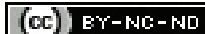


Mask-wearing Behaviours among the Public in Saudi Arabia during the COVID-19 Pandemic: A Cross-sectional Study

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ABSTRACT

Introduction: Public behaviour involving the wearing of face masks are influenced by a host of interdependent demographic, economic, and educational factors, therefore, mask-wearing behaviours among the public vary not only in different countries but also from region to region within a country.

Aim: To assess mask-wearing behaviours among the public in Saudi Arabia during the Coronavirus Disease 2019 (COVID-19) pandemic.

Materials and Methods: This cross-sectional study was conducted among the general public of Saudi Arabia who could communicate in Arabic, from 9th August 2021 to 12th October 2021, after approval from Taif University. To collect as many respondents as possible, convenience sampling was used and a total of 481 participants gave consent for the same. A social media platform was used for

the data collection. Descriptive statistics and a logistical regression model were employed for data analysis.

Results: A total of 481 participants consented to take part in the current research, with 56.8% being males and 43.2% being females. Most individuals showed poor compliance (67.6%). Female participants, participants who had graduate degree, and people who worked in a confined environment, including a hospital, restaurant or similar place, reported better compliance with the use of a face mask ($\chi^2=13.29$; p-value <0.001), ($\chi^2=8.26$; p-value=0.041), and ($\chi^2=16.84$; p-value <0.010), respectively. Regression analysis defined three characteristics linked with good compliance i.e., sex, level of education and present work/living situation.

Conclusion: Most people did not comply with public behaviour concerning the use of face masks. Female participants were more likely to wear a face mask.

Keywords: Coronavirus disease 2019, Disposal of face mask, Educational level, Poor compliance, Self-quarantine

INTRODUCTION

Wearing a mask should be made a natural aspect of social interactions. To make masks as effective as possible, they must be used, stored, cleaned, and disposed of correctly. Coronavirus disease 2019 (COVID-19) is a severe disease for which there is no cure and is spreading at an alarming rate, especially in the immunologically naive population. From 6th-12th September 2021, approximately 4 million new cases of COVID-19 were recorded globally, representing the first significant drop in weekly occurrences in more than two months. The total number of cases reported globally as of 14th September 2021 were over 224 million, with a death toll of a little over 4.6 million [1]. Many countries, notably Saudi Arabia, the United States, and Canada, have forced or advised on the use of face masks in public places [2,3,4].

Data supporting the effectiveness and acceptance of various types of face masks in avoiding lung diseases throughout the epidemic is limited [5,6]. Applying a face mask or even other barrier (protective eyewear, shields, veils) to stop the recurrence of respiratory infections such coronavirus, rhinovirus, tuberculosis, or influenza were explored in a preview of a review of the literature issued on 6th April, 2020 [7]. Mask use resulted in slight but insignificantly decreases in rates of infection, both in general and among affected members of households. The study concluded that "the data is inadequate to recommend the widespread use of masks as a COVID-19 protection strategy" [7] and called for more high-quality randomised trials. During the COVID-19 pandemic, there has been strong indirect evidence to support the claim that the public should wear masks. When discharged as an aerosol under experimental settings, the Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) has indeed been discovered to survive for several hours in the air, [8] and in field and laboratory trials, face masks seem to protect against such particles [9].

It has been demonstrated that for up to 2.5 days prior to the beginning of symptoms individuals are infectious [10]. Furthermore,

it appears that up to 50% of infections occur in people who are not yet symptomatic [11]. The community incidence of COVID-19 is anticipated to be significant in many countries [12]. According to modelling studies, even a minor drop in community transmission of SARS-CoV-2 might have a significant positive impact on other health system components like mechanical ventilators and inpatient bed spaces) [13]. The present study aimed to assess the public behaviour in Saudi Arabia involving the wearing of face masks during the COVID-19 pandemic.

