Knowledge, Attitude and Practice towards Use, Reuse and Disposal of Face Masks during COVID-19 Pandemic amongst University Students of Karachi

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Abstract

Objective: This study is intended to evaluate the knowledge, attitude and practice towards use, reuse and disposal of face masks amongst university students of Karachi.
Methods: A descriptive cross sectional study was conducted in a period of 1 month on the students of Jinnah Sindh Medical University, Bahria University of Medical and Dental College, Liaquat National Hospital and Medical College, Iqra University, SZABIST, Bahria University, and Karachi University. Non-probability convenience sampling was used to conduct an online questionnaire survey assessing personal information, knowledge and attitude toward face mask disposal.
Results: A total of 386 valid questionnaires were included in the study. 87.3 % of participants wear face masks regularly. Only 24.4 % of students had adequate knowledge about face masks disposal. The majority of participants discarded the face masks in general trash bins, which is very alarming for public health. 39.1 % showed a positive attitude towards cooperating always with relevant authorities on face masks disposal. 69.2 % were very concerned about hazards associated with improper face masks disposal.
Conclusion: This study emphasizes the necessity of policies and strict implementation should be introduced by relevant authorities to ensure the proper use and disposal of face masks in order to narrow the gap the university students have towards the knowledge, attitudes and practices regarding use, reuse and disposal of face masks.
Keywords: COVID-19, face masks, Pandemic, SARS-CoV-2, medical waste
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Introduction

Originating in Wuhan, China, and being declared a pandemic by WHO in March 2020, the severe acute respiratory syndrome coronavirus-2 has become a global concern[1]. The spread of SARS-CoV-2 from one infected individual to others is through respiratory droplets and aerosols[2]. Masks help in this regard by reducing pathogen inhalation and encouraging adherence to other preventative measures like hand washing and general hygiene practices[3]. Different types of face masks are available with variable effectiveness. Compared to wearing no mask, wearing a cotton mask resulted in a 20% to 40% reduction in virus absorption[4]. Emissi on rate is decreased by 90% to 75% by using surgi cal masks and unvented KN95 respirators[5]. In some nations public demand for face masks has been so high that it resulted in depletion of supplies and sh ortages reported[6].

In the United States, facemasks shortage has been reported among healthcare workers despite lesser public demand[7]. Pakistan is one of the count-

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ries in Asia which produce a high amount of medical waste (about 1099.30 tons per day) [8]. The WHO estimates a need of 89 million masks per month for an adequate COVID-19 response[9]. This need then increases the number of masks used and discarded every day; and in a city like Karachi that already has poor municipal waste management and suffers from the improper collection, transportation, and disposal of solid waste[10], it becomes an issue of public health and safety. Furthermore, the improper disposal of face masks and other personal protective equipment increases the risk of transmission of the virus with serious health hazards to the workers involved in waste management[11]. Given that SARS coronavirus can be present on objects like glass, plastic or metal for up to 9 days[12].

A study in Jinan, China, showed that despite a positive attitude towards face masks, 47 percent of the participants lacked proper knowledge about the disposal of masks[13]. Studies in Italy showed that a total of 70.5 percent of the population discarded their used medical face mask in general waste whilst only 13.4 percent discarded them in a specified waste basket[14].

To the best of our knowledge, not enough work has been done in our region to highlight the alarming count of face masks disposal. This study emphasizes the misconceptions and gaps in knowledge and attitude of mask disposal among university students. The aim of the study is to assist relevant authorities with awareness campaigns to improve the practice of hazardous face mask disposal. This study focuses on the university students' knowledge and misconceptions regarding the proper face mask disposal. By assessing the perception of students regarding proper disposal practices, we aim to better the awareness about them. Studies have shown that compliance with usage and subsequently gaining knowledge about the proper disposal is high[14], and if there is a similar positive attitude in our demographic, we would be furthering an effective health education. Given how medical waste can be a cause of the further spread of disease during a pandemic, it is imminent for us to understand and prevent spread via improper mask disposal.

The primary objective was to evaluate the knowledge and attitude towards disposal and face masks during the COVID-19 pandemic amongst university students aged 18-25 in Karachi, Pakistan. We also measured compliance towards usage of face masks compare knowledge and attitude of face mask disposal between medical and non-medical students.

