multistage sampling method was conducted. The sample size was 600 parents of school-going adolescents and 60 class teachers from 19 schools in Kollam District, Kerala.[8] The study collected data about socio-demographic details, emotional and behavioural problems of the adolescents using Strength & Difficulties Questionnaire (SDQ)[9] for 4-17 years and 18 years & above age groups. The current study used only the Malayalam/English version of the parents and teachers SDQ report and it was a validated.[10] There were 25 items comprised of 5 scales of 5 items each and the scales consisted of emotional problems, conduct problems, hyperactivity, peer problems, and pro-social behavior. The item score is zero = "not true," one = "somewhat true" and two = "certainly true" and there were items like 7, 11, 14, and 25 which had a reverse scoring pattern. The current study scoring was based on the original three-band categorization (normal, borderline, and abnormal). The parent report total score ranges are normal (≤13), borderline (14–16), and abnormal (17–40), whereas the teacher report total score range is normal (≤11), borderline (12–15), and abnormal (16–40). The data collection began by taking written permission from each school authority followed by written consent from parents and teachers during the period, July to October 2019. The study was undertaken with the approval of the Academic Council of Mizoram University. The statistical analysis was done with independent *t*-test, multivariate analysis of variance (MANOVA), and multiple linear regression.

RESULTS AND DISCUSSION

Overall SDQ score on parents' report found that 12.5% of school-going adolescents had abnormality, whereas in teachers' reports it was 14.3%. Gender comparison on parents' reports of SDQ total score shows a highly significant contribution in each scale-emotional problems, conduct problems, hyperactivity, peer problems, and overall. The teachers' reports revealed a significant comparison with emotional problems and highly significant with hyperactivity while the rest of the scales has no significant comparison [Table 1].

Table 2 depicts multivariate test result of one-way MANOVA which shows statistically significant differences in emotional and behavioral problems (SDQ total score) of school-going adolescents based on school area (government-urban, government-rural, private-urban, and private-rural), $F = 13.85$, $P < 0.0005$; Wilk's $\Lambda = 0.874$, partial $\eta^2 = 0.07$. The tests of between-subject effects found that school area has a statistically significant effect on both parental perceptions on SDQ total score ($F = 14.57$; $P < 0.0005$; partial $\eta^2 = 0.07$) and teachers' perception on SDQ total score ($F = 14.14$; $P < 0.0005$; partial $\eta^2 = 0.07$).

Multiple linear regression analysis was made for the association of parental and teacher SDQ total scores with gender, urban-rural settings, and socioeconomic status. The results show parents' report of overall difficulties in SDQ is significantly predicted with gender, urban-rural settings, and socioeconomic status. Teachers' reports of overall difficulties in SDQ are significantly predicted with urban-rural settings and socioeconomic status whereas gender has no significant prediction [Table 3].

Parents' and teachers' reports on emotional and behavioral problems of school adolescents found prevalence rate were higher than one-tenth of the total sample in the study. Epidemiological study on mental health disorders of children and adolescents in Asia found the general prevalence to be in the range of 10%–20%.[11] Teachers' reports in another study stated that adolescents had emotional and behavioral disorders due to less monitoring and poor interactions.[12]

According to the parents' report, significant gender association was found with all SDQ domains, whereas teachers' report in the current study shows significant gender association only with emotional problems and hyperactivity. Psychological distress such as depression and anxiety is seen more among girls than boys.[13] Conduct problems are mostly seen among boys and increases in middle adolescence.[14] A study found that the attention deficit hyperactivity disorder prevalence rate is higher among female than male adolescents.[15] The current multivariate analysis found a significant difference between emotional and behavioral problems in the school area. A multiple linear regression analysis found an association between socio demography and mental health among children.[16]

The limitation of the study is that it is a cross-sectional study; results were based on a single scale and does not incorporate sociodemographic details of parents and teachers. The strength of the current study is a large sample size, it covers rural/urban and government/private schools.

Table 1: Parents' and teachers' perceptions on emotional and behavioural problems compared with gender

SD domains	Gender, mean (SD)		df	*t*	*P*
	Male	Female			
Parental report					
Emotional problems	2.20 (2.18)	2.71 (2.28)	598	−2.77	0.006**
Conduct problems	2.12 (1.67)	1.80 (1.36)	598	2.56	0.01**
Hyperactivity	4.05 (2.30)	3.11 (2.02)	598	5.31	0.000***
Peer problems	2.45 (1.63)	2.04 (1.48)	598	3.20	0.001***
Overall	10.82 (5.57)	9.66 (4.98)	598	2.69	0.007**
Teachers report					
Emotional problems	2.13 (1.86)	2.50 (2.19)	598	−2.17	0.03*
Conduct problems	1.81 (1.85)	1.67 (1.71)	598	0.91	0.35
Hyperactivity	3.22 (2.39)	2.25 (2.01)	598	5.40	0.000***
Peer problems	2.06 (1.85)	2.10 (1.86)	598	−0.26	0.79
Overall	9.12 (5.58)	8.47 (5.84)	598	1.38	0.65

*$P<0.05$, **$P<0.01$, ***$P<0.001$. SD: Standard deviation

Table 2: One-way MANOVA analysis on emotional and behaviour problems of school going adolescents with school-area

Source	Dependent variable	df	*F*	*P*	Partial η^2
School-area	Parental perception - SDQ total score	3	14.57	0.000	0.07
	Teachers perception - SDQ total score	3	14.14	0.000	0.07

P-value of 0.000 means $P<0.0005$. SDQ: Strength and Difficulties Questionnaire

Table 3: Multiple linear regression analysis – total Strength and Difficulties Questionnaire score of parents' and teachers' reports

Dependent variable	Independent variable	*B*	*P*	95.0% CI	Model summary
Parental report - total score of SDQ	Gender	−1.24	0.003**	(−2.07–−0.41)	R=0.23
	Urban-rural settings	−1.67	0.000***	(−2.51–−0.82)	R^2=0.05
	Socio-economic status	0.57	0.01**	(0.13-1.02)	F=11.17
Teachers report - total score of SDQ	Gender	−0.71	0.12	(−1.61-0.18)	R=0.22
	Urban-rural settings	−1.31	0.005**	(−2.23–−0.40)	R^2=0.05
	Socio-economic status	0.99	0.000***	(0.51-1.47)	F=10.50

**Statistically highly significant at $P<0.01$, ***Statistically highly significant at $P<0.001$. CI: Confidence interval, SDQ: Strength and Difficulties Questionnaire

CONCLUSION

The teachers and parents reports found some level of emotional and behavioral problems of school-going adolescents. Adolescents need proper concern and psychosocial care and support for their present and future development.

