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Knowledge, Attitude, and Practices of Face Mask Use among University Students during the COVID-19 Pandemic: A Cross-Sectional Study

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Abstract: At the peak of the COVID-19 pandemic, the estimated daily use of face masks was at its highest, thereby creating huge public health and environmental challenges associated with the indiscriminate disposal of used ones. The present study assessed Abu Dhabi University students' handling and disposal of single-use face masks during the pandemic. A cross-sectional study using an online survey questionnaire was used to gather data from 255 students from the target group. Face mask type was found to be significantly influenced by both the student's gender and age, while the participant's habit of hand washing after handling a used face mask was found to be significantly influenced by the student's age. The student's educational level significantly influenced group decisions regarding the most appropriate face mask to use, as well as environmental and health consequences awareness of indiscriminate face mask disposal. While the students are adequately aware of COVID-19's impact and had good knowledge of face mask use, a high proportion professed to the unsafe disposal of used face masks in public areas, thereby adding to microplastic pollution in the environment and its associated impacts. The study alluded to the need for strengthening the participant's knowledge, attitude, and practices as precautionary measures that mitigate the environmental effect of the indiscriminate disposal of used face masks. The findings also call for a collaborative partnership among stakeholders toward designing effective educational campaigns to minimize the environmental impacts posed by face mask disposal.

Keywords: COVID-19; university students; UAE; public health; face masks; waste management

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1. Introduction

The COVID-19 pandemic was the most severe global health crisis at the turn of the century [1,2]. As of 4 November 2022, the World Health Organization (WHO) has confirmed 628 million cases of COVID-19 around the world, including 6.57 million deaths [3]. Several precautionary measures, including social distancing, personal hygiene, and personal protective equipment, were enforced to curb the spread of the virus [4]. Many countries introduced local plans to help control the spread of the pandemic [5]. As countries across the globe are rolling out public health measures to reduce the rate of transmission, during this period, an exponential rise in the demand for face masks was witnessed as a result of these measures [6]. During the multiple lockdown regimes in China, the daily demand for single-use face masks went up to 900 million pieces [7]. At the height of the pandemic, it was estimated that healthcare workers alone in the United States of America required 89 million pieces per month [1]. Furthermore, an estimated 105 thousand tonnes of face

mask waste were generated monthly across Africa during this period [1]. In Asia, the daily demand for face masks at the peak of the pandemic was estimated at around 2.2 billion pieces [1]. This resulted in a face mask production shortage in some countries [8]. A closer look at these trends translates into around 3.4 billion pieces of single-use face mask waste being generated and discarded each day [1].

Aside from the problem of waste management associated with face mask disposal, during the pandemic, there was an interruption of several industrial and commercial activities, thereby leading to a significant decrease in greenhouse gas (GHG) release and other associated waste generation [9]. On the contrary, the production of personal protective equipment (PPE) increased exponentially in order to meet the global demand, thereby consuming around 10-30 Wh of energy and releasing 59 g CO_2-eq greenhouse gas to the environment [10]. While face masks used during the pandemic were considered the primary line of defense against COVID-19, their uninformed disposal paves the way for waste management, increased air pollution associated with its production, and the plastic pollution crisis. Importantly, the commonly adopted disposable face masks are manufactured from petrochemical-based plastic materials, such as polypropylene, polystyrene, polycarbonate, polyethylene, or polyester. These materials, as they wither, can enter into the food chain, thereby presenting a secondary public health challenge [11–13].

