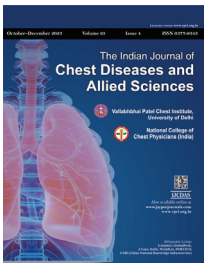
ORIGINAL ARTICLE

A Descriptive Analytical Study to Assess the Knowledge and Practice of Proper Face Mask Wearing among Healthcare Professionals, Patients and Attendants in a Tertiary Care Center of North India



This article is available on www.vpci.org.in

Arjun Kumar[1], Ashok K Janmeja[2], Balbir Singh[3], Rohit Manchanda[4], Rahul Gupta[5], Ankit Lakra[6]

Received on: 20 September 2023; *Accepted on:* 01 March 2024; *Published on:* 26 March 2024

Abstract

Introduction: Respiratory infections including tuberculosis (TB) is a major public health issue around the world. Regular use of a proper face mask is a cost-effective preventive measure to reduce the risk of respiratory infection among healthcare workers (HCWs) and patients attending hospitals. Hence, we conducted the study aimed to assess the knowledge and practice of proper face mask wearing among healthcare professionals, patients, and attendants.

Materials and methods: We conducted a descriptive cross-sectional study from November 2022 to August 2023 at the Maharishi Markandeshwar Medical College & Hospital, Kumarhatti, Himachal Pradesh, India. A total of 390 participants were enrolled in this study including healthcare professionals, patients, and their attendants presented to Maharishi Markandeshwar Medical College & Hospital, Kumarhatti, Himachal Pradesh, India. All participants fulfilling inclusion criteria were interviewed face to face using a validated, semi-structured questionnaire for collecting data regarding knowledge and proper practices for face mask utilization. The collected data were analyzed using the Software Statistical Package for the Social Sciences (SPSS), version 20.0.

Results: Out of 390 subjects, 221 (56%) were females and the predominant 212 (54.3%) age group was in between 18 and 34 years. Among 390 participants 165 (42.3%) were medical students, 114 (29.2%) were patients and attendants, 68 (17.4%) were nurses, and 43 (11%) were doctors. There was a statistically significant association between face mask wearing in public places and higher education levels ($p = 0.0234$). It was found that most participants did not wash their hands before wearing 293 (75.1%) and after removing 307 (78%) the face mask.

Conclusion: Knowledge and proper practice of face mask wearing among the participants, specifically patients and attendants was poor. Hence, there is an utmost need to improve awareness regarding knowledge and proper practices of mask utilization among HCWs, patients, and the general population to prevent respiratory infections.

Keywords: Face mask, Healthcare workers, Infection, Knowledge, Tuberculosis.

The Indian Journal of Chest Diseases and Allied Sciences (2023): 10.5005/jp-journals-11007-0095

Abbreviations used in this Article

HCWs = Healthcare workers, MTB = *Mycobacterium tuberculosis*; TB = Tuberculosis; WHO = World Health Organization

Introduction

Respiratory infections including coronavirus and tuberculosis (TB) are communicable diseases that pose a major public health issue around the world, that threaten the lives of people worldwide.[1] As per the World Health Organization (WHO) Global TB Report 2022, nearly 10.6 million people fell sick due to TB. India has the highest burden of TB accounting for 28% of global TB cases.[2] *Mycobacterium tuberculosis* (*MTB*) infection spreads through air from one infected person to a healthy person while coughing or sneezing. Many defensive approaches are designed to prevent the spread of respiratory infections including social distancing, self-isolation when symptomatic, hand washing, and proper face mask wearing.[3]

Worldwide, various efforts are being made to eliminate TB by 2030, while the Government of India has committed to achieving this target in 2025, which demands effective preventive measures. Social distancing and regular use of a face mask are the key infection prevention practices for healthcare workers (HCWs), patients, and their attendants attending hospitals, especially in

[1–6]Department of Respiratory Medicine, Maharishi Markandeshwar Medical College & Hospital, Kumarhatti, Himachal Pradesh, India

Corresponding Author: Arjun Kumar, Department of Respiratory Medicine, Maharishi Markandeshwar Medical College & Hospital, Kumarhatti, Himachal Pradesh, India, Phone: +91 8054809188, e-mail: aknlnegi@gmail.com

How to cite this article: Kumar A, Janmeja AK, Singh B, *et al.* A Descriptive Analytical Study to Assess the Knowledge and Practice of Proper Face Mask Wearing among Healthcare Professionals, Patients and Attendants in a Tertiary Care Center of North India. Indian J Chest Dis Allied Sci 2023;65(4):182–187.