MATERIALS AND METHODS

This cross-sectional study was conducted from 9th August 2021 to 12th October 2021, among the general public of Saudi Arabia, who could communicate in Arabic. The affiliated Taif University Ethics Committee accepted the study protocol (Application code: 42-0085). Informed consent was obtained. Convenience sampling was used.

The survey was based on Tan M et al., instrument [14]. The questionnaire was validated and the reliability of the English was checked. It was then translated into Arabic by an expert and assessed for linguistic reliability. Due to the serious circumstances of COVID-19, the researcher used Google Forms to establish Arabic questionnaire electronic links. Because WhatsApp is the most popular social media platform in Saudi Arabia, it was chosen to distribute the questionnaire. The online survey was created using Google Forms and it was opened for the study participants for 42 days.

Inclusion and Exclusion criteria: The study participants included people who were aged 14 years or older, lived in Saudi Arabia at least for one year during the COVID-19 pandemic and could communicate in Arabic, while those who were less than 14 years old, not completed the questionnaire, and could not communicate in Arabic were excluded from the study.

The survey was based on Tan M et al., instrument, which was separated into two parts [14]:

First part included:

- Respondents' demographical information, such as gender, age in years, etc.
- Behaviours of mask use, which includes 15 items such public habits on mask-wearing, disposal of face mask methods, etc.

Second part of the instrument contained a Likert-type 4-point scale (never, occasionally, often, always), and also forcible and multiple choice questions, to obtain total scores ranging from 0 to 12.

Study Procedure

Ten participants were chosen (who were not part of the main study) to assess the questionnaire's reliability, completion time, whether the questions were straight forward and easy to answer, and whether the questionnaire was well-designed. The Cronbach's α -reliability test to determine the questionnaire's internal consistency had been 0.709. A score of 1 was assumed for every correct response and a score of 0 was assumed for every incorrect answer on face mask wearing behaviours, to ease the analysis.

- Answers of "never" and "occasionally" were classified as erroneous for items 1, 2, 3, 4-1, 5-1, and 9, while.

- "Often" and "always" were defined as correct.
- For items 4, 5, 6, 7, 11, and 13, the definitions were reversed.
- Items 13-1, 14-1, and 15 were not taken into account, resulting in a total of 13 points.
- The total result was categorised as "good" or "poor" depending on whether a total of 10 or even more points (out from a possible 12) was obtained, which has been employed as a predictor variable in logistical regression study.

STATISTICAL ANALYSIS

The Statistical Package for the Social Sciences (SPSS) software (version 16.0) was employed for data analysis. All the data were categorised and presented as frequencies with percentages. The Chi-square test was used to compare the "good" rate among subgroups and variables with p-value <0.05 being significant.

RESULTS

A total of 481 participants consented to take part in the current research, with 56.8% being male, and 43.2% being female. Most participants reported that they had not experienced flu-like symptoms (86.9%) or were communicating with clients who had been in self-quarantine in the last 15 days (90.4%) respectively [Table/Fig-1].