Furthermore, the attitude witnessed where face masks are indiscriminately discarded in public areas (e.g., parks, streets, and coastlines) can act as secondary pollutant carriers, thereby presenting another form of environmental and health challenges [14]. Relatedly, thrown face masks can undergo withering and form micro- and nano-plastics. Earlier studies have shown that microfibers from medical-grade polypropylene can take up to 450 years to degrade in nature [15,16]. Earlier, Benson et. al. [17,18] reported on the plastic waste pollution crisis in the Global South countries that include Nigeria, Ethiopia, Egypt, DR Congo, Tanzania, and South Africa, to which face mask disposal has further added to the already existing plastic waste management burden in these countries [4]. At the same time, the microfibers can easily propagate in nature and undergo biomagnification [19], leading to further environmental and health-related issues. Shruthi et. al. [20] stated that reusable face masks are a missing piece of the micro-plastic problem; similar to single-use face masks, a cloth face mask can significantly contribute to marine and environmental pollution, through laundering, and consequently emit the micro-plastic through the wastewater to the aquatic life and other connected systems, thereby creating environmental concerns worthy of further investigation.

On the other hand, face masks played a crucial role in controlling the spread of the virus in the UAE. A study by Sangkham [21] raised concerns around the daily usage of face masks and concluded an estimated 7.9 million pieces of single-use face masks were used and 237.88 tons of face mask waste were added to the waste stream every day in the Emirates. Owing to the strict mask mandates introduced in the UAE, single-use face masks were recommended to be used for 4 h; in addition, most individuals adopted the use of a double face mask as the pandemic continued to worsen. This, alongside other factors, exponentially increased the total number of used face masks likely to be discarded daily [21].

While there are emerging studies related to the societal drivers and the environment around the subject among different populations considered, having a better understanding of the complex interaction of these drivers among university students can significantly help in reducing the potential dangers of face mask waste [13,22,23]. Considering the environmental impact associated with face masks during their life cycle, there is the need to appraise user behavior and perception around the end-of-life safe disposal of this product in order to advance sustainable measures that will enhance positive behavior while reducing its environmental burden. In this regard, knowledge, attitude, and practices (KAP) studies provide valuable insight into user behavior and perception.

Consequently, the main objective of this work is to assess KAP around the waste management of single-use face masks during the COVID-19 pandemic. This cross-sectional

study was conducted on students from Abu Dhabi University. It is worth mentioning that, to the best of our knowledge, this study is the first in the Middle East that considered university students as stakeholders and conducted an assessment of the environmental and health KAPs related to the waste management of single-use face masks during the COVID-19 pandemic.

2. Materials and Methods

2.1. Study Design, Population and Sampling

To assess the KAPs of face mask usage and disposal methods among university students, a cross-sectional study was conducted between 12/04/2021 to 11/03/2022. The questionnaire was structured into three sections in order to evaluate: the participants' socio-demographic characteristics; their mask-wearing behaviors and perceptions of personal hygiene; and their environmental impact awareness of end-of-life face mask litter. Participation in the survey was voluntary and anonymous, and verbal approval was gained before filling out the survey sections.

Individuals were asked to confirm that they are over the age of 18 and enrolled in the relevant study program within the university as part of the study inclusion criteria. Participants were accessed through deliberate contact and sensitization exercises among the students' community. At the end of the survey period, 255 participants responded to the survey. The ethics committee (CoHS-21-11-35) granted ethics approval on 11 April 2021.

To determine the minimum sample size for the study, Fisher's formula [24,25] was applied to the student population of 6600 active individuals, which resulted in the estimation of single proportions and the minimum sample size of 364 students.

Fisher's formula is calculated as follows:

$$n = \frac{Z^2 P(1-P)}{d^2}$$

where:

n = sample size;
Z = standard deviation for 95% confidence level;
P = prevalence of the attribute (50%);
d = acceptable difference; if 5%, d = 0.05;
q = $1 - p$.

2.2. Data Collection, and Analysis

The most common face mask readily available to the study sample group was identified through a desk-based study. Moving forward, data was collected using a structured pre-tested questionnaire among Abu Dhabi University students to evaluate the reliability and validity of the survey instrument before the final distribution of the survey instrument.

