Face mask use in the COVID-19 pandemic: a cross-sectional study

Prática do uso de máscaras no contexto da pandemia da COVID-19: um estudo transversal

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ABSTRACT

Objective: This study aimed to investigate face mask use among the population of the state of Rio de Janeiro during the COVID-19 pandemic. **Method**: This was an online cross-sectional study. Data were collected via social media using an online form to gather general information about the participants and administering the Brazilian Portuguese version of the Face Mask Use Scale. Mann-Whitney and Kruskal Wallis tests were used to compare the scores. All ethical aspects were considered. **Results:** 1,783 (100%) individuals participated. The mean score was 18.2 (SD=8.2), with items ranging between 6.0 and 30, placing the practice of mask use at 60.6%. When evaluating self-protection, the mean score was 9.5 (SD=4.0), and protection of others, 8.7 (SD=4.6), ranging between 3.0 and 15.0. **Conclusion:** The practice of wearing face masks was neglected by the population of this study, and their use was geared more at self-protection than at the protection of others.
Descriptors: Health Knowledge, Attitudes, Practices; COVID-19; Masks.

RESUMO

Objetivo: Investigar o uso de máscaras entre a população do estado do Rio de Janeiro, durante a pandemia da COVID-19. **Método:** Trata-se de um estudo transversal *online*. A coleta de dados ocorreu via redes sociais e utilizou-se um formulário de informações gerais e a versão para o Português do Brasil da *Face Mask Use Scale*. Os testes Mann-Whitney e Kruskal Wallis foram utilizados para comparação dos escores. Os aspectos éticos foram contemplados. **Resultados:** Participaram 1.783 (100%) indivíduos. O escore obtido foi de 18,2 (DP=8,2), com itens variando entre 6,0 e 30 evidenciando que a prática do uso de máscaras foi de 60,6%. Ao avaliar a autoproteção, obteve-se 9,5 (DP=4,0) e a proteção do outro 8,7 (DP=4,6), variando entre 3,0 e 15,0. **Conclusão:** A prática do uso das máscaras foi negligenciada por parte da população deste estudo, sendo melhor sua utilização para a autoproteção do que para a proteção do outro.
Descritores: Conhecimentos, Atitudes e Prática em Saúde; COVID-19; Máscaras.

INTRODUCTION

Coronavirus belongs to a family of viruses capable of causing respiratory infections. Seven types of human coronaviruses (HCoVs) have been identified, among them SARS-CoV (that causes severe acute respiratory syndrome) and MERS-CoV (that causes the Middle East respiratory syndrome). At the end of 2019, a new coronavirus was discovered in Wuhan, China, which was named severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) responsible for the coronavirus disease 2019 (COVID-19)[1]. SARS-CoV-2 spread so rapidly that on March 11, 2020, the World Health Organization (WHO) declared the COVID-19 pandemic[1].

By July 14, 2021, 205.338.159 cases of COVID-19 had been confirmed worldwide with 4.333.094 deaths. By the same date, in Brazil, 20,245,085 cases were confirmed with 515,985 deaths. In the state of Rio de Janeiro alone, there were 1,080,746 confirmed cases and 60,632 deaths[2-3].

COVID-19 is transmitted from person to person, through the respiratory droplets sprayed by an infected individual when coughing, sneezing, or

talking. The droplets from infected individuals can reach the mouth, nose or be inhaled into the lungs of individuals around them. People can also become infected through contaminated surfaces or objects. Given the above, WHO recommends frequent handwashing with water or soap, or the use of alcohol-based hand sanitizers[4].

Infected people usually manifest symptoms. However, in some cases they can be asymptomatic and still be capable of spreading the virus. Those infected with COVID-19 may present with symptoms 2 to 14 days after exposure and, in the mildest cases, the symptoms include an acute respiratory condition, feeling feverish or having a fever, accompanied by a cough, or a sore throat, or a runny nose, or shortness of breath. Additionally, loss of the sense of smell and taste may also occur. In the most severe cases, patients may present dyspnea/respiratory distress or a feeling of persistent pressure on the chest[5].

Considering the COVID-19 pandemic and its forms of transmission, health authorities have recommended that the population adopt non-pharmacological measures, such as social distancing, cough etiquette, and respiratory hygiene. In addition, face masks should be used both for self-protection and the protection of others. These strategies should be followed broadly, especially in public places, to reduce the risk of contamination[4].

The use of face masks is recommended to reduce the spread of coronavirus. Masks act as protective barriers for healthy individuals against the pathogens emitted by sick individuals when coughing or sneezing. This reduces the transmission of the virus and prevents contamination of others[4,6].