Source of support: Nil

Conflict of interest: Dr Ashok K Janmeja is associated as the Editorial board members of this journal and this manuscript was subjected to this journal's standard review procedures, with this peer review handled independently of these Editorial board members and their research group.

resource-constrained countries such as India, with high population and pollution.[4,5] India accounts for 18% of catastrophic health expenditure on TB out of all diseases. A recent study conducted in the year 2023 estimates ₹26,500–30,500 per patient total cost of TB treatment from the onset of symptoms until 1-year posttreatment.[6] Therefore, proper face mask wearing becomes a cost-effective preventative measure against TB infection, especially in crowded places such as hospitals often have poor cross-ventilation. The latter can further increase the chances of cross-infection to healthy persons and HCWs from TB patients.

Inappropriate face mask wearing can lead to the escape of contaminated air through gaps between the mask and the face. As per the World Health Organization, improper use and inappropriate discarding of face masks increase the degree of spread of respiratory infections confirming a lack of knowledge or awareness of the proper use of face masks among the healthcare providers, and the general population.[7,8] Furthermore, it has been observed that face masks that are inappropriately discarded in hospitals and public places including bus stands, railway stations, parks, streets, and rivers can act as a source of pollution, which is another emerging form of environmental and health challenges.[9,10]

Hence, we conducted the present study with the aim to assess the knowledge and practices of proper face mask wearing among healthcare professionals, patients, and attendants.

Materials and Methods

Study Design and Population

A descriptive cross-sectional study was conducted from November 2022 to August 2023 in the Department of Respiratory Medicine at Maharishi Markandeshwar Medical College & Hospital, Kumarhatti, Himachal Pradesh, India.

Study Population

The source population for this was all healthcare professionals working in the respiratory medicine department, and the patient and their relatives admitted due to any reasons in the respiratory medicine department of Maharishi Markandeshwar Medical College & Hospital, Kumarhatti, Himachal Pradesh, India. Only willing subjects of more than 18 years of age from hospital staff, medical students, doctors, patients, and attendants were included in the study.

Sample Size and Sampling

The sample size was calculated at 384, assuming the percent frequency of outcome factor in the population (p) 50% ± 5, 95% confidence level, acceptable difference if 5%, $d = 0.05$, and a design effect of 1. Hence, we included a total of 390 participants in this study.

Data Collection and Analysis

Participants fulfilling inclusion criteria were enrolled consecutively in the study after taking written informed consent. Baseline demographic details including education, and socioeconomic status were recorded. A face-to-face interview was conducted to assess knowledge of face mask utilization based on a carefully modified semi-structured questionnaire acquired from a previous study.[7] Each correct answer in the information category was given a score of 1 and each incorrect response was given a score of 0. The final score was determined, and more than 80% of correct answers were considered good knowledge, while the correct response of less than 80% was considered poor knowledge of mask utilization.

Table 1: Demographic profile of subjects

Characteristics	*N = 390* *n (%)*	*p-value*[§]
Age (year)		
18–34	212 (54.3)	0.6703
35–44	98 (25.1)	
45–60	53 (13.6)	
>60	27 (6.9)	
Gender		
Male	169 (43.3)	0.7313
Female	221 (56.7)	
Education level		
No formal education	21 (5.4)	**0.0234***
Elementary education	82 (21)	
High school education	218 (55.8)	
Graduate	52 (13.3)	
Postgraduate	17 (4.4)	
Socioeconomic status		
Upper class	76 (19.5)	0.5443
Upper middle class	178 (45.6)	
Lower middle class	92 (23.6)	
Upper lower	29 (7.4)	
Lower	15 (3.8)	

[§]Association between face mask wearing in public places and demographic variables; *Significant value

All participants were evaluated regarding the correct practice of face mask utilization using the questionnaire acquired from the previous study.[7,8] Each correct response scored 1 and each incorrect response was scored 0. The correct response of more than 80% of the total questions was considered good practice and less than 80% of the total was considered as poor practice.

All participants were evaluated regarding gaps/reasons for poor knowledge and correct practice of proper mask utilization. Then participants were taught and demonstrated the proper practice of face mask wearing with the help of a poster by a coinvestigator under the supervision of the principal investigator daily for 6 consecutive days. Participants were re-evaluated on the 7th day using questionnaires and improvement in knowledge and practice of proper mask utilization compared to preteaching score.