Variables	Overall	Behaviours of wearing a face mask		Chi-square	p-value
	N (%)	Good, n (%)	Poor, n (%)		
Overall behaviour of wearing a face mask		156 (32.4%)	325 (67.6%)		
Gender					
Male	273 (56.8%)	70 (44.9%)	203 (62.5%)	13.29	0.001*
Female	208 (43.2%)	86 (55.1%)	122 (37.5%)		
Age (years)					
≤14	238 (49.5%)	78 (50.0%)	160 (49.2%)	1.76	0.623
15-34	236 (49.1%)	75 (48.1%)	161 (49.5%)		
35-65	3 (0.6%)	2 (1.3%)	1 (0.3%)		
>65	4 (0.8%)	1 (0.6%)	3 (0.9%)		
Place of residence					
Urban	437 (90.9%)	141 (90.4%)	296 (91.1%)	0.061	0.805
Rural	44 (9.1%)	15 (9.6%)	29 (8.9%)		
Educational level					
Middle school or below	13 (2.7%)	5 (3.2%)	8 (2.5%)	8.26	0.041*
High school	77 (16.0%)	19 (12.2%)	58 (17.8%)		
College	47 (9.8%)	23 (14.7%)	24 (7.4%)		
Graduate degree	344 (71.5%)	109 (69.9%)	235 (72.3%)		
Current work/living environment					
Working in a relatively enclosed setting such as a hospital, airport, railway station, subway/metro station, bus, aircraft, train, grocery store, restaurant, or similar	211 (43.9%)	81 (51.9%)	130 (40.0%)	16.84	0.010*
Working in multiple settings within a day; for example, as a police officer, security guard, mail carrier, courier	18 (3.7%)	1 (0.6%)	17 (5.2%)		
Living in self-quarantine or with people in self-quarantine at home	10 (2.1%)	3 (1.9%)	7 (2.2%)		
Studying or taking part in activities in crowds	37 (7.7%)	10 (6.4%)	27 (8.3%)		
Studying or taking part in activities at home	107 (22.2%)	35 (22.4%)	72 (22.2%)		
Indoor office environments	74 (15.4%)	15 (9.6%)	59 (18.2%)		
Outdoor open space	24 (5.0%)	11 (7.1%)	13 (4.0%)		
Flu-like symptoms					
Yes	63 (13.1%)	17 (10.9%)	46 (14.2%)	0.982	0.322
No	418 (86.9%)	139 (89.1%)	279 (85.8%)		
Living with people who were in self-quarantine					
Yes	46 (9.6%)	7 (4.5%)	39 (12.0%)	6.88	0.009*
No	435 (90.4%)	149 (95.5%)	286 (88.0%)		

Knowledgeable about face mask use instruction					
Yes	427 (88.8%)	156 (100.0%)	271 (16.6%)	29.198	0.01*
No	54 (11.2%)	0 (0.0%)	54 (100%)		

[Table/Fig-1]: Study subjects' demographic characteristics (N=481).
*p-value <0.05 was considered as statistically significant

In general, the public showed poor compliance (67.6%) with regard to wearing face masks. Female participants, participants who were graduates, or people who worked in a confined environment, including a hospital, restaurant, or similar place, reported better compliance with the use of a face mask ($\chi^2=13.29$; p-value <0.001),

($\chi^2=8.26$; p-value=0.041), and ($\chi^2=16.84$; p-value <0.010), respectively [Table/Fig-1].

However, only 15.8% of the participants never touched the mask while using it. The most common source of knowledge regarding face mask use (45.7%) was through social media sites [Table/Fig-2].