Health authorities have recommended cloth masks, N95 or PFF2 masks, and surgical or medical masks, depending on the context and situations of each individual[4]. In cases where access to masks is difficult, an informative note issued by WHO and the Brazilian Ministry of Health recommended that the population make and manufacture their own masks, preferably with three layers[7].

Knowledge about mask use is an important factor influencing adherence to this practice. A cross-sectional study that evaluated adherence of the Chinese public to mask use during the COVID-19 pandemic found that this practice was four times higher among people informed about the proper use of this equipment than those who did not have this information[8].

Face masks are a fixture in the daily lives of people in Asian countries, even before the COVID-19 pandemic. They have been used to combat other respiratory diseases and epidemics, such as the SARS epidemic that affected these countries in 2003. However, this practice is not common in the West, demonstrating that the use and adoption of face masks are associated with social and cultural practices[9].

Therefore, even though the use of masks is not a common practice among the Western population, especially in Brazil, the pandemic made Brazilians have to adopt this practice. This change in behavior justifies carrying out regional studies to analyze this practice and then underpin the decision-making process of managers in terms of health knowledge, attitudes, and practice.

The objective of this study was to investigate the use of face masks by the population of the state of Rio de Janeiro, Brazil, during the COVID-19 pandemic.

METHOD

This was a cross-sectional study conducted in the state of Rio de Janeiro, in the period between April and May 2020, via an electronic form. This study is part of the project entitled "Multinational study on the face mask use practice among the general public during the COVID-19 pandemic". To be included, participants had to be 18 years or older, living in the state of Rio de Janeiro, and have access to the Internet. Foreign individuals residing in the state of Rio de Janeiro were excluded.

Sample sizing was based on the number of inhabitants of Rio de Janeiro (17,463,349) according to population estimates in 2021 provided by the Brazilian Institute of Geography and Statistics (IBGE)[10]. Based on this number, the sample was calculated by adopting a 5% margin of error, a 95% confidence interval, an estimated prevalence of 50%, and statistical power of 80%, which resulted in a minimum total sample of 385 individuals.

Data collection was carried out through social media, on platforms such as Instagram Facebook, Twitter, WhatsApp, and e-mail, through which the study was also publicized. The data collection instruments were converted into an online format using Google Forms. The participants were invited to take part in the study via messages sent on the social media platforms,

which contained a link to the study.

Two instruments were applied: 1 - General Information Form (sex, marital status, income, education, occupation, if they had been in contact with someone with respiratory symptoms and direct contact with someone diagnosed with COVID-19); 2 - Brazilian Portuguese version of the Face Mask Use Scale (FMUS-PB).

The Face Mask Use Scale (FMUS) was created originally in China and developed in Chinese and English in 2012 to measure the frequency of face mask use in different circumstances. The FMUS divides the practice of face mask use into two categories: "protect oneself" and "protect others", in three common circumstances: public areas, clinics or hospitals, and home, in the prior two weeks.

The instrument consists of six items, namely: 1 - I wear a face mask in public venues to protect myself against influenza-like-illness.; 2 - I wear a face mask in a doctor's clinic to protect myself against influenza-like-illness; 3 - I wear a face mask at home when I have symptoms of influenza-like-illness; 4 - I wear a face mask in public venues when I have symptoms of influenza-like-illness; 5 - I wear a face mask in the doctor's clinic when I have symptoms of influenza-like-illness; and 6 - I wear a face mask at home when family members have influenza--like-illnesses. Items 1, 2 and 6 refer to mask use for self-protection, while items 3, 4 and 5, refer to the protection of others. Response options vary on a 5-point Likert-type scale, namely: "never", "rarely", "sometimes", "often" and "always" that characterize the frequency of face mask use. Each answer option is scored 1 to 5 in ascending order, with the total possible score ranging from 6 to 30. The higher the score, the higher the frequency of face mask use[11].

The psychometric properties of the FMUS are satisfactory. The present study used the Brazilian Portuguese version of the Face Mask Use Scale (FMUS-PB), adapted and validated for Brazil[12]. The collected data were analyzed using descriptive statistics with measures of central tendency and dispersion. The rates of mask use were examined considering the FMUS-PB score as well as the individual variables. The Mann-Whitney and Kruskal Wallis tests were used to compare the scores of the overall practice of face mask use (minimum=6 and maximum=30), mask use for self-protection (minimum=3 and maximum=15) and to protect others (minimum=3 and maximum=15). Significance was set at p<0.05.