Data Processing and Analysis

The collected data were coded and entered into Statistical Package for the Social Sciences (SPSS), version 20, for analysis. Continuous variables were presented as mean ± standard deviation (SD) and categorical variables were displayed as an absolute count and percentage. Chi-square test was used to calculate significance levels for categorical data and t-test was utilized for the comparison of continuous data. The p-value of less than 0.05 was assumed significant.

Results

Baseline Demographic Profile

Out of 390 subjects, 221 (56%) were females and the most predominant 212 (54.3%) age group was found to be in between 18 and 34 years (Table 1). Among 390 participants 165 (42.3%) were medical students, 114 (29.2%) were patients and attendants, 68 (17.4%) were nurses, and 43 (11%) were doctors. Most of the

Table 2: Knowledge of the face mask utilization in the healthcare providers, patients and attendants

Variables	*Categories*	*Response N = 390 (%)*
Which is the correct way of using surgical face masks to protect against respiratory infections?	White side facing out	157 (40.2)
	White side facing in (correct)	233 (59.7)
How many layers are there in a surgical mask?	Two	211 (54.1)
	Three (correct)	143 (36.6)
	Four	36 (9.2)
Can wearing a surgical mask protect you from COVID-19 and TB?	Yes	277 (71.1)
	No	113 (28.9)
Which layer acts as a filter media barrier?	First layer	132 (33.8)
	Middle layer (correct)	189 (48.4)
	Last layer	69 (17.6)
Which type of masks actually protect against COVID-19?	Surgical mask	78 (20)
	N95 (correct)	312 (80)
How long can you wear a surgical mask?	8 hours (correct)	163 (41.7)
	4 hours	116 (29.7)
	2 hours	91 (23.3)
	1 hour	20 (5.1)
For proper wearing, to which extent the surgical mask should cover?	Nose only	14 (3.5)
	Nose and mouth	135 (34.6)
	Nose, mouth, and chin (correct)	241 (61.7)
What is the purpose of the metal strip on a surgical mask?	No purpose	23 (5.8)
	To fit on the nose (correct)	357 (91.5)
	To fit on the chin	10 (2.5)
Is the cloth facial mask as effective as a regular surgical facial mask?	Yes	123 (31.5)
	No (correct)	267 (68.4)

study participants belonged to the upper middle 178 (45.6%) socioeconomic class and 218 (55.8%) of participants completed their elementary school education. There was a statistically significant association between face mask wearing in hospitals and higher education levels ($p = 0.0234$) (Table 1).

Knowledge of Face Mask Utilization

Most of the participants 247 (63.3%) were unaware of the exact number of layers in surgical face masks. The majority of participants 233 (59.7%) were aware of the correct side of the surgical mask to be used to protect against respiratory infection (Table 1). However, 227 (58.2%) of the participants didn't know how long the surgical mask can be used. A large proportion (91.5%) of participants knew about the purpose of metal strips in the surgical mask.

Proper Practice of Face Mask Wearing

Most of the participants (293, 75.1%) do not wash their hands before wearing a face mask (Table 2). The majority of participants (283, 67.7%) touch their mask after wearing it. A large proportion of participants (78.7%) did not wash their hands after removing their face masks. Most of the participants (264, 67.7%) wear a face mask in public places to protect them against respiratory infections. Of them, most (232, 59.5%) participants wear face masks in health institutions. The majority of participants (57.1%) disposed of their masks in the wrong, that is, a black color bag.

Subgroup Analysis

Out of all four groups, namely, doctors, nurses, medical students, and others, that is, patients and attendants, most of the doctors (90.7%) and nurses (75%) had good knowledge of face mask utilization (Table 3). However, most (58.8%) of patients and their attendants had poor knowledge of face mask utilization. Proper practice of face mask wearing was also poor in 66.7% of patients and their attendants.

Both students, patients, and their attendants had shown improvement in knowledge and practice of face mask utilization after the teaching session for six consecutive days (Table 4).