Factors considered in the survey tool include face mask usage, reuse, and disposal behavior; knowledge of possible environmental and health consequences; and common safety practices adopted during and after wearing face masks. Students' attitudes about face mask use and their associated impact were measured using a 6-point Likert scale. Responses were set as extremely no = 1, no = 2, not sure = 3, I don't know = 4, yes = 5, and extremely yes = 6.

A statistical package for social sciences (SPSS) version 25.0 for Windows was used to analyze the data. Raw collected data were reviewed to remove cases with empty or missing responses. Descriptive statistics results were presented as mean, standard deviations, percentage, and frequency tables for categorical data [26].

To compare the means between factors influencing participants' behavior toward the use of face masks during the pandemic and their disposal habit, a one-way analysis of variance (ANOVA) was performed with statistical significance set at $p < 0.05$.

3. Results

3.1. Students' Demographic Characteristics

Table 1 summarizes the demographic characteristics of the study participants, of which a total of 255 students took part in the survey. From the sample group, 53.7% identify as male, and 46.3% identify as female. Most of the students were between the age group of 18–25 (85.9%), this was followed by 26–30 (9.8%), 31–35 (3.1%), 36–40 (0.4%), ≥41 (0.8%). Correspondingly, 91.3% of the participants are currently enrolled in an undergraduate course. Only 22 students (8.7%) are enrolled in postgraduate study, of which 2 students (0.8%) were undertaking research. The marital status of the participants includes 90.6% married, 7.1% single, and the remaining 2.4% preferred not to reveal their marital status (Table 1).

Table 1. Details on students' demographic characteristics.

Variables		Percentage (%)
Gender	Male	53.7
	Female	46.3
Age	18–25	85.9
	26–30	9.8
	31–35	3.1
	36–40	0.4
	≥41	0.8
Marital status	Married	90.6
	Single	7.1
	Prefer not to say	2.4
University education	Undergraduate	91.3
	Postgraduate (Taught)	7.9
	Postgraduate (Research)	0.8
Do you use mask before leaving home?	Yes	93.6
	No	6.4
Face mask preference	Disposal mask	80.2
	Re-usable mask	19.8
Hand washing habit	Alcohol hand rub	29.4
	Water and soap (warm/cold)	54
	Water only	9.7
	Do not wash hand	5.7

Assessment of participants' face mask usage during the pandemic revealed that a majority of 93.6% affirmed that they wear face masks before leaving their homes and 80.2% said they preferred disposable single-use face masks as an option. The outcome based on end-of-life disposal of used face masks revealed an equal distribution of responses among the participants, where 36.3% of the participants said they discard their used face masks in any available waste bins without distinction. More than half of the participants (54%) affirmed washing their hands using water and soap, while 29.4% use alcohol-based hand rubs. In addition, 9.7% of the participants said they only use water after handling used face masks. Relatedly, 5.7% of the participants professed to not practicing any form of hand hygiene despite the health concern posed by the pandemic (Table 1).

3.2. Students' Knowledge of Face Mask Use

Table 2 presents the relative distribution result of the participant responses around their face mask handling knowledge; perception of different types of commercially available face mask; effectiveness of face masks and reusing face mask attitudes; and environmental health impacts awareness associated with the unsafe disposal of face masks.

Table 2. Students' knowledge of face mask usage.

Knowledge of Face Mask Use			
No.	**Factor**	**Response**	**Percentage (%)**
1.	Most popular face mask type	- Surgical mask - N95 - Cloth mask - FFP3 - FFP1 - FFP2	55 23 9 6 4 3
2.	Effectiveness of face mask in reducing the spread of COVID-19	- Yes, a lot - Yes, some - Not sure - No, it does nothing - Don't know	58 31 7 4 0
3.	Reusing face masks	- A good practice - Not a good practice - Not sure	43 29 28
4.	Face masks wastes as a source for environmental and health consequences	- Yes, of course - Yes - Not sure	48 29 23
5.	End of life disposal of face mask	- Hazardous waste bin - Mixed waste bin - Any available waste bin	31.5 32.3 36.3