Item	Never	Occasionally	Often	Always	n (%)
Q1 Before putting on a mask, did you clean your hands with alcohol-based hand rub or soap and water?	102 (21.2)	159 (33.1)	97 (20.2)	123 (25.6)	
Q2 After putting on a mask, did you make sure that your mouth, nose, and chin were covered by the mask?	20 (4.2)	52 (10.8)	75 (15.6)	334 (69.4)	
Q3 After putting on a mask, did you make sure that there were no gaps between your face and the mask?	53 (11.0)	93 (19.3)	106 (22)	229 (47.6)	
Q4 Did you touch the mask while using it?	76 (15.8)	198 (41.2)	113 (23.5)	94 (19.5)	
Q4-1. (If Q4 not answering never). If you did touch the mask, did you clean your hands with alcohol-based hand rub or soap and water immediately?	125 (30.9)	137 (33.8)	69 (17.0)	74 (18.3)	
Q5 Did you adjust the mask while using it?	43 (8.9)	139 (28.9)	118 (24.5)	181 (37.6)	
Q5-1. (If Q5 not answering never). If you did adjust the mask, did you clean your hands with alcohol-based hand rub or soap and water immediately?	137 (31.3)	139 (31.7)	67 (15.3)	95 (21.7)	
Q6 Did you hang the mask under the chin while using it?	127 (26.4)	214 (44.5)	86 (17.9)	54 (11.2)	
Q7 Did you uncover your mouth and/or nose for a breath while using the mask?	105 (21.8)	211 (43.9)	89 (18.5)	76 (15.8)	
Q8 How did you remove the used mask? (Multiple choices)	Loosen its strings to remove it				413 (85.9)
	Pull it off by touching the front side of the mask				96 (20.0)
	Touch the inside of the mask to remove it				16 (3.3)
Q9 When you removed the mask, did you clean hands with alcohol-based hand rub or soap and water immediately?	122 (25.4)	134 (27.9)	79 (16.4)	146 (30.4)	
Q10 After you removed the mask, how did you dispose of it? (Multiple choices)	Place it in a trash can with a cover				169 (35.2)
	Place it in a trash can without even a cover				149 (31.0)
	Toss the worn mask into the trash				91 (19.0)
	Regardless of whether it has a lid or not, toss it into a waste bin within your reach				124 (25.8)
	Keep it for reuse				26 (5.4)
Q11 Did you wear multiple masks at the same time?	288 (59.9)	127 (26.4)	48 (10.0)	18 (3.7)	
Q12 When did you replace the mask with a new one? (Multiple choices)	Replace it immediately once it becomes wet				166 (34.7)
	Replace it within no more than 4 hours of use				115 (24.0)
	Replace it after using for 4 to 8 hours				104 (21.7)
	Replace it after using for more than 8 hours				169 (35.3)
Q13 Did you reuse disposable masks?	218 (45.3)	150 (31.2)	62 (12.9)	51 (10.6)	
Q13-1. (If Q13 not answering never). If you did reuse the disposable masks, how did you disinfect the disposable mask? (Multiple choices)	Hang in a well-ventilated area				140 (49.1)
	Dry using an electric hair dryer				6 (2.1)
	Expose it to steam				4 (1.4)
	Boil it				5 (1.8)
	Heat in the oven				1 (0.4)
	Use alcohol to sterilise it				17 (6.0)
	Wear a tissue within a temporary mask while using it, as well as discard it afterwards				5 (1.8)
	Wear a cotton mask inside a disposable mask				8 (2.8)
	No special treatment				139 (48.8)
	Wash it				2 (0.7)
Q14 Which type of face masks did you choose? (Select all that apply)	Cloth face mask				136 (28.3)
	Disposable medical mask				414 (86.1)
	N95 respirators				43 (8.9)

Q15 How did you get to know about using face masks? (Multiple choices)	Parents or siblings have informed you	100 (20.8)
	News on television	134 (27.9)
	Social media platforms	220 (45.7)
	Dissemination in the community	177 (22.3)
	Others	163 (33.9)

[Table/Fig-2]: Characteristics of mask-wearing behaviours of the general public (n=481).

Males have been less inclined than females demonstrating greater levels of adherence (OR=2.35, 95% confidence interval CI=1.46:3.79, p-value=0.001). Respondents with a high school education had a lower rate of adherence to face mask using habits than those of other educational levels (ORs=1.26, 95% CI:0.64-2.46, p-value 0.5). Respondents who worked at numerous contexts throughout the day, such as a police officer, showed (95% CI:1.71-176.86, p-value=0.02) greater adherence. Furthermore, participants who lived with people in self-quarantine reported worse compliance than those who did not live with people in self-quarantine (OR=3.30, 95% CI:1.31-8.30, p-value=0.01) [Table/Fig-3].

of adherence to face mask using habits than those of the other educational levels. In addition, respondents who worked in different settings throughout the day, such as a police officer, and individuals who worked in indoor office settings showed greater adherence than individuals who were learning or contributing to activities inside a crowded environment, whereas lower adherence was seen in those communicating with clients who had been in self-quarantine. Furthermore, participants who lived with people in self-quarantine, reported, worse compliance than those who did not live with people in self-quarantine. However, another study reported that people working in relatively enclosed or multiple settings and living in self-quarantine