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Conflicts of interest

There are no conflicts of interest.

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Short Communication

A clinico-epidemiological profile of scrub typhus cases admitted in a tertiary hospital in South India

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Abstract

Scrub typhus (ST) is a consistently underreported disease. The disease is spreading to newer areas, and an understanding of disease epidemiology is needed in the local Indian and current context. This study describes the demographic characteristics, monthly distribution, clinical and laboratory presentations, and treatment outcome of the ST cases recently identified. Case sheets of 15 ST patients diagnosed from January 2019 to December 2020 were analyzed. The majority of the patients were male. Eighty percent of the patients were from rural or suburban areas. Higher admission was observed from September to December. Fever (100%), skin rash (73.3%), body ache (53.3%), and vomiting (53.3%) were the most common clinical features. The onset of fever till the appearance of skin rash was 3 ± 1.2 days. The mean day from onset of symptoms till diagnosis was 6.8 ± 3.9 days. Eschar was found in only two patients. Nine (60%) patients already had complications at the time of admission. Most patients presented a laboratory picture of thrombocytopenia, neutrophilic leukocytosis, and anemia. Complications such as septic shock, acute kidney injury, and hepatic involvement were observed. All responded to doxycycline within 48 h. No fatalities were observed. Early clinical suspicion of ST among those with high fever, skin rash and thrombocytopenia, and transaminitis showed positive clinical outcome.

Keywords: Doxycycline, febrile illness, scrub typhus, thrombocytopenia, Weil–Felix test

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INTRODUCTION

Scrub typhus (ST) is a re-emerging disease. Although there is an increasing trend in the number of cases and disease outbreaks in India, there is a lack of awareness among clinicians about the disease.[1-4] Furthermore, there is a lack of awareness about importance of disease surveillance in control of such diseases. Overall, a poor participation of health facilities in disease surveillance activities has been observed.[3,4] Lack of epidemiological data due to consistent underreporting of ST cases is proving to be an obstacle to effective planning and implementation of appropriate prevention and control measures.

The case fatality rate due to ST is reported to be around 30%–45% and is influenced by a number of patient factors and availability of diagnostic and treatment facilities.[5-7] Around 50% of those with fever of unknown origin were later found to be positive for ST by serological studies.[8] South India has started to see rise in ST cases.[3,8-10] This case series study was undertaken with the objective of describing the demographic characteristics, monthly

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distribution, clinical presentations, and treatment outcome of the ST cases admitted in a tertiary hospital in South India.

METHODOLOGY

A record based case series study was undertaken at a tertiary health facility in Bangalore, South India. The medical records of patients from January 2019 to December 2020 were reviewed for ST cases. A total of 15 patients were treated for ST during that time. The results of the analyzed 15 case sheets are presented here.

Case description of Scrub Typhus

In 2017 the clinical case definition Scrub Typhus surveillance was modified as follows:
A clinical case of scrub typhus is one with acute undifferentiated febrile illness of 5 days or more with or without eschar should be suspected as a case of Rickettsial infection. If eschar is present, fever of less than 5 days should be considered at Scrub Typhus. Other signs and symptoms may be headache, rash, lymphadenopathy, multi-organ involvement like liver, lung and kidney involvement. Other common diseases like dengue, malaria, pneumonia, leptospirosis, and typhoid should be ruled out.[11]

Case series analysis revealed that the confirmation of diagnosis was made either by Weil–Felix test or by strong clinical suspicion after ruling out dengue, typhoid, leptospirosis, and malaria or by observing their response to doxycycline regimen within the first 24–48 h.

The patient blood samples were sent to authorized laboratories for testing. Among those tested with Weil–Felix, a titer of more than 1:80 for OXK was considered diagnostically significant as per the new modified definition for ST by the National Integrated Disease Surveillance Programme (IDSP).[11] Data were analyzed for descriptive statistics using MS Excel and IBM SPSS 23 Chicago, IL. USA.

RESULTS

There was a male preponderance (66.4%) in the case occurrence [Figure 1]. The mean age of the patients was 19.24 ± 18.6 years (range: 2–55 years). Age distribution of the cases showed that there were three (20%) under 5 years, five (33.3%) between 5 and 18 years, and seven (46.6%) above 18 years of age. Comorbid conditions based on investigation reports were found in three cases, with one having alcoholic liver disease (fatty liver signs in ultrasonography [USG] abdomen), one tested positive for typhoid, and one for chikungunya. Only three (20%) gave a history of contact with pets and animals. The majority of the patients came from rural areas (80%) [Table 1].

All 15 patients had high grade fever; 7 (46.7%) with and 8 (53.3%) without chills and rigor. Erythematous maculopapular rash (73%), body ache (53.3%), and vomiting (53.3%) were the other most common accompanying clinical features. The clinical signs of periorbital puffiness and redness of eyes were observed only among young children. On clinical examination, eschar was found only in two (13.3%) patients who reported insect bite. Location of the eschar was in the ear and thigh region [Table 2].

Time distribution of the cases showed that the majority of the cases (73.3%) were admitted from September to December month in those years [Figure 2].

Anemia was present in 13 (86.7%) with a mean Hb% of 11.1 ± 2.2 g% (range: 8.6–15 g%), transaminitis was present in 12 (80%), and thrombocytopenia was observed in

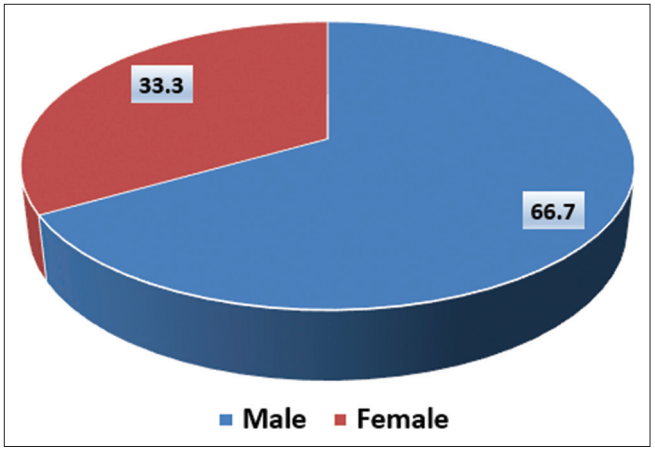

Figure 1: Gender distribution of the scrub typhus cases (*n* = 15)