Subjects and Methods

A cross sectional study was conducted using Google forms from 1st June 2021 to 1st July 2021, which were distributed to students of Jinnah Sindh Medical University, Bahria University Medical and Dental college, Liaquat National Hospital and Medical college, Iqra University, Szabist, Bahria University and Karachi University. The target age of participants was 18-25 years. Using nonprobability convenience sampling, the distributed questionnaire was filled online, and results were compiled using Microsoft Excel. We calculated a sample size of 383 using OpenEpi calculator with the confidence level of 95% and confidence limit of 5%. Regarding the inclusion criteria, students aged 18-25 studying in aforementioned universities were chosen. We excluded people who do not wear face masks and the students who filled the form incompletely. Data was collected by online questionnaires designed with the help of WHO guidelines regarding face mask disposal and from our reference studies. We also did a pilot study on a group of 15 people to evaluate their understanding of our questionnaire and made the necessary improvement accor-ding to their feedback in our questionnaire. The questionnaire was hosted on google forms and was sent out to university students using social media platforms like WhatsApp and Facebook.The questionnaire had three sections:

- Personal characteristics i.e.,age, gender, universities, education level, residence, previous infection with COVID-19, and vaccination status.

- The second section focused on knowledge of face mask use and disposal. It consists of 13 questions about knowledge of mask use, reuse, disinfection, and disposal.
- The third section focused on attitude toward face mask disposal. It consists of 5 questions i.e., willingness to acquire knowledge and cooperation with authorities.

Information from each section was scored according to the Likert-type scale where 1 is given to 'No', 2 is 'sometime/neutral', 3 is 'yes'.

The questionnaire was opened till the required number of responses was met and then exported to Microsoft Excel for further analysis. The information obtained from questionnaires was analyzed using SPSS version 23. Ethical approval of this research was obtained from Indus Hospital Research Center. Informed consent was requested at the beginning of the online questionnaire. Participants were assured about confidentiality and were permitted to withdraw participation at any time.

Results

We collected a total of 386 students' questionnaires. The study population consisted of 297 females (76.9%) and 89 males (23.1%). The ages of the population ranged from 18-25 with a majority being in between 21-23 (172), followed by age of 24 (54), 20 (38), 25 (-36), 19 (18) and 18 (8). Most of our responses were from Karachi Medical and Dental College (19.9%) and Karachi University (18.4%). Only 53 (13.7%) students were diagnosed with COVID-19 whilst 281 (72.8%) had a family member that had been diagnosed with COVID-19. Regarding the vaccination status, 255 (66.6%) students had received the COVID vaccine with Sinopharm (118) and Sinovac (110) being the most common type of vaccine. Most of the students. 338(87.3%) used a face mask regularly. Out of the 48 who did not wear a mask regularly, the most common reason for not using one, because uncomfortable to wear, 35 (72.9%); other reasons included that masks aren't perceived as being effective (5) or that they tend to avoid social gatherings and do not need one at all 3 (6.3%). the majority of the students reported using a surgical mask 324 (84.5%), followed by a cloth mask (50) and N95 (6) 94 (24.4%) reported to use face mask for 1-3 hours a day, 100 (25.9%) reported to use it for 3-5 hours, 56 (14.4%) for less than 1 hour and 136 (35.2%) for more than 5 hours.

A total of 271 participants agreed that a face mask should be changed after a single-use, 55 chose 'No' whilst 60 chose 'Not sure'. 361 chose 'Yes' when asked if a mask should be changed after being wet or soiled, while only 9 selected 'No' and 16 were 'not sure'. Regarding washing or disinfecting a mask for reuse, 261 said they do not wash or disinfect, whilst the ones that do, the most common method was soap/detergent (n=73), followed by a rinse in water (n=27), sunlight (n=13), alcohol (n=6) and boil in water (n=6). Only 78 out of the total cleaned their hands before taking off the mask, 111 never washed their hands and 197 chose sometimes. In contrast, 177 washed their hands after disposing off the mask, 53 chose sometimes and 52 did not wash their hands. When it came to the storage of masks for reuse, 88 were stored in a drawer, 53 were stored anywhere, 33 in a zip-lock bag, and 22 in specified containers. Out of the people who chose multiple answers for the former question, anywhere and drawer were the most common choice (n=9); while 152 did not store masks for reuse.

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Table 1. Status of knowledge of face masks use, reuse and disposal

ITEMS	Total (n)	Percentage (%)
Do you think a face mask should be changed after a single use?		
Yes	271	70.2
No	55	14.2
Not sure	60	15.5
Knowledge level of disposal of discarded facemasks		
Yes	94	24.4
No	123	31.9
Somewhat Knowledgeable	169	43.8
Proper management of face mask disposal in your area		
Yes	44	11.4
No	285	73.8
Not sure	57	14.8
Current sources of information about disposal of face masks		
CDC website and internet	7	1.80
Interpersonal communication	47	12.2
Medical literature	1	0.30
Newspapers & magazines	12	3.10
Personal experience	138	35.8
Radio and TV	34	8.80
Social media	5	0.80
Training seminars	3	0.30
Others	142	36.7
Expected ways for acquiring knowledge on face mask disposal?		
CDC website and internet	4	1.00
Interpersonal communication	18	4.70
Training seminars	55	14.2
Newspapers & magazines	13	3.40
Personal experience	42	10.9
Radio and TV	58	15.0
Social media	3	0.77
Others	193	50.0