Variables	β	Standard error	Wald	Degree of freedom (df)	p-value	OR	95% C.I. for OR	
							Lower	Upper
Gender								
Male	0.86	0.24	12.42	1.00	0.001*	2.35	1.46	3.79
Female	-	-	-	-	-	-	-	-
Age (Years)								
≤14	1.40	1.98	0.50	1.00	0.48	4.06	0.08	196.11
15-34	0.85	1.28	0.44	1.00	0.51	2.34	0.19	28.83
35-65	0.83	1.28	0.42	1.00	0.52	2.28	0.19	27.83
>65	-	-	-	-	-	-	-	-
Place of residence								
Urban	0.13	0.38	0.11	1.00	0.74	1.13	0.54	2.37
Rural	-	-	-	-	-	-	-	-
Educational background								
Middle school or below	-0.14	0.79	0.03	1.00	0.85	.87	0.18	4.07
High school	0.23	0.34	0.45	1.00	0.50	1.26	0.64	2.46
College	-1.02	0.37	7.83	1.00	0.01	.36	0.18	0.74
Graduate degree								
Current work/living environment	-	-	15.63	6.00	0.02	-	-	-
Working in a confined space, such as a hospital, or similar establishment	0.86	0.56	2.34	1.00	0.13	2.37	0.78	7.18
Working in a variety of settings during the day, such as a police officer	2.86	1.18	5.83	1.00	0.02	17.40	1.71	176.86
Communicating with clients who have been in self-quarantine	0.42	0.96	.19	1.00	0.66	1.52	0.23	9.99
In a crowded environment, studying or participating in activities	1.47	0.67	4.83	1.00	0.03	4.34	1.17	16.08
At home, might study or participate in activities	1.28	0.58	4.79	1.00	0.03	3.59	1.14	11.30
Indoor office environments	1.71	0.61	7.75	1.00	0.01	5.53	1.66	18.42
Outdoor open space	-	-	-	-	-	-	-	-
Flu-like symptoms								
Yes	0.21	0.35	0.36	1.00	0.55	1.23	0.62	2.44
No	-	-	-	-	-	-	-	-
Communicating with clients who have been in self-quarantine								
Yes	1.19	0.47	6.45	1.00	0.01	3.30	1.31	8.30
No	-	-	-	-	-	-	-	-
Knowing about the usage of face masks								
Yes	-20.7	52.5	0	1.00	1.0	0	0	-
No	-	-	-	-	-	-	-	-
Constant	18.69	52.5	0	1.00	1.0	13.9	-	-

[Table/Fig-3]: Binary logistical regression analysis.
*p-value <0.05 was considered as statistically significant

DISCUSSION

Among the factors influencing mask-wearing behaviours, we found that respondents with a college education had a lower rate

of adherence to face mask using habits than those of the other educational levels. In addition, respondents who worked in different settings throughout the day, such as a police officer, and individuals who worked in indoor office settings showed greater adherence than individuals who were learning or contributing to activities inside a crowded environment, whereas lower adherence was seen in those communicating with clients who had been in self-quarantine. Furthermore, participants who lived with people in self-quarantine, reported, worse compliance than those who did not live with people in self-quarantine. However, another study reported that people working in relatively enclosed or multiple settings and living in self-quarantine

Authors also found that factors such as age, place of residence, having flu-like symptoms, and knowledge of the use of face masks had no significant impact on public behaviour involving the use of face masks. This stands in contrast with a study conducted in China by Tan M et al., which found that people who lived in urban areas showed better compliance than those who lived in rural areas. When people have flu-like symptoms like coughing and sneezing, they may feel uncomfortable and touch their face masks more frequently, resulting in lower compliance. The effect of age exhibited different patterns, with those aged 14 years or below demonstrating the best compliance and other groups, displaying increasing trends of better compliance with increasing age [14].