Table 1: Demographic and clinical profile of the scrub typhus cases (*n*=15)

Variables	Descriptives
Age (years) (mean±SD/median/IQR)	19.24±18.6/10/37
Gender - number of males/number of females (percentage of males)	5/10 (66.7)
Days of illness before appearance of rash (mean±SD/median/IQR) (*n*=11)	3±1.2/3/2
Duration of illness before diagnosis (mean±SD/median/IQR)	6.14±3.2/5.5/7
Length of hospitalization (mean±SD/range)	8.7±8.7/3-40
Mean duration of disease to initiation of effective antibiotic therapy (mean±SD/range)	6.8±3.9/3-19
Comorbid conditions present	3 (20)
History of contact with pets/animals	3 (20)
Residence - urban/rural (percentage from rural areas)	3/12 (80)

SD: Standard deviation, IQR: Interquartile range

9 (60%) cases with a mean platelet count of 98500 ± 54586 lakhs/ml of blood (range: 32000–160000/ml of blood). Five patients (33.3%) developed serious complications. Four of the five patients who developed complications had OXK titer >1:160 [Table 3].

DISCUSSION

Male preponderance (66.4%) of ST was observed in this study. Similar finding was reported by Varghese *et al.*[12] in the neighboring states of Tamil Nadu and Andhra Pradesh.[13] Fever, rash, and body aches were the most common presenting clinical features. Pain and ulceration on scrotal skin among two (13.3%) male patients were the chief presenting complaints, which has not been reported earlier in any research study. These patients specifically had prominent maculopapular rash with petechial hemorrhage and central necrosis scattered over other parts of their body.

There was no mortality due to ST recorded during the study period even though complications such as sepsis and acute hepatorenal injury occurred in them. All the patients responded to tablet doxycycline. In this study, a dramatic response to doxycycline was observed in all patients. Most of them became afebrile within 24–48 h and symptomatically of improved and could be discharged after around 3–4 days. Similar findings were reported in other studies done in South India.[3,8,14]

Eschar was found in only 2 (13.3%) of the 15 patients. Eschar indicates the site of bite by the chigger, the larval stage of the mite. Although the presence of an eschar supports diagnosis, it may not be always found in all cases. Literature review revealed that patients from Southeast Asia

Table 2: Summary of clinical manifestations of the scrub typhus cases (*n*=15)

Clinical manifestations	Frequency, *n* (%)
Fever with chill and rigor	7 (46.7)
Fever without chill and rigor	8 (53.3)
Skin rashes and location	11 (73.3)
Body ache	8 (53.3)
Vomiting	7 (46.7)
Pain abdomen	5 (33.3)
Eschar and location	2 (ear and thigh) (13.3)
Headache	4 (26.6)
Nausea	2 (13.3)
Loss of appetite	4 (26.6)
Generalized weakness	4 (26.6)
Joint pain	4 (26.6)
Loose motion	1 (6.6)
Cough and throat congestion, runny nose	2 (13.3)
Redness of eyes	2 (13.3)
Periorbital puffiness	3 (20)
Lymph node swelling and location	2 (neck/inguinal) (13.3)
Pedal edema	4 (26.6)
Jaundice	1 (6.6)
Scrotal ulcer	2 (13.3)
Liver enlargement	5 (33.3)

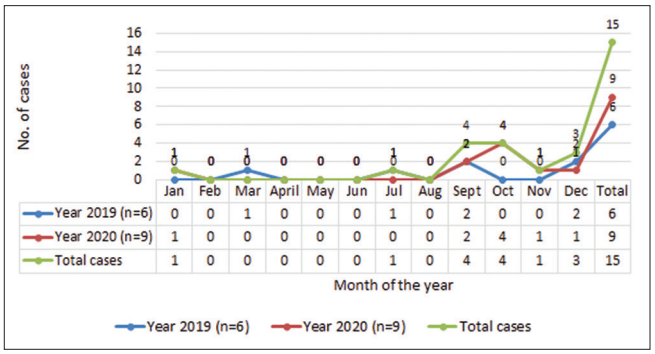

Figure 2: Scrub typhus case distribution for the years 2019 and 2020 (*n* = 15)

Table 3: Summary of laboratory findings and complications observed among scrub typhus cases (*n*=15)

Case number	Thrombocytopenia	Transaminitis	Neutrophilic leukocytosis	Anemia	Abnormal renal profile	CRP	Hyponatremia	Complications
1	+	+	+	−	−	×	×	Sepsis
2	−	−	+	+	−	×	×	-
3	+	+	+	+	+	×	×	-
4	−	−	−	−	−	×	×	-
5	+	+	−	+	+	×	×	-
6	−	+	−	+	−	×	×	-
7	+	+	−	+	+	×	+	-
8	+	+	−	+	−	High	+	Sepsis, ARDS, MODS
9	+	+	−	+	+	High	+	Sepsis, ARDS, AKI
10	−	+	−	+	+	×	×	Sepsis
11	−		+	+	−	×	+	-
12	+	+	−	+	−	×	+	-
13	+	+	−	+	−	×	×	-
14	−	+	+	+	−	×	×	-
15	+	+	−	+	+	×	×	Septic shock
Mean±SD (range)	98,500±54,586 lakhs/ml of blood			Hemoglobin% 11.1±2.2 (8.6-15)			130±6.1 (123-137)	-

ARDS: Acute respiratory distress syndrome, AKI: Acute kidney injury, MODS: Multiple organ dysfunction syndrome, SD: Standard deviation, CRP: C-reactive protein

rarely present with an eschar. Furthermore, people living in endemic areas rarely develop severe illness, often without rash or eschar.[15,16]

In this study, those with severe complications were found to have OXK titer >1:160. However, the significance of this titer could not be established statistically in this study. A study did find a correlation between higher titers of Weil–Felix tests to more severe forms of disease.[17]