Discussion

Healthcare workers and general populations are at higher risk of various respiratory infections such as coronavirus, influenza A (H1N1), TB, etc. and nonrespiratory hazards including cytotoxic drugs, toxic chemicals, gasses, cleaning and disinfectant agents.[11] Most cost-effective way to protect patients and HCWs against respiratory infections in hospitals is by proper face masks (e.g., surgical masks and N95 respirators) wearing.[4,5,12,13]

The aim of our study was to assess the knowledge and practice of proper face mask wearing among healthcare professionals, patients, and attendants in a tertiary care center, Maharishi Markandeshwar Medical College & Hospital, Kumarhatti, Himachal Pradesh, India. At the end of the study period out of 390 subjects, 56% were females and the most predominant (54.3%) age group was found to be between 18 and 34 years. This might be due to the high proportion of female students participating in this study. Most (45.6%) of the study participants belonged to the upper middle socioeconomic class. There was a statistically significant association between proper face mask wearing in public places and higher education levels ($p = 0.0234$). One similar study noted gender, marital status, and education have a significant association

Table 3: Proper practice of face mask wearing in the healthcare providers, patients, and attendants

Variables	*Categories*	*Response N = 390 (%)*
Before wearing a mask, clean their hands	Yes	97 (24.9)
	No	293 (75.1)
Remove his/her mask if there is a need to talk	Yes	163 (41.7)
	No	227 (58.2)
Confirm the metal noseband on the top	Yes	173 (44.3)
	No	217 (55.6)
Place the loop around the ear	Yes	305 (78.2)
	No	85 (21.8)
Pull the top and bottom of the mask to extend the folds	Yes	263 (67.4)
	No	127 (32.5)
Press the noseband	Yes	259 (66.4)
	No	131 (33.5)
Do not touch the mask	Yes	126 (32.3)
	No	283 (67.7)
Remove the mask from the face touching only the bands	Yes	167 (42.8)
	No	223 (57.2)
Avoid pulling the mask up over my forehead or down over my chin	Yes	262 (67.2)
	No	128 (32.8)
Before wearing the mask identified the inside and outside mask	Yes	296 (75.9)
	No	94 (24.1)
Clean hands after taking off	Yes	83 (21.3)
	No	307 (78.7)
Re-used a single-use mask	Yes	174 (44.6)
	No	216 (55.4)
Dispose of the mask when soiled/wet	Yes	287 (73.6)
	No	103 (26.4)
Do not eat drink/smoke while wearing the mask	Yes	17 (4.3)
	No	373 (95.7)
Do you wear a face mask in public places to protect yourself against respiratory infections?	Yes	264 (67.7)
	No	126 (32.3)
When you wear face mask	Starting from home	42 (10.7)
	Starting from entry of transportation	116 (29.7)
	At health institution	232 (59.5)
Do you wear a surgical mask (face mask) always at working time	Yes	102 (26.2)
	No	288 (73.8)
In which color-coded bag you dispose of your mask?	Black-colored bag	223 (57.1)
	Yellow-colored bag	167 (42.9)

Table 4: Knowledge and practice of proper face mask utilization in different groups

Parameters	*Doctors (N = 43) n (%)*	*Nurse (N = 68) n (%)*	*Students (N = 165) n (%)*	*Patient and attendant (N = 114) n (%)*
Knowledge of face mask utilization				
Good knowledge	39 (90.7)	51 (75)	116 (69.4)	47 (41.2)
Poor knowledge	4 (9.3)	17 (25)	49 (29.6)	67 (58.8)
Proper practice of face mask utilization				
Good practice	31 (72.1)	49 (72)	111 (67.3)	38 (33.3)
Poor practice	12 (27.9)	19 (28)	54 (32.7)	76 (66.7)
Percentage improvement after teaching (day 7)				
Knowledge	100%	100%	98%	92%
Practice	100%	98%	94%	87%

with the knowledge of proper face mask wearing.[12] This might have been possible as a well-educated population can be updated on the internet, and digital and print media regarding knowledge and practice regarding mask wearing especially during the COVID-19 era as compared to the illiterate population. Additionally, poor and resource-limited populations living in rural and remote tribal communities are devoid of such preventive education, which makes them more susceptible to having poor knowledge and incorrect practices regarding face mask wearing.

In this study, most participants (63.3%) were unaware of the exact number of layers in surgical face masks. This might be due to a lack of clear information about the surgical mask and the proper way to wear the three-layered surgical mask in print and electronic media.