From the survey responses, it was evident that the majority (91%) of the students stated that they use different types of face masks during the peak of the pandemic. The single-use surgical face mask was the preferred form of respirable protection equipment (RPE) used among the students surveyed (55%). The second most preferred form of protection was the N95 face mask (23%), while the FFPs type usage was low (135) among the participants. The outcome from participants' perception toward the effectiveness of face masks (Factor 2) revealed 89% of participants agreed on the use of preferred RPE presents a positive impact in curbing COVID-19 spread, whereas 4% assume it has no measurable impact. A good majority of the participants (43%) affirmed that reusing disposal face masks was considered safe. However, 29% considered this an unsafe practice. When it comes to end-of-life disposal, 31.5% stated face masks should be carefully disposed of in a designated waste bin. However, 36.3% of them considered disposal in any available waste collection bin as a safe practice (Table 2).

3.3. Students' Attitudes to Face Mask Use

Regarding responses from the participants' attitudes toward face masks, 40% of the participants used face masks for a short duration of 1–3 h daily, whereas 20% of the participants used it for more than 5 h each day. A quarter (24%) of the participants wore face masks between 3–5 h daily and 16% wore them for less than an hour. (Figure 1a).

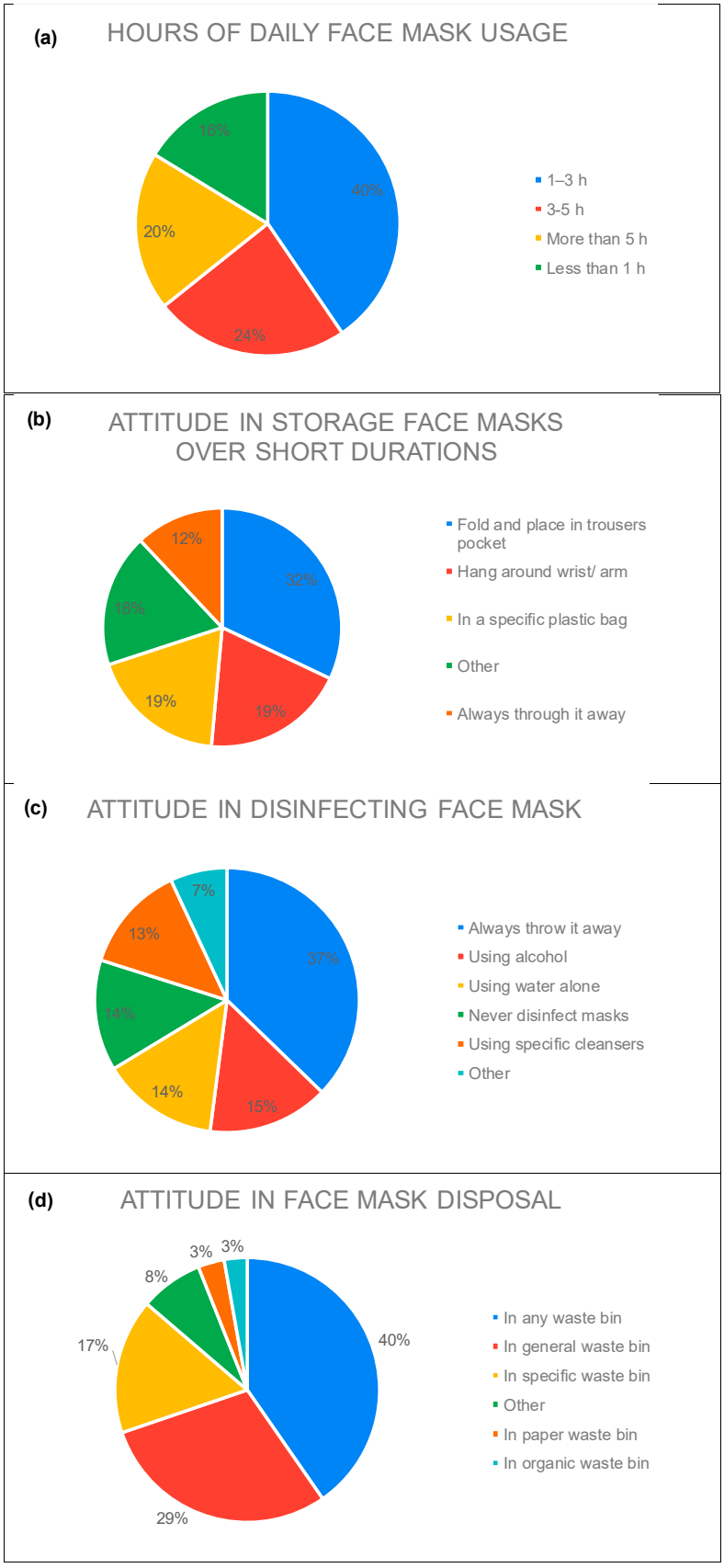

Figure 1. Relative distribution of participant responses to various attitude-related questions. (**a**) Hours of daily face mask usage, (**b**) attitudes in storing face masks for short durations, (**c**) attitudes in disinfecting face masks, and (**d**) attitudes in face mask disposal.

Among the participants that affirmed reusing their face masks over varying durations of time, 14% stated that they reuse theirs between 2–5 days, while 1% said they sometimes use their face mask for over a week before discarding them. As shown in Figure 1b, when the face masks are removed for a short duration, 32% of participants tend to fold them and place them in their trouser pockets. Other forms of storage preferred among the group include hanging around the wrist (19%), storing in a specific plastic bag (19%), and utilizing "other" options (18%). However, 12% of the participants said they discard their face masks after each use.