Even though the Weil–Felix test has a low sensitivity and specificity, it is the cheapest and common test for diagnosis of ST in developing countries.[14,18] Weil–Felix tests do show false positives in those with urinary infections, leptospirosis, and relapsing fever.[13] Weil–Felix test is usually positive after 5–10 days of onset of fever. We might get false negative test results if the Weil Felix test is done during the first 4 days of illness. So if the early test is negative, clinicians may repeat the test again after 5 days of illness for laboratory confirmation. But symptomatic treatment for suspected Scrub typhus must start. Therefore, timing of the test is crucial.[10,13] Furthermore, among the immunocompromised, the test might yield false-negative results. Physicians must clinically correlate to come to a diagnosis. In such a situation, response to doxycycline treatment might help. Studies done in India revealed that recombinant IgM ELISA and rapid immunochromatographic test which has excellent specificity and acceptable sensitivity, can be an alternative to Weil–Felix test in a moderate setup.[14,19] Till better diagnostic techniques are available, low-income countries will have to depend on the Weil–Felix test as a primary screening tool with clinical correlation for disease management. Public health experts in India may review the feasibility and programmatic implementation of IgM test for ST diagnosis and for more accurate reporting of cases.

The monthly distribution pattern of the cases revealed that most of the cases occurred during the relatively cooler and drier months. Mathai *et al.*[8] and Varghese *et al.*[12] also found outbreaks of ST to be more common in cooler months in southern states of Tamil Nadu and Andhra Pradesh between August to November and September to January, respectively, in South India. However, another report stated that a high index of suspicion of ST is needed in patients presenting with fever during the monsoon months in India.[1]

Studies have shown that the ST cases mainly belong to rural areas in India.[2,12,20] Varghese *et al.*[12] reported that cases are more likely to be agricultural laborers, not wear a shirt at home, live in houses adjacent bushes or shrubs, and live in a single room home, and the first three of these variables were statistically significant. Since most of the cases in this study belonged to the rural (80%) areas, the same environmental and occupational risks mentioned by Verghese *et al.*[12] might prevail in this study population as well. Since this was a hospital based retrospective study, these aspects could not be covered in detail. History of abdominal pain was present in five (33.3%) patients, which is considered to be an unusual symptom, observed mostly among people coming from hyperendemic areas.[21,22] This symptomatology among laboratory-positive cases indicated disease endemicity.[23] Active surveillance of such cases might help to identify the hot spots for taking necessary prevention and control measures.

In this study, there were eight patients below the age of 18 years and three below the age of 5 years. It is observed in this study that the pediatric cases developed periorbital and pedal edema in the early stages suggesting acute kidney injury. A consultative committee of the Indian Academy of Pediatrics in 2016 recommended that pediatricians must be aware of the compatible clinical, laboratory, and demographic features, differential diagnosis to avoid overdiagnosis. They also recommended that once strong clinical suspicion is established, immediate treatment with doxycycline should start without waiting for the laboratory results. This will prevent unnecessary delay and reduce the occurrence of life-threatening complications.[24] Often suspicion of ST occurs only when other treatments fail, and complications develop. Delay in diagnosis is found to be due to time spent in testing for dengue, malaria, typhoid, and leptospirosis. Most of the diagnoses come only after the patients respond to the doxycycline treatment. The clinical observations showed that to properly define cases of ST for surveillance among pediatric and adult populations, more studies on these two population groups are needed which can guide the clinicians better.

It was observed that the rash appeared on the 3rd day of illness (3 ± 1.2 days) and around a week elapsed (6.14 ± 3.2 days) before a diagnosis of ST was made and treatment initiated. Determination of incubation period was not possible as the probable source of infection could not be elicited. A study reported that it takes around 7–10 days from exposure till symptoms manifest. Nine (60%) of the 15 patients already had complications at the time of admission, and many of them were referred from other health facilities. Complications in ST usually appear after a week of illness.[1] They mostly presented with a blood picture of normocytic normochromic anemia, neutrophilic leukocytosis, and thrombocytopenia. ST is an important differential diagnosis in a patient having fever with thrombocytopenia.[19] But endemicity of other thrombocytopenia causing diseases

such as dengue and leptospirosis delays the diagnosis of ST due to absence of clinical suspicion.

Even those who had developed complications improved clinically and recovered from acute kidney injury as evident by the laboratory and USG reports after doxycycline treatment was started. It was observed that the Weil–Felix test turnaround time was at least 3 days. Once suspicion of ST is made, treatment should be started without waiting for test results. This might have been the reason for no ST-related mortality in this study. The clinical response with Doxycycline is so fast that often physicians discharge those patients with mild symptoms, without waiting for laboratory confirmation and thereby reduce duration of hospitalisation. Patients were discharged if they remained afebrile for 48 h and blood parameters improved, with advice to continue doxycycline. The current guidelines also state that once suspicion is made, treatment should be initiated without waiting for laboratory confirmation.[25]

Health education and awareness among the general public and health practitioners will play an important role in its prevention and control. Recreational activities such as hiking, camping, or similar activities have become a trend among city dwellers. Before venturing into endemic areas, personal protection measures must be followed.

The following self protection measures are to be followed by people residing in endemic areas and for travellers from non-endemic areas:

1. Application of repellents such as diethyltoluamide,
2. Treating garments and hiking boots, socks etc in permethrin solution,
3. Wear long-sleeved shirts and pants tucked into socks,
4. C vegetations and shrubs around houses or camping sites,
5. Avoid walking barefoot, also avoid wearing sandals that do not cover the feet,
6. Use a mat or tarp when sitting on the ground and
7. Seek antibiotics from health-care practitioners before entering endemic areas.

There is no vaccine or preventive medication against ST.[6,26]

Destruction of forest areas for creation of newer human settlements has increased the risk of zoonotic disease in humans. It is thus pertinent that public health professionals, namely the medical fraternity, and the specialists such as entomologists and epidemiologists are sensitized about the enhanced activity of ST pan-India to ensure capacity building and formulation and implementation of strategies to prevent and/or reduce adverse outcomes of ST and associated morbidity.[27]

In 2017, the Integrated Disease Surveillance Programme (IDSP) modified the definition of ST for clinical diagnosis and confirmation of ST.[11] A need is felt for a proper case assessment/survey form for screening fever cases which will help clinicians to diagnose ST early. Furthermore, sufficient evidence is available to consider doxycycline among the essential drugs in rural primary care settings with ST endemicity or for cases of pyrexia of unknown origin (PUO) presenting with fever, rash, and thrombocytopenia, which will save many lives and prevent complications and hospitalizations. Currently, the following regimens are used for treatment of ST irrespective of age:[26]

1. Doxycycline – drug of choice (4.5 mg/kg/day in two divided doses up to a maximum of 100 mg twice daily for 7–14 days)
2. Alternative drugs – azithromycin (10 mg/kg/day for 5 days) or chloramphenicol (50–100 mg/kg/day in four divided doses for 7–14 days).