The majority of the participants discarded the masks in general trash bins (n=299), 29 in a specified waste container, 12 in a plastic bag and only 1 reported throwing it at the roadside. When it came to the participants' current source of information about face mask disposal, a majority chose personal experience (n=138), followed by interpersonal communication (n=47), and radio and TV (n=34). Out of the ones that chose multiple options for the former question, the most common combinations were personal experience and interpersonal communication (n=29), personal experience and radio (n=12), personal experience, radio, and interpersonal communication (n=10). Similarly, when asked about where people expect to better their knowledge about face mask disposal, the most popular choice was Radio and TV (n=58) followed by training seminars (n=55), and personal experience (n=42). Out of the people who chose multiple options, the most common choices were Radio and TV; Posters; Training seminars (n-17), and Radio and TV; Newspapers & magazines (n=16). Regarding the disposal management of discarded face masks, 73.8% were certain that, there was no proper management in their areas, 14.8% were unsure while 11.4% said yes to the question (Table 2).

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Table 2. Practice of face masks use, reuse and disposal

Items	Total(n)	Percentage %
Where do you dispose your face mask?		
General trash bin	299	87.7
Plastic bag	12	8.50
Roadside	1	0.30
Specific waste container	29	8.50
Do you regularly use face mask?		
Yes	338	87.3
No	48	12.7
If not regularly, then what is the reason?	n=48	
It is uncomfortable to wear	35	72.9
I don't think masks are effective	5	10.4
I avoid social gatherings	3	6.30
I wear Niqab	2	4.20
I am vaccinated	1	2.10
Asthma	1	2.10
Affordability	1	2.10
How long do you use a face mask?		
1-3 hours	94	24.4
3-5 hours	100	25.9
Less than 1 hour	56	14.5
More than 5 hours	136	35.2
How do you wash or disinfect a face mask for use?		
Soap/Detergent	73	18.9
Rinse in water	27	7.00
Sunlight	13	3.40
Boil in water	6	1.60
Alcohol	6	1.60
I don't reuse	261	67.7
Do you clean your hands before taking off your mask?		
Yes	78	20.2
No	111	28.8
Sometimes	197	51.0

69.2% were very concerned about the hazards associated with improper disposal of face masks and 89.9% of the respondents believed that through proper guidelines and regulations regarding face masks disposal, these hazards can be avoided while 39.9% were not aware of these regulations, while 31.3% said that they were 'somewhat aware'. 39.1% showed a positive attitude towards cooperating with relevant regulations on face mask disposal while 50% agreed to cooperate not always but sometimes. Only 24.6% were satisfied with information sources for the disposal of discarded face masks. 63% were not satisfied with the management status of face masks disposal in their areas. 87.6% of the participants think that improvements can be made to better the face mask disposal practices in their areas (Table 3).

Table 3. Attitude of the public towards face masks use, reuse and disposal.

Item	Total (n)	Percentage (%)
Are you worried about the hazards associated with large amount of discarded face masks?		
Yes	267	69.2
No	31	8.00
Sometimes	88	22.8
Are you aware of the regulations concerned with proper face mask disposal?		
Yes	111	28.8
No	154	39.9
Somewhat Familiar	121	31.3
Do you cooperate with the relevant regulations on the disposal of discarded face masks?		
Always	151	39.1
Never	42	10.9
Sometimes	193	50.0
Are you satisfied with the information sources for the disposal of discarded face masks?		
Yes	95	24.6
No	160	41.5
Not sure	131	33.9
Do you think that improvements can be made to better the face mask disposal practices in your area?		
Yes	338	87.6
No	11	2.80
Not sure	37	9.60

Discussion

To limit the spread of the novel coronavirus, use of facemask should be considered within the community[15]. Like in past wearing a face mask alone decreased human-to-human transmission by 68% amid the Severe Acute Respiratory Syndrome (SARS) virus epidemic in the past[16]. In countries like Pakistan where the frequency of infectious illness is high and hospital environmental conditions are typically poor, healthcare workers depend solely on facemasks to constrain the transmission of COVID-19[17]. However, the substandard disposal management and the subsequent addition of an enormous burden to our medical waste can become a serious health hazard. But improper use and disposal of this mask may actually increase the incidence of COVID-19. If you use a mask, you must know how to put it on and take it off properly to minimize the risk of transmission as stated by the World Health Organization[18]. Therefore, our study discussed the inadequate knowledge our university students have regarding the disposal of used Face Masks amidst the COVID-19 outbreak.