Among the participants that use cloth masks and other reusable masks during the pandemic, 14% said they rarely disinfect the masks between reuses. However, almost half (49%) of the participants practice some form of disinfection routine such as using alcohol (15%), using water (14%), using specific cleansers (13%), and "other" options (7%) (Figure 1c).

Attitude toward the end-of-life disposal of used RPEs revealed 40% said they discard used face masks in the available waste bins, while 29% used general waste bins for such a practice, and 17% only discard theirs in designated waste bins (Figure 1d).

3.4. Safety Practices among Students

The Table 3 results depict the relative distribution of participant responses regarding their personal safety practices. From the results, 58% of the participants said they use face masks daily while 20% only use it between 4–5 days. To gain insight into the number of RPEs used per participant, 46% used only one mask per day, while around one-third of the participants (34%) said at least two masks each day and only 9% said they use more than three every single day. Regarding the choice of face masks, 55% preferred disposable face masks over reusable types. This was followed by N95 (16%). The majority of the participants did agree that they touched their face/face mask, with 36% affirming this action at some point, while 30% said such action only happens occasionally.

Table 3. Students' safety knowledge of face mask usage.

Safety Practices on Face Mask Use			
No.	**Factor**	**Response**	**Percentage (%)**
1.	Frequency of wearing face masks	- Daily - 4–5 days/week - 2–3 days/week - Less than two days/week	58 20 15 7
2.	Types of face masks used by students	- Surgical face mask - N95 respirator and other comparable face masks - Non-antibacterial cloth face mask - Antibacterial cloth face mask - Activated carbon filter face mask	55 16 12 10 7
3.	Frequency of touching the face mask while wearing	- Sometimes - Occasionally - Never - Often	36 30 24 10
4.	End-of-life practices in face mask usage	- Throwing in the garbage - Throwing in the streets, public places, and nature - Burning - Wash & reuse	45 44 7 4

The end-of-life disposal of used masks presents different views, as most of the participants affirmed disposing of their used face masks in any bin (45%). Furthermore, 44% of the participants said they discard theirs in public places or streets (Table 3).