The project was submitted and approved by the National Commission for Research Ethics (CONEP) under Resolution no. 3.971.512 and abided by all the ethical aspects of Resolution 510/2016 of the National Health Council. On the initial page of the online questionnaires, the participants were presented with an online informed consent form and were only allowed to answer the questionnaires if they selected the option "I have read the information about the study and agree to participate," thus providing their free and informed consent.

RESULTS

A total of 1,783 (100%) individuals participated in the study, most of them female (79.2%), married (53.2%) and with an income equal to or greater than 7 monthly minimum wages (36.9%). Most of the participants stated that they had a graduate degree (51.2%). Regarding occupation, 932 (52.3%) were not health professionals and had never (47.1%) been in contact with patients who might present respiratory symptoms in their work environment (Table 1).

Regarding item 1 of the FMUS-PB, 1,051 (58.9%) participants answered that they always used a face mask in public places to protect themselves and, regarding item 4, 877 (49.2%) also always used it when they had symptoms of influenza--like-illnesses.

Regarding items 2 and 5, on the use of masks in healthcare services, respectively, 1,119 (62.8%) stated that they always used them for self-protection, and 982 (55.1%) used them when they presented symptoms of influenza--like-illnesses.

In terms of items 3 and 6, respectively, which touch on face mask use at home, 1,061 (59.5%) individuals answered that they never adopted this practice when they had symptoms, and 1,073 (60.2%) never used masks when family members had indications of influenza-like-illnesses (Table 2).

The mean total score of the FMUS was 18.2 (SD = 8.2), with items ranging between 6.0 and 30, showing that the practice of wearing masks among the population of the state of Rio de Janeiro was 60.6%. Considering the items that evaluate self-protection, the result was 9.5 (SD=4.0) and those that evaluate the protection of others, 8.7 (SD=4.6), with a minimum of 3.0 and a maximum of 15, respectively.

Regarding the items related to the practice of face mask use, women presented (p= 0.000) the

highest score, both for self-care (*p*= 0.000) and the care of others (*p*= 0.000), when compared to men. The marital status of the participants showed that divorced and widowed individuals benefitted from the protection that face masks offer, even if *p* was not statistically significant.

In terms of income, participants who earned 3 to 4 monthly minimum wages presented the highest rates of mask use. Furthermore, those with the highest level of education (p=0.050) showed the highest scores for mask use (p=0.050), especially to protect others (p=0.015).

In terms of occupation, nursing professionals (p=0.001) scored the highest in all the items, both for self-protection (p=0.007) and protection of others (p=0,000). In addition, individuals who had contact with individuals in the workplace with possible symptoms of influenza-like-illnesses at least once a month (p=0.000) or ongoing and daily contact (p=0.000) respectively, also had the highest mask use scores for all items. Regarding coming in direct contact with someone diagnosed with COVID-19, participants who reported "Yes" had better overall mask use scores (p= 0.000) (Table 3).

Table 1 - Characteristics of participants (n= 1,783). Rio de Janeiro, Rio de Janeiro, Brazil. 2021

Variables	N	%
Sex		
Male	371	20.8
Female	1412	79.2
Marital Status		
Single	619	34.7
Married	948	53.2
Separated / Divorced / Widowed	216	12.1
Income		
< 1 monthly minimum wage	59	3.3
1 to 2 monthly minimum wages	289	16.2
3 to 4 monthly minimum wages	457	25.6
5 to 6 monthly minimum wages	320	17.9
7 or more monthly minimum wages	658	36.9
Education level		
Complete Elementary Education	15	0.8
Complete Secondary Education	263	14.8
Complete Undergraduate Education	592	33.2
Graduate Degree	913	51.2
Occupation		
Not a health professional	932	52.3
Physicians	51	2.9
Nursing professionals	507	28.4
Other health professionals	293	16.4
Contact with patients with respiratory symptoms		
Never	839	47.1
Rarely	312	17.5
At least once a month	31	1.7
At least once a week	185	10.4
At least once a day	148	8.3
Ongoing and daily contact	268	15.0

Source: Created by the authors, 2021.

DISCUSSION

The present study showed the rates of face mask use in the population of the state of Rio de Janeiro during the COVID-19 pandemic, its use for self--protection and protection of others, and its use in public venues, clinics or hospitals, and home. Face mask use was not a practice adopted by all the participants of this study, even in the face of the great impact of the COVID-19 pandemic in Brazil and the state of Rio de Janeiro, still a significant epicenter of the disease, which by July 14, 2021, had 1,080,746 confirmed cases[3]. The use of face masks for self-protection was higher than to protect others.