Improved diagnostic methods, improved surveillance mechanisms, public awareness campaigns, and training health-care providers about its treatment and management will determine the success of public health interventions.

Limitations

The number of cases available for analysis in this study is too small to make a generalizable interpretation of the findings. Other limitations are that most of the inflammatory markers are not done in all the patients to make a comparison. Furthermore, it was not possible to correlate the serological findings with clinical status as patients were admitted at various stages of their illness. Few of the patients were referred to this hospital after receiving initial treatment elsewhere. Their preadmission clinical status was assessed using the available clinical and laboratory investigation report in the discharge summaries. As this data was collected retrospectively using case sheets from medical records, information regarding the socioenvironmental conditions, occupational risk, knowledge, and awareness about the disease could not be elicited. Further, field-level epidemiological studies including all the above factors must be conducted to get a wholesome picture of the ST scenario.

CONCLUSIONS

Timely diagnosis and treatment of ST reduces the duration and severity of illness and improves prognosis.

Greater awareness among physicians regarding ST as a differential diagnosis for PUO will enhance the testing and diagnosis.

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Case Report

Paraquat-induced lung fibrosis and multiorgan failure: A case report from North India

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Abstract

Paraquat is a herbicide which is widely used by agricultural communities worldwide. It is extremely toxic for humans and ingestion of as less as 30 mL of 20%–24% concentration is usually lethal. The lack of an effective antidote is a concern due to the fatal outcomes associated with ingestion of paraquat. Herein, we are presenting a case of fatal paraquat poisoning in a young male from a center in India. The clinical course was complicated by liver, renal, and lung injury. We also describe its mechanism of toxicity, clinical features, and newer strategies being tried for treatment.

Keywords: Fibrosis, herbicide, kidneys, lungs, paraquat, poisoning

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INTRODUCTION

Ingestion of pesticides with an intent of deliberate self-harm is prevalent in the rural parts of South Asia due to their easy availability and lack of strict regulatory laws. The consumption of organophosphorus compounds, celphos (aluminum phosphide), and paraquat account for majority of the suicide cases.[1] Paraquat (dimethyl bipyridylium dichloride) poisoning is particularly concerning due to its widespread use, low fatal dose, high mortality, and lack of an effective antidote. It is a herbicide and inhibits the growth of a wide variety of weeds on direct contact.[2] The lethal dose has been estimated to be 150 mg/kg of bodyweight. Therefore, the ingestion of more than 30 mL of the commercially available 20%–24% solution is lethal, and lesser quantities can also result in significant damage.[3] Here, we present a case of fulminant paraquat poisoning with discussion regarding pathophysiology, clinical presentation, and various novel treatment strategies.

CASE REPORT

A 25-year-old male was brought to the casualty with a history of ingestion of around 50 mL of paraquat 3 days earlier with suicidal intent. He was previously healthy and had no significant past medical or surgical history. He developed epigastric pain and several episodes of vomiting for which he was admitted to a primary care center where gastric lavage was done 3 h after ingestion. He was managed conservatively for 2 days and kept nil per os. He was referred to our hospital in view of progressive dyspnea and jaundice. At presentation, the patient was icteric and in respiratory distress but well oriented to time, place, and person. He was already on oxygen therapy and any attempt to step down the oxygen support led to

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worsening of dyspnea with desaturation. His oral mucosa was edematous and ulcerated [Figure 1]. Bilateral fine-end inspiratory crepitations were noted on auscultation. The rest of the systemic examination was unremarkable.

The important investigations are depicted in Table 1. The clinical course was marked by progressive renal, hepatic, and pulmonary dysfunction. The kidney injury was nonoliguric and creatinine rose to 5.5 g/dL. The bilirubin rose to 12 mg/dL and transaminases to 500 IU/L. The blood culture was sterile and he tested negative for viral markers. No abnormality was noted on the ultrasound of the abdomen and urinalysis. The patient was treated with intravenous dexamethasone (8 mg IV TDS), ceftriaxone (1 g IV BD), pantoprazole (40 mg IV OD), Vitamin C (500 mg PO BD), Vitamin E (600 mg PO OD), and intravenous fluids. Gel-containing benzalkonium chloride (antiseptic) and choline salicylate (analgesic) were applied to the oral mucosal lesions. Mild hyperkalemia occurred that was medically managed by the use of nebulized salbutamol and infusions of dextrose with insulin. The hypoxia gradually worsened and oxygen therapy had to be stepped up. Chest radiograph that was done on the fourth day of poisoning showed bilateral haziness and reticulations [Figure 2]. He was placed on nonrebreathing mask and a high-resolution computed tomography scan of the chest was done 2 days later [Figure 3], which revealed changes consistent with pneumonitis. In view of respiratory failure, rapid sequence intubation was performed, and mechanical ventilation was instituted. He died on the tenth day of poisoning due to severe acute respiratory distress syndrome (ARDS) and progressive multiple organ dysfunction syndrome. Due to the clear-cut chronological history, clinical features and investigations, other differential diagnoses such as sepsis, viral pneumonia, and acute interstitial pneumonia were not considered.

Figure 1: Ulcerations on the tongue

DISCUSSION

Paraquat toxicity is caused by the generation of superoxide radicals and other highly reactive oxygen species that lead to exhaustion of reduced nicotinamide adenine dinucleotide phosphate and subsequent damage to body cells through lipid peroxidation.[4] The organs most commonly affected are those with high perfusion and oxygen requirement, chiefly the lungs, kidneys, and liver.[5] Paraquat is preferentially concentrated to more than ten times the plasma value in the lung parenchyma by uptake through the alveolar epithelium by the activity of polyamine transport system. Damage to lungs occurs in two phases. First, the destructive phase which manifests as swelling and fragmentation of the alveolar epithelium, and second, the proliferative phase which is characterized by alveolar edema and appearance of an acute inflammatory exudate. This can progress to pulmonary fibrosis.