3.5. Factors Influencing Students' Face Mask Usage Behavior

Tables 4 and 5 summarize the influence of gender and age on face mask usage, reuse, and disposal habits. From the analyzed data, gender was found to have had a significant influence when it came to their choice of face mask use ($p \leq 0.000$). Age significantly influenced both the choice of appropriate face mask for public use ($p \leq 0.01$) and the habit of washing hands after removing the face mask ($p \leq 0.05$). However, both gender and age did not influence participants' knowledge related to reuse practices and their opinions on environmental and health consequences due to face mask littering.

Table 4. Results from ANOVA study by participants' gender.

Question	df	Mean Square	F	Sig.
Do you regularly see disposal mask littered on the floor	1	0.472	0.555	0.457
In your viewpoint, which of the following face masks is most appropriate to use in the community	1	46.400	12.809	0.000 *
In your opinion, reusing face masks is a good practice	1	0.320	0.150	0.699
In your opinion, face masks should be disposed carefully and in specific places	1	0.889	1.035	0.310
In your opinion, face masks littering lead to environmental and health consequences	1	1.419	1.376	0.242
Do you wash your hands if you wash your hands after removing a face mask?	1	0.016	0.024	0.878

* Significance level ($p \leq 0.00$).

Table 5. Results from ANOVA study by participants' age.

Question	df	Mean Square	F	Sig.
Do you regularly see disposal mask littered on the floor	4	0.962	1.135	0.341
In your viewpoint, which of the following face masks is most appropriate to use in the community	4	11.057	3.009	0.019 **
In your opinion, reusing face masks is a good practice	4	0.983	0.459	0.766
In your opinion, face masks should be disposed carefully and in specific places	4	0.351	0.404	0.806
In your opinion, face masks littering lead to environmental and health consequences	4	0.351	0.337	0.853
Do you wash your hands if you wash your hands after removing a face mask?	4	1.498	2.302	0.059 *

* Significance level ($p \leq 0.05$); ** Significance level ($p \leq 0.01$).

Table 6 summarizes the influence of participants' educational background on their attitudes of face mask usage and disposal. Based on the analyzed data, there was a significant effect of the face mask type that is commonly used in the community ($p < 0.05$). Additionally, it was reported that participants believe that face mask littering leads to environmental and health consequences. In addition, educational level was found to have a significant influence on face mask choice ($p \leq 0.05$), and the awareness of the environmental and health consequences of face mask waste ($p \leq 0.05$), respectively.

Table 6. Results from ANOVA study by participants' educational background.

Question	df	Mean Square	F	Sig.
Do you regularly see disposal mask littered on the floor	2	0.021	0.024	0.976
In your viewpoint, which of the following face masks is most appropriate to use in the community	2	13.153	3.547	0.030 *
In your opinion, reusing face masks is a good practice	2	3.009	1.426	0.242
In your opinion, face masks should be disposed of carefully and in specific places	2	3.364	4.002	0.19
In your opinion, face masks littering lead to environmental and health consequences	2	3.105	3.055	0.049 *
Do you wash your hands if you wash your hands after removing a face mask?	2	1.338	2.023	0.134

* Significance level ($p \leq 0.05$).

4. Discussion

The aim of this study was to undertake a cross-sectional survey among students from Abu Dhabi University, UAE, to assess their knowledge, attitude, and practices related to face mask use during COVID-19. At the end of the sampling period, 255 students participated in the survey. A demographic mix was observed in the study, where 53.7% of participants were males, 85.9% were between 18–25 years of age, 91.3% were currently enrolled in an undergraduate course, and 90.6% were married. Results from the ANOVA study conclude that age, gender, and level of education were all significant factors in determining the choice of appropriate face masks for public use. Higher levels of education are also reflected in increased awareness of environmental and health consequences. Based on the results, good knowledge, attitude (89%), and practices (93%) have been reported related to the effectiveness of using face masks to control the spread of COVID-19. However, face mask reusing and disposal-related knowledge, attitude (43%, 75%), and practices (88%, 56%), respectively, are reported to be moderate.