There is lots of confusion in the general population regarding surgical face masks whether the white-colored layer is to be faced outside or inside. The outer blue-colored layer is hydrophobic in nature and it prevents harmful germs from sticking to it, whereas the inner white layer is hydrophilic and absorbs moisture from the air we breathe out and the middle layer filters the microorganism. On the contrary, wearing a face mask the other way around can cause moisture from the air to stick to it, thus making it easier for harmful germs to stay there.[14] In this study majority of participants (59.7%) were aware of the correct side of the surgical mask to be used to protect against respiratory infection.

Up to 80% risk of respiratory infections can be prevented by the effective use of face masks in crowded places including hospitals, bus stops, railway stations, and airports.[14] In the study, conducted among public transport drivers in a town found that only (59,14.32%) of the participants were always wearing face masks properly while working or driving.[15] However, in our study most 264 (67.7%) participants were wearing a face mask in public places to protect them against respiratory infections. This difference might be due to a different study population in our study where most of the study participants were HCWs having higher knowledge of face mask utility.

In this study, we observed that most of the participants did not wash their hands before wearing 293 (75.1%) and after removing 307 (78%) the face mask. Similar observations were made in two previous studies where no practice of any form of hand hygiene before or after face mask wearing was noted among study participants.[15,16] However, it is vital to practice proper hand washing before and after wearing a face mask in daily life, so that transmission of harmful germs can be prevented from infecting yourself or other people.[17,18]

In the present study, most (67.7%) participants were wearing face masks in public places to protect them against respiratory infections. However, 32.3% of participants in this study were still avoiding face mask utilization in crowded places. Hence, areas of improvement and good public awareness among the general population are still needed regarding face mask utilization, especially in public places.

The majority of participants (57.1%) in our study disposed of their masks in the wrong, that is, in a black colored bag. Inappropriate disposal of face masks in public places may lead to the degradation of masks into smaller fragments and eventually form micro or nanofibers that could take many years to degrade in nature.[9,19] In this study, the proper practice score of face mask wearing was also poor, that is, <80% in 66.7% of patients and their attendants. However, both patients and their attendants have shown improvement in knowledge and practice of face mask utilization after teaching sessions on the proper practice of face mask utilization. Therefore, it is crucial to improve the knowledge level of proper face mask utilization practices and proper disposal practices among the community for future sustainable organizational growth.[20]

Limitations of this study are that we have included only participants from a single center and other factors including financial status, for example, income and cultural beliefs were not evaluated. A larger population of different centers including various factors is needed to get more generalized results in future studies.

Conclusion

Both HCWs and the general population are at higher risk of various respiratory infections. Knowledge and proper practice of face mask wearing among the participants, specifically patients and attendants was poor compared to healthcare providers including doctors, nurses, and medical students. However, their knowledge and practice of face mask utilization improved significantly after daily six consecutive teaching sessions on awareness and methods of effective face mask utilization. Hence, it is vital to improve awareness regarding knowledge and proper practices of mask utilization among HCWs, patients, and the general population to prevent respiratory infections.

Clinical Significance

- Healthcare workers and general populations are at higher risk of various respiratory infections.
- There was a statistically significant association between face mask wearing in hospitals and higher education levels.
- Knowledge and proper practice of face mask wearing among the participants, specifically patients and attendants was poor compared to healthcare providers.
- Knowledge and practice of face mask utilization can be improved significantly after short teaching sessions on awareness and methods of effective face mask utilization.

Orcid

Arjun Kumar https://orcid.org/0000-0002-5581-6176

Reference

1. Sohrabi C, Alsafi Z, O'Neill N, et al. World Health Organization declares global emergency: A review of the 2019 novel coronavirus (COVID-19). Int J Surg 2020;76:71–76. DOI: 10.1016/j.ijsu.2020.02.034.
2. World Health Organization. TB disease burden: TB incidence. 2023. Available at: https://www.who.int/teams/global-tuberculosis-programme/tb-reports/global-tuberculosis-report-2022/tb-disease-burden/2-1-tb-incidence. Accessed on: 02 January 2023.
3. Anderson RM, Heesterbeek H, Klinkenberg D, et al. How will country-based mitigation measures influence the course of the COVID-19 epidemic? Lancet 2020;395(10228):931–934. DOI: 10.1016/S0140-6736(20)30567-5.
4. Shen M, Zu J, Fairley CK, et al. Projected COVID-19 epidemic in the United States in the context of the effectiveness of a potential vaccine and implications for social distancing and face mask use. Vaccine 2021;39(16):2295–2302. DOI: 10.1016/j.vaccine.2021.02.056.
5. Liang M, Gao L, Cheng C, et al. Efficacy of face mask in preventing respiratory virus transmission: A systematic review and meta-analysis. Travel Med Infect Dis 2020;36:101751. DOI: 10.1016/j.tmaid.2020.101751.
6. Chatterjee S, Das P, Shikhule A, et al. Journey of the tuberculosis patients in India from onset of symptom till one-year post-treatment.