The results showed that 53% of the respondents were infected with COVID-19 while 72 percent had a family member that tested positive. 66.6% had received the vaccine.

In our survey, it was found that the majority (87.3%) of the students used face masks regularly. Nzediegwu & Chang, in their study, discussed the fact that the use of face masks has increased exponentially amidst the pandemic[19]. The case study from Apulian Hospital in Southern Italy showed that during the pandemic, the consumption of facial masks increased from 10,412 to 145,342 pieces[20]. The same study revealed that the total increase of waste attributable to the users' face masks in the Hospital surpassed approximately 33,541 kg to 536,891 kg. The surge in the usage of face masks poses a great concern to our environment.

Our research revealed that 48% did not use face masks regularly. The most common reas-on that they mentioned was it being uncomfortable. Whilst 115% of the participants said that they reused their face masks all the time or sometimes, and for reuse they stored them in Ziplock bags, drawers, in specified containers, or just anywhere. This shows the cognitive level amongst the respondents regarding the proper use & reuse of the face masks which is not satisfactory. Around 70.7% (n=271) of the participants believed that the masks should be changed after a single use while 14.3% (n=55) said that the masks can be reused.

According to a study, the proportion of participants who replaced masks according to the current guidelines was found to be even less than 60%[20].

According to our survey, 177 of all respondents washed their hands after disposing of the masks. Meanwhile, 52 individuals did not believe in washing hands after discarding the mask. A total of 299 individuals discarded the face masks in the general trash bin. Meanwhile, only 12 claimed that they discarded them in plastic bags. In a study from Morocco, the researchers found out that almost all the masks used were thrown in the house trash, while 36% of the studied populations reused and washed their masks (using the tissue masks)[21]. This can even clog our water drainage systems and also become a source of transmission of viru-ses and infections. This calls for immediate atten-tion to control the situation that is unlikely to cha-nge in the foreseeable future if the relevant dep-artments do not act wisely and timely.

Medical students were found to have more knowledge regarding proper mask disposal compared with non-medical counterparts.

Our study showed that only 24.9% of the respondents had adequate knowledge about proper face mask disposal. Li F and Zhang Y in their study found out that 47% of individuals had a low level of relevant knowledge about the disposal of discarded face masks[13]. The lack of knowledge and improper waste management brings great safety hazards like the majority of participants discarded their face masks in general trash bins. This can become a source of secondary contamination, especially in developing countries for example informal waste handlers like street pickers are mostly at risk of getting the infection although they significantly contribute to the informal waste cycling factor[10]. If these discarded masks get recycled, marketed by illegal traders, the consequences would be more disastrous[22]. Our survey showed that only 11.4% had proper face mask disposal management in their area. Considering this, concerning authorities should take immediate action and they should issue proper regulation on management of face mask disposal to prevent these health hazards. 69% of the respondents were worried about the hazards, improper disposal of masks can bring. In their questionnaire, Li F and Zhang Y showed more than 90% of respondents were aware of the hazard associated with improper disp-osal of discarded face masks[13]. According to a current survey, the majority of students agreed to cooperate with the authorities to implement these regulations and these regulations must reach the general public to get to the maximum audience as only 24.6% were satisfied with the infor-mation sources. For this, communication and awar-eness campaigns should be ramped up to educate people with the support of TV & radio being the popular information source in this study, followed by training seminars, articles/social media about the proper disposal. The relevant departments have failed to prioritize the need to issue guidelines and regulations on the management of disposal of face masks despite the ever-increasing environmental concerns. Their below-par efforts can result in an unmanageable increase in impending waste burden to our environment and appropriate actions need to be taken immediately

It should be encouraged among the general public to not throw the used face masks randomly in workplaces, public places, and even at homes. One should discard the used face mask in Ziplock/ sealed bags before disposing of it in general trash cans and on the roadside. Relevant authorities can install separate trash bins solely for discarded facemasks and after that hands should be washed or sanitized. This can be achieved with the help of short training sessions and awareness campaigns in schools, universities, and workplaces. Brochures can be distributed roadside, in restaurants, and malls. These guidelines can reach a mass audience through advertisements in television, newspapers, and social media. Individual practice involving inappropriate face mask disposal can be monitored by police and law enforcement authorities.

The basic limitation of our study is results cannot be generalized over the population from which the sample has been taken because of the relatively small sample size, furthermore, our study

population was university students who are considered as an educated stratum of society.

Moreover, an online questionnaire has some of its limitations.

Conclusion

Our study indicates significant gaps in knowledge, attitude, and practice among university students regarding the use, reuse, and disposal of face masks. Awareness campaigns, regulations, and strict implementation for proper use and disposal should be considered to bridge the gap.

Conflict of Interest

Authors have no conflict of interest and no grant /funding from any organization.

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