Overall, the survey participants showed good knowledge when it comes to the use of face masks, just as 93.6% of the participants said they regularly wear their face masks before leaving home during the pandemic. This finding contrasted with the results from Alremeithi et. al. [26], where only 55.4% of the participants wore face masks. This could probably be due to the study being conducted during early COVID time and can also be justified as 93% of the participants remained indoors due to COVID concerns. However, the current results are consistent with the results from another cross-sectional study conducted on the UAE population by Lutfi et. al. [27], which reported that 93% of the participants used face masks. Considering that the study was conducted shortly after the first wave of COVID-19 in 2020, it was an interesting finding that the young population in UAE is still able to adhere to the face mask mandate satisfactorily, even with reduced restrictions. At the same time, 89% of the participants believed that face masks were able to curb the spread of COVID-19. This reflects the effectiveness of the public awareness broadcasts and campaigns by Abu Dhabi University and the Ministry of Health. It was observed that 91% of the participants suggested the use of disposable single-use face masks; this is concerning for two reasons. Firstly, from the same participants, 43% believe that reusing face masks is a good practice, but if the disinfection step is not properly done this may pave the way for secondary infections. At the same time, if disinfection is being conducted on single-use face masks, it greatly reduces the structural integrity of the mask material and leads to withering over time. Earlier, Spennemann [28] stated that 75% of all pieces of surgical-type single-use face mask fabric decays into microfibers and are disposed of together alongside general waste, adding to the municipal waste stream, while also presenting a long-term source of microplastics in urban waste [28]. On another note, if a structurally compromised mask is being used, the plastic microfibers can probably be inhaled, which may result in

health complications [29–31]. Reusing single-use face masks is not generally advised and should only be done when there is a shortage in face mask availability.

With regards to how the participants store their face masks, 32% preferred to fold and place them in their trouser pockets. This is concerning as this may lead to secondary transmission and if the mask is damp or wet could result in mold formation over time [32]. Another unsustainable practice among the participating group was the high response (40%) related to discarding face masks in any available waste bin; such a practice could lead to the spread of the virus and other community-acquired infections [21].

The participants seem to adhere to most of the recommendations regards the use of face masks, such as wearing a face mask when exiting their homes, washing their hands before putting on the mask, and covering both their nose and mouth while wearing the mask. However, there are still areas for improvement needed, as 25% affirmed not practicing any form of personal hygiene practice after handling used RPEs. These actions are likely to pave way for secondary transmission, where the virus from the face mask may be transferred on the individual palm, and subsequently enter the body or get transferred to an unassuming individual during social interactions. Hence, it is vital to practice proper hand hygiene, not just while using face masks, but throughout frequent intervals in the day [32,33]. Based on the study outcome, a major difference between the application of personal hygiene practices was observed compared with the previous studies in which the most frequent habit was hand washing, and not wearing face masks [34,35].

The pandemic phase has resulted in an exponential increase in plastic/medical waste. Moving on from the pandemic, a major challenge would be the management of this medical waste. Since 43% of the participants do believe in reusing face masks, there is an onus on the public health commentators to promote the use of reusable cloth masks, which has comparatively lower environmental impact [33]. A biopolymer-based biodegradable face mask could also be a good alternative, given that 75% of the participants are aware of the environmental and health concerns arising from face mask waste.