Another issue for the public is a good variety of different sorts of face masks. However, 86.1% of the subjects wore disposable medical masks, few participants (8.1%) wore N95 respirators, which would not be advised for the public at large, while about 13.7% of respondents said they wore numerous masks at the same time. In non healthcare settings, the Centre for Disease Control and Prevention (CDC) does not suggest wearing N95 respirators to guard against COVID-19. Commercially available medical procedure masks (including surgical masks) for community usage are often marketed as “disposable face masks.” Healthcare professionals and other workers who are required to use N95 respirators for protection against additional threats, should be given priority [15].

When there is a mask shortage, face mask reuse is an unavoidable problem. During the period whenever disposable masks were sparse, the public was encouraged to reuse them if they were clean, but to replace them with new ones if they were unclean and had been worn for more than 8 hours [16]. Disposable masks were reused by more than half of the present study subjects, although only about a 1/3rd (21.7%) did not replace them even after they had been worn for more than 8 hours. The World Health Organisation (WHO) requires people not to reuse single-use masks and to discard the mask as soon as it becomes moist [17]. For the next point, nearly half of the subjects (49.1%) hung their worn masks in well-ventilated areas. Some members of the public used other methods, for example rubbing spirits, heating, steaming, and putting tissue or even a fabric mask on the inside of a one-use mask. But the majority applied no special treatment to the reused mask. Disposable masks should not be disinfected, according to the evidence. To prevent contamination, cloth masks should be cleaned using hot water and soap or with washing powder [18]. Cloth masks are constructed from a range of fabrics and come in several styles; to avoid leaks, they should be worn with a suitable fit over the nose and mouth. A nasal wire and multiple layers of closely woven breathable cloth should be employed. This is especially crucial for single-layer materials or lightweight fabrics that do not obstruct light [19].

The disposal of used masks is another concern. The United Nations Children's Fund (UNICEF) requires people to carefully dispose of masks, gloves, and other items for personal protection, and only in closed bins [20]. The present study result showed that 31% placed their masks into a waste basket without even a cover, whereas 25.8% dumped them into any trash barrel that was accessible, irrespective of whether it had a cover. According to UNICEF, the number of used masks that ended up in nature increased during lockdowns. This occurred because most of these items are discarded improperly, such as in open garbage cans or on the ground, allowing the very light masks to be carried by the wind and washed into rivers, seas, and oceans by rain, which explains why used masks have been found on the shores of uninhabited islands.

The worn masks and gloves that we find on the ground in practically every community are not only hazardous to the environment, but also to humans. These items have a higher risk of coronavirus infection than other types of garbage [21]. Authors discovered that participants who were given instructions on how to apply face masks complied with guidance four times compared to those who weren't.

Among the factors influencing mask-wearing behaviours, we found that respondents with a college education had a lower rate of adherence to face mask using habits than those of other educational levels. Surprisingly, the higher one's educational level, the lower one's compliance on face mask use. As a result, it appeared that good mask-wearing behaviours were determined by the amount of mask use education received rather than educational levels. This outcome further confirmed the premise of Greenhalgh T et al., study inside the framework of COVID-19, individuals may be encouraged to use masks safely and correctly not sacrificing others critical anti-contagion procedures [22]. Together along with the findings of the present study, this evidence on how participants obtained related material, implies that institutions and researchers should make every effort to distribute guidance through diverse ways, with social media being the most beneficial to the public.

Limitation(s)

The responder's honesty and frankness may be limited due to the nature of the issue. Another limitation of the present study is the questionnaire's low reliability, which could be due to the small sample size and the fact that we used items from other questionnaires because there were no reliable gold-standard public face mask using questionnaires to measure individual's mask-wearing behaviours among the public. In addition, the current study's questionnaire addressed obstacles in general, rather than categorising them as psychological, physical, or cultural. For future research to get a better understanding of this essential health topic, a bigger sample size is needed.

CONCLUSION(S)

Most people did not comply with public behaviour concerning the use of face masks. Female participants in the present study were more likely than male participants to wear a face mask. It was observed that mask-use education rather than education level seemed to determine the level of good mask-wearing behaviour.

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