PLoS Glob Public Health 2023;3(2):e0001564. DOI: 10.1371/journal.pgph.0001564.
7. Kumar J, Katto MS, Siddiqui AA, et al. Knowledge, attitude, and practices of healthcare workers regarding the use of face mask to limit the spread of the new coronavirus disease (COVID-19. Cureus 2020;12(4):e7737. DOI: 10.7759/cureus.7737.
8. World Health Organization. Rational use of personal protective equipment (PPE) for coronavirus disease (COVID-19): Interim guidance. 2020. Available at: https://apps.who.int/iris/handle/10665/331498. Accessed on: 05 November 2022.
9. Anastopoulos I, Pashalidis I. Single-use surgical face masks, as a potential source of microplastics: Do they act as pollutant carriers? J Mol Liq 2021;326:115247. DOI: 10.1016/j.molliq.2020.115247.
10. Alfarisi S, Sholihah M, Mitake Y, et al. Sustainable approach towards disposable face mask production amidst pandemic outbreaks. sustainability 2022;14(7):3849. DOI: 10.3390/su14073849.
11. De Perio MA, Brueck SE, Mueller CA, et al. Evaluation of 2009 pandemic influenza A (H1N1) exposures and illness among physicians in training. Am J Infect Control 2012;40:617–621. DOI: 10.1016/j.ajic.2012.01.014.
12. Hayat K, Rosenthal M, Xu S, et al. View of Pakistani residents toward coronavirus disease (COVID-19) during a rapid outbreak: A rapid online survey. Int J Environ Res Public Health 2020;17(10):3347. DOI: 10.3390/ijerph17103347.
13. Honarbakhsh M, Jahangiri M, Ghaem H. Knowledge, perceptions and practices of healthcare workers regarding the use of respiratory protection equipment at Iran hospitals. J Infect Prev 2018;19(1):29–36. DOI: 10.1177/1757177417724880.
14. MacIntyre CR, Chughtai AA. A rapid systematic review of the efficacy of face masks and respirators against coronaviruses and other respiratory transmissible viruses for the community, healthcare workers and sick patients. Int J Nurs Stud 2020;108:103629. DOI: 10.1016/j.ijnurstu.2020.103629.
15. Yimenu DK, Jejaw A, Haylu E, et al. Knowledge, attitude, and practice towards face-mask use amid the coronavirus 2019 pandemic among public transport drivers in Gondar town: A cross-sectional study. Inquiry 2022;59:469580221096285. DOI: 10.1177/00469580221096285.
16. Ajaj R, Shahin S, Moda H, et al. Knowledge, attitude, and practices of face mask use among university students during the COVID-19 pandemic: A cross-sectional study. Sustainability 2023;15(4):2868. DOI: 10.3390/su15042868.
17. Kutralam–Muniasamy G, Pérez–Guevara F, Shruti VC. A critical synthesis of current peer-reviewed literature on the environmental and human health impacts of COVID-19 PPE litter: New findings and next steps. J. Hazard Mater 2022;422:126945. DOI: 10.1016/j.jhazmat.2021.126945.
18. World Health Organization. Coronavirus disease (COVID-19) advice for public: When and how to use masks. Available at: https://www.who.int/emergencies/diseases/novel-coronavirus-2019/advice-for-public/when-and-how-to-use-masks. Accessed on: 2 June 2023.
19. Rathinamoorthy R, Balasaraswathi SR. Impact of coronavirus pandemic litters on microfiber pollution: Effect of personal protective equipment and disposable face masks. Int J Environ Sci Technol 2022;20:1–20. DOI: 10.1007/s13762-022-04462-8.
20. Jamil MN, Rasheed A, Mukhtar Z. Corporate social responsibility impacts sustainable organizational growth (firm performance): An empirical analysis of Pakistan stock exchange-listed firms. J Environ Sci Econ 2022;1:25–29. DOI: 10.5281/zenodo.6245428.