The clinical course can be classified into mild, moderate to severe and acute fulminant.[2] The manifestations depend on the amount ingested.[2] In the mild form, patients experience only gastrointestinal discomfort and recover completely, while the severe form shows multi-organ involvement and relentlessly progressive lung fibrosis, culminating in death within 2–3 weeks of poisoning. Death in fulminant poisoning occurs within a few hours to days. Serum and urine paraquat levels can be measured to confirm diagnosis when in doubt and higher levels are associated with increased mortality. These tests are not essential and have no role in guiding the management.

A study comprising of 14 fatal cases of paraquat poisoning from South India by Kanchan *et al*. in 2015 reported a survival duration ranging from 10 h to 25 days after

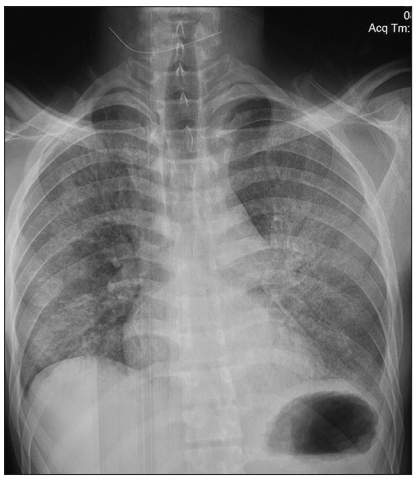

Figure 2: Chest radiograph showing diffuse confluent areas of ground-glass haziness and interspersed areas of reticular opacities in bilateral lung fields

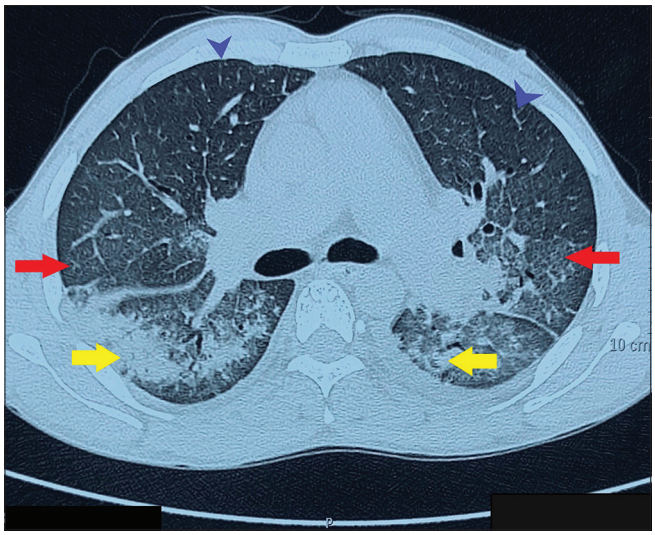

Figure 3: Axial section of high-resolution computed tomography scan of the chest at the level of lower lobes showing bilateral areas of ground-glass attenuation (red arrows), interlobular septal thickening (blue arrow heads), and consolidation (yellow arrows)

Table 1: Serial laboratory investigations and clinical observations

Investigation/observation	Day of poisoning				
	1	4	6	8	9
Hemoglobin (g/dL)	14.4	13.9	14.7	13.2	13.0
Platelets ($\times 10^5$/mL)	2.13	1.80	2.15	1.45	1.20
TLC ($\times 10^3$/mL)	12.1	10.7	7.9	13.2	14.0
Sodium (mmol/L)	139	143	155	154	147
Potassium (mmol/L)	3.7	4.9	4.8	5.7	5.8
Urea (mg/dL)	39	96	99	101	138
Creatinine (mg/dL)	1.2	3.1	3.3	6.2	5.5
Total bilirubin (mg/dL)	2.0	7.8	8.4	11.9	12
Conjugated bilirubin (mg/dL)	NA	4.9	4.8	9.7	10.1
AST (U/L)	36	63	124	477	485
ALT (U/L)	44	108	110	500	470
ALP (U/L)	NA	156	NA	380	341
INR	NA	1.47	NA	1.86	1.9
Arterial pH	NA	7.32	7.35	7.10	6.97
pO_2 (mm Hg)	NA	82	55	50	42
SpO_2 (%)	97	96	84	76	70
FiO_2	0.21	0.60	0.80	0.95	1.00
pCO_2 (mm Hg)	NA	38	44	47	37
Bicarbonate (mEq/L)	NA	18	19	14	9
Lactate (mmol/L)	NA	2.2	2.3	3.8	5.1
Respiratory rate (/min)	17	24	20	22	21

TLC: Total leukocyte count, AST: Aspartate transaminase, ALT: Alanine transaminase, ALP: Alkaline phosphatase, INR: International normalized ratio, FiO_2: Fraction of inspired oxygen, SIMV: Synchronized intermittent mandatory ventilation, NA: Not available

ingestion.[6] Acute kidney injury occurred in 10 patients, multi-organ failure in five, ARDS in six, acute liver failure in three, and nosocomial pneumonia in one patient. Im *et al.* described radiological findings in 42 patients of paraquat ingestion. Twenty-six manifested diffuse consolidation; 15 developed pneumomediastinum with or without pneumothorax, and eight exhibited cardiomegaly with superior mediastinal widening.[7]

Nonavailability of a specific antidote makes supportive management the current mainstay of treatment of paraquat poisoning. Initial measures include gastric lavage and use of adsorbents such as activated charcoal and Fuller's earth within 1 h of ingestion to reduce the absorption.[5] Possible role of antioxidants such as Vitamin C and E and free radical scavengers such as N-acetyl cysteine has also been studied with unconvincing results. The data are available from animal studies or uncontrolled human studies with very small sample sizes. Hemoperfusion is reserved for patients who develop acute kidney injury and, if done within the first 4 h of ingestion, is known to decrease the systemic levels of paraquat.[8] Oxygen therapy acts as a double-edged sword as higher partial pressure of oxygen has been shown to enhance the oxidation of paraquat which increases its toxicity; hence, the use of oxygen therapy is recommended only in the presence of significant hypoxia.[9]