Empirical evidence from the Middle East region suggests an association between the pandemic with increased face mask waste generation [21,23]. The major precursor to this trend points to a lack of public knowledge and a poor attitude toward safe waste disposal of the used mask. As mentioned by Islam et al. [36], social media plays a major role in information dissemination related to COVID-19; therefore, latching on to this can help ally the need for stakeholder acceptance of sustainable approaches toward the disposal of used face masks and promotion of good environmental stewardship among the target group. According to Cudjoe and Wang [1], considerable face mask waste, if not controlled, could contribute to micro-plastic pollution. Supporting this statement, the present study participants demonstrate a good awareness of this, as 77% said they are aware of the negative environmental and health impacts of face mask waste. However, 17% of the participants reported a counterintuitive attitude of discarding their used masks in open spaces and other non-designated areas, thereby presenting both public and environmental health challenges. Based on this, it can be concluded that, while there is a good level of awareness demonstrated among the surveyed group of students around face mask waste in the environment, there is however a need for further effort to raise safety awareness and strengthen positive attitudes toward attaining sustainable outcomes desired among all stakeholders.

Face mask waste disposed of in public areas may undergo withering due to mechanical abrasion or UV irradiation. Over time, these may degrade into smaller fragments and eventually form micro- and nanofibers. The face masks are mainly made from petrochemical-based polypropylene material and medical-grade polypropylene microfibers that could take up to 450 years to degrade in nature [16]. In the meantime, these fibers can travel across the biosphere and cause microplastic pollution in various ecosystems [23,28,37] in addition to encouraging a dynamic relationship between pollution and economic growth, to which conscious efforts at reducing pollution rates can promote the attainment of health

and well-being of citizens and sensitize for good sanitation and hygiene standards as set by the community in general [38].

As a result, it is crucial to enhance the knowledge level for safe face mask reuse and disposal practices. Raising knowledge levels could drive a better attitude and safer practices in the community. In this regard, tailored initiatives that focus on information dissemination and education are needed by the university management that will help in the promotion of sustainable RPE stewardship integration into the university waste management policy implementation, monitoring, and enforcement. Such institutional effort can encourage social responsibility and significantly contribute toward better sustainable actions across the nation [39].

Limitations of the Study

The main limitation of this study includes the absence of the evaluation for factors including cultural variations (e.g., nationalities, traditions), financial status (e.g., income), and the role of educational specialization (e.g., medicine, engineering, science, social sciences, etc.). Therefore, a further study could consider students from different nationalities and universities inside and outside the UAE. Moreover, it is necessary to study the influence of income and specialization on face mask use, disposal attitude, and safety practices.

5. Conclusions

The cross-sectional survey analyzed the KAPs of the young population in the UAE. It was observed that the students from Abu Dhabi University possessed good knowledge, attitude, and practices in precautionary measures and face mask usage. A resounding 93.6% of the participants still wore face masks while exiting their homes, even in this relaxed COVID-19 situation. This demonstrates the effectiveness of public awareness initiatives by Abu Dhabi University and the Ministry of Health. Age, gender, and level of education were all determining factors in the choice of appropriate face masks for public use. The level of education increased the participants' awareness of environmental and health consequences. However, while 75% of the participants claimed to be aware of the environmental and health implications of face mask waste, 44% of the participants are still disposing of used face masks in public areas. This reflects moderate knowledge, attitude, and practices of face mask reuse and disposal. This is a grave concern as it paves the way for micro-plastic pollution, affecting nature, animals, and humans alike. While the participants are adequately aware of COVID-19 and its response measures, there is a need to focus more efforts on environmental and public health impact awareness around medical waste pollution using tailored health and environmental campaign initiatives that focus on the best practices in face mask use, reuse, and disposal. Moving on from the pandemic, management of the medical waste would be the single-most demanding challenge to be tackled. Proper interventions may prevent an explosive increase in the amount of microplastic fibers in nature.

The use of social media to educate the target group with regards to the sustainable disposal of used face masks and proper waste management should be encouraged. It is also recommended that future research assess the influence of sociodemographic characteristics (e.g., family size, employment status, income rate) on face mask use, reuse, and disposal.

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