Various studies worldwide have also studied the role of immunosuppressive agents. In a Cochrane systematic review of three randomized controlled trials with a total of 164 patients of moderate or severe paraquat poisoning, the mortality was lower in the subset of patients who received glucocorticoids and cyclophosphamide in addition to the conventional management.[10] Pirfenidone, an antifibrotic drug currently approved for the treatment of idiopathic pulmonary fibrosis, has also been seen to reduce the production of reactive oxygen species; however, its role in the treatment of poisoning in humans is yet to be investigated.[11] Resveratrol, an antioxidant that is currently being explored for its anti-aging and anti-cancer properties, has been shown to reduce paraquat-induced damage to hepatocytes in rats by depleting the excess free radicals generated.[12]

A systematic review studying the use of immunosuppressive pulse therapy in the treatment of paraquat poisoning which included 7 trials enrolling 426 patients over a period of 23 years concluded a 21.7% reduction in mortality when patients were treated with immunosuppressive pulse therapy. However, patients with hypoxia did not achieve remission during hospitalization suggesting that methylprednisolone and cyclophosphamide might have little effect on hypoxia caused by early acute inflammation.[13]

Another meta-analysis evaluating the efficacy of immunosuppressive therapy in the management of lung injury due to paraquat poisoning included 12 studies between 1980 and 2006, suggested that immunosuppressive therapy with glucocorticoids and cyclophosphamide is efficacious in the management of lung injury in patients

with severe paraquat poisoning and is likely to decrease the mortality in this group of patients.[14]

The use of paraquat as a herbicide is common in rural India. Intake of paraquat with suicidal intent carries with it a high risk of morbidity and mortality even when consumed in small amount due to its low lethal dose. Primary health care centers in India are mostly ill-equipped to manage paraquat poisoning cases as they rapidly progress to respiratory and multi organ failure. Such patients often have delayed contact with a tertiary health care facility leading to high mortality rates. The absence of a specific antidote makes its management even more challenging as the available supportive therapies have no definitive mortality benefit. In many countries (Sri Lanka and South Korea), paraquat has been banned which has led to reduction in pesticide-associated mortality rates.[15]

CONCLUSION

Suicidal poisoning with herbicides is a common yet neglected cause of mortality in South Asia. This case report highlights the clinical features and outcomes following paraquat poisoning. It also outlines the various treatment strategies that have been devised in the management of paraquat poisoning and are under research currently. We hope that this report will help clinicians in the prompt management of paraquat poisoning. Lungs, kidneys, and liver are the most severely affected organs. Research is underway to develop the treatments to halt organ damage with little success so far.

Declaration of patient consent

The authors certify that they have obtained the appropriate patient consent form. In the form, the patients' relative (father) has given consent for patient's images and other clinical information to be reported in the journal. The relative understands that the patients' name and initials will not be published, and due efforts will be made to conceal the identity, but anonymity cannot be guaranteed.

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Conflicts of interest

There are no conflicts of interest.

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Letter to Editor

COVID-19 – reminds failure of compliant precaution practices in the society

Sir,

A simple basic understanding is that standard and transmission-based isolation precautions are to be used by health-care workers (HCWs). The Centers for Disease Control and Prevention guideline has laid down these standards in their 2007 document for the infection control staff.[1] Hence, these terms are meant for HCWs, not for patients. The absolute term "universal precaution," introduced in 1985–1988, refers to the practice of avoiding contact with patient's body fluids, which was replaced by "standard precautions" in 1996.[2,3] Latter includes a set of practices that are applied to the care of patients regardless of the status of infection (suspicion or confirmation). The key elements are; hand hygiene, gloves and gowns, facial protection, prevention of needle-stick and injuries from other sharp instruments, respiratory hygiene and cough etiquette, environmental cleaning, waste disposal, handling and process of linens, and patient care equipment. Special types of transmission, i.e., "Transmission-based precautions" (contact, droplet, and airborne) are also there for patients who are known or suspected to be infected or colonized with certain infectious agents. These evidence-based practices by HCWs are designed to protect patients and their HCWs and prevent cross-infections. Of all these precautions, had it been practiced by all uniformly, at least hospital-acquired infections could be zero. Sadly, this has never happened in any hospital, as evidenced; violations (deviations from recommended operating practices or procedures), mistakes (failures of intention), and slips (failures of execution) are commonly seen.[4] Furthermore, these precautions have never been translated to common people practices where patients live majority of times, before reaching any doctor/hospital.

In the past two decades, the world has seen three coronaviruses emerge with considerable global health consternation. The SARS outbreak in Guangdong (2003), MERS in South Arabia (2012), and COVID-19 in Wuhan (2019) may represent only the tip of the iceberg of epiphenomenon toward noncompliant precaution practices in society.[5] Transmission of COVID-19 can occur through droplet (most common), contact (direct/indirect), and/or airborne transmissions. It is rightly said that COVID-19 is nothing but nature's repeating calls to awaken human beings.[6] All these transmissions can be prevented by special precautions. Hand hygiene and cough etiquette have been advocated for the common public by various health agencies from time to time. In theory, had these measures and precautions which existed well before the outbreaks of SARS, MERS, and COVID-19, been practiced by the common people before reaching hospitals, such outbreaks would not have spread in the first place? This looks more exaggerated when science has proved asymptomatic can transmit infections too. However, if we will not follow standard precautions, then no matter what special precautions we take, it is fruitless.

Isolation through separation of ill people from noninfected people usually occurs in hospital settings but could also be done at home for mild infections as seen these days with the COVID-19 pandemic. It has also been observed that the application of the principles of self-quarantine (or even self-isolation) among the people is inadequate compounding the present situation. Among some economic sections, people have a single room for all family members, self-quarantine/isolation is not possible. However, the use of face mask, maintaining physical distance as much as possible, sleeping separately, cleaning the bathroom after every use, and frequent use of hand hygiene by affected family member with flu-like illness can be a possible solution to counter this pandemic.[7] Here comes the importance of proper ventilation, environmental cleaning, and wearing the right use of personal protective equipments (PPEs). Recently one special edition in a newspaper reported, "Half of India is not wearing masks and the other half is wearing them wrong."[8] During the initial period of COVID-19 pandemic, on asking experts for ideas "how to conserve PPEs," at least 290 experts gave their suggestions. Common to all was to have right precaution practices. Here, right means with respect to need, place, and person.[9] Hence, if all scientific precautions would be translated to the public, then many outbreaks could be prevented.

Namaste, sometimes spoken as "Namaskar," is a customary Indian greeting.[10] Namaste is usually spoken with a slight bow and hands pressed together, palms touching and fingers pointing upward, thumbs close to the chest. This practice is so important in contact precautions that now it

is commonplace to greet each other by folding hands and saying "Namaste" as opposed to shaking hands. This is just one simple measure people take by themselves without any scientific pieces of evidence, but it is a good move. Similarly, few other good community precautions are hand/body part washing when coming back home from outside visit, not using other's clothes for own use and changing clothes for sleeping/worship, soft-spoken speech (to avoid more aerosol generation), observing silences for few hours/days, drying clothes in sunlight, doing yoga and pranayama, and eating foods having ayurvedic medicinal values.[11]

As recently proved, COVID-19 can be transmitted by airborne transmissions, and this is probably the main reason why pandemic is still on with recurring waves. This mode of spread needs special care in the form of negative pressure isolation room for each patient. However, the majority of hospitals do not have this facility and general public is unaware of this negative pressure concept. When basic personal health preventive steps such as performing hand wash/rub appropriately, observing cough etiquette, wearing mask in the right way, self-isolation/quarantine once symptomatic/exposed, staying in ventilated environment, taking vaccinations timely, and maintaining a clean surrounding environment are not being followed, then expecting all hospitals to have negative pressure rooms cannot be debated.

Several factors may be responsible for this unfortunate complacence in lack of environmental cleaning, optimal hand hygiene practices, cough etiquette, respiratory hygiene, right wearing of PPE, proper physical distancing, isolation rooms, and timely vaccinations to stop spread of COVID-19. First, there may be a lack of awareness of precautions among the greater mass; secondly, there could be an indifferent attitude of the common public for these measures, and thirdly, lack of role models in the society who will educate and influence all. Thus, we are yet to translate our evidence to common practices which is the need of the hour to counter such pandemics.

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An easy, efficient, and safe method to extend utilization of N95 masks: A physician's perspective

Dear Editor,

We want to inform the readership about a relatively easy, efficient, and safe method to extend the utilization of N95 respirators from the perspective of a practicing physician. Risk of contracting infection was always an occupational hazard for doctors, but COVID-19 pandemic has taken that to unprecedented levels. N95 masks are the current cornerstone of protection against COVID-19.[1] While the common medical or surgical masks are quite abundantly available to use, studies indicate that filtration efficiency of surgical masks is quite low varying from 38.5% (with ear loops) to 71.5% (with ties behind the head/head loops), whereas for N-95 masks, it approaches 98%.[2] According to the Centers for Disease Control and Prevention, surgical masks are not considered as "respiratory protection."[3] Moreover, it is not just the filtration capacity of the mask, also equally important is the fit of the mask to the contour of the individual's face, which is much poorer in case of surgical masks.[4]

N95 masks and personal protective equipment might be somewhat abundant in larger cities and hospitals; however, for physicians having their practice in semiurban and rural setups, attending to outpatients with a fresh N95 mask everyday, let alone after every patient, becomes quite unfeasible. Availability and financial factors among others are major limiting factors.

At present, recommendations for reuse or extending the life of N95 masks may include methods such as hot air oven and ultraviolet-sterilization, that protect the filtration efficiency of N95, but are quite inconvenient to carry out on a daily basis and outside of well-equipped bigger hospitals. Other methods such as washing with alcohol-based solution, soaps, and chlorine-based solutions are not recommended as it degrades the filtration efficiency of such masks significantly.[5] Washable masks are generally cloth-based, which may or may not have an added meltblown filter layer in between, but their filtration efficiency does not approach N95 standards, and are not indicated for handling patients where chances of exposure to COVID-19 is relatively high.

Few institutions in India including the All India Institute of Medical Sciences, Delhi,[6] are following the practice of issuing five N95 masks to its residents and faculty, to be used on a rotational basis over a period of 20 days, but this practice has not become widespread so far. The basis for this appears to be a lot of studies, which show that the surrogates of severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2), namely HCov-229E, and the erstwhile SARS-CoV-1 virus is inactivated mostly within a period of 5 days, when considering its survival on common inanimate surfaces such as paper, rubber, metal, ceramic, glass, and plastic.[7] While studies also claim that SARS-CoV-2 which is more similar to SARS-CoV-1, is considerably more stable than HCoV-229E and can remain viable for 6 days in dried state.[8] It was also noted by the authors that rotational use of the mask on every 6th day was becoming increasingly confusing, as it was difficult to keep track of the sequence, thereby exposing the, doctor to potential risk of unintentional use of a "wrong" mask on a "wrong" day!

This led us to improvise, to think of an simple, easy but effective way to maximize the available resources at hand. We like to call it the "day-mask policy." Seven paper bags are taken and marked from "Monday" through "Sunday" [Figure 1]. Each bag contains one N95 and one 3-layered surgical mask. The 3-layered surgical mask is worn over the N95 mask, only to prevent gross external soiling of the N95 while clinically managing patients and also during surgeries where it is more prone to accidental body fluid splashes, so that the longevity of the N95 is prolonged. It is not advocated with an intent to provide additional filtration efficiency against COVID-19. The surgical mask, as they come cheap, may be discarded daily after use.

Figure 1: One envelope per day, each containing a N95 and a triple layered surgical mask

We consider the "day-mask policy" to be superior to wearing the same N95 mask for 6 days on one go with or without a cloth mask on, it as the main principle behind our "day mask policy" is to allow time for the entrapped viral particles over the outer surface of the mask to be destroyed or inactivated without the need for any active intervention. Using the same mask on consecutive days defeats this very idea and thus increases the exposure. Again, this same policy allows for the mask to be used better in regions of excess humidity, or where sweating is more, as it eliminates the factor of moisture and odor accumulation which soon becomes an issue with continuous usage.

While the maximum possible number of safe reuses for a N95 mask has still not been determined,[9] we have found that each N95 masks can usually be used in a normal working day (8–9 h approximately) for 6 days (therefore 6 such cycles), before it is rendered potentially unusable due to deformity, smell and concerns of reduced efficacy.

The "day-mask policy" makes it extremely easy to identify the "right packet for the day," thus preventing the chance of picking the wrong mask before the virus becomes potentially unviable and noninfective. This practice not only simplifies and extends N95 mask usage, but makes it financially more feasible when we consider physicians and other health-care workers working in small setups in rural and semiurban areas. We hope that fellow physicians find this technique rational, practical, and useful.

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Conflicts of interest
There are no conflicts of interest.

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