The use of face masks is recommended by health authorities as one of the non-pharmacological measures to reduce the spread of SARS-CoV-2, the causative agent of the coronavirus pandemic[4].

There are several factors that influence this practice among the population, and culture is one determinant[6]. Masks have been a fixture in the daily life of Asian countries even before the COVID-19 pandemic, for various reasons beyond having symptoms of an influenza-like-illness. However, this practice in Western countries is still recent and has been established through public awareness campaigns and the dissemination of information by health authorities, thereby promoting education about the practice of mask use[13].

Women represented most of the participants of the present study and also presented higher scores of mask use, both for self-protection and to protect others, than when compared to men. However, the probability of both genders using masks was the same: the difference lies in each gender's perception of the practice, which influences the adoption of mask use in everyday life[14]. Men adopt risk behaviors[15] by not using masks; therefore the population as a whole and especially men should be made aware of the importance of this practice. A study conducted among Ecuadorians to assess the knowledge, attitudes and practices of the population during the COVID-19 outbreak, showed that most participants wore masks when leaving home[15]. These findings differ from the data found among the population in the state of Rio de Janeiro during the pandemic.

In addition, a survey that identified the factors associated with the use of masks among the population of Paraiba, the Brazilian capital with a high incidence of COVID-19 cases, revealed that the population neglected their use. The authors believed this fact could be linked to the actions of the health authorities, their determinations regarding mandatory use, and the population's

Table 2 - Frequency of responses of the Brazilian Portuguese version of the Face Mask Use Scale (n= 1,783). Rio de Janeiro, Rio de Janeiro, Brazil. 2021

Item	1 n (%)	2 n (%)	3 n (%)	4 n (%)	5 n (%)
1 - I wear a face mask in public venues to protect myself against influenza-like-illness.	354 (19.9)	106 (5.9)	271 (15.2)	1 (0.1)	1051 (58.9)
2 - I wear a mask in a doctor's clinic to protect myself against influenza-like-illness.	451 (25.3)	70 (3.9)	143 (8.0)	0 (0)	1119 (62.8)
3 - I wear a face mask at home when I have symptoms of influenza-like-illness.	1061 (59.5)	162 (9.1)	149 (8.4)	0 (0)	411 (23.1)
4 - I wear a face mask in public venues when I have symptoms of influenza-like-illness.	680 (38.1)	112 (6.3)	114 (6.4)	0 (0)	877 (49.2)
5 - I wear a face mask in a doctor's clinic when I have symptoms of influenza-like-illness.	597 (33.5)	101 (5.7)	103 (5.8)	0 (0)	982 (55.1)
6 - I wear a face mask at home when family members have influenza-like-illnesses.	1073 (60.2)	166 (9.3)	164 (9.2)	0 (0)	380 (21.3)

1-Never; 2-Rarely; 3-Sometimes; 4-Often; 5-Always
Source: Created by the authors, 2021.

Table 3 - Mean scale scores according to demographic variables and contact with patients with respiratory symptoms and COVID-19 (N= 1,783). Rio de Janeiro, Rio de Janeiro, Brazil. 2021

Variable	Face mask use		Self-protection		Protection of others	
	Mean (SD)	p	Mean (SD)	p	Mean (SD)	p
Sex						
Male	16.5 (8.4)	0.000+	8.8 (4.1)	0.000+	7.7 (4.6)	0.000+
Female	18.7 (8.1)		9.7 (3.9)		8.9 (4.6)	
Marital status						
Single	18.2 (8.2)		9.5 (4.0)		8.7 (4.6)	
Married	18.2 (8.3)	0.968++	9.5 (4.0)	0.602++	8.6 (4.7)	0.865++
Separated/Divorced/Widowed	18.5 (7.6)		9.9 (3.7)		8.6 (4.4)	
Income						
> 1 monthly minimum wage	17.6 (8.0)		9.5 (3.9)		8.0 (4.5)	
1 to 2 monthly minimum wages	17.7 (8.3)		9.3 (4.0)		8.4 (4.7)	
3 to 4 monthly minimum wages	19.0 (8.1)	0.117++	9.9 (3.9)	0.089++	9.1 (4.6)	0.131++
5 to 6 monthly minimum wages	18.6 (7.9)		9.7 (3.8)		8.9 (4.6)	
7 or more monthly minimum wages	17.8 (8.3)		9.2 (4.1)		8.5 (4.7)	
Education level						
Complete Elementary Education	18.0 (8.4)		9.6 (3.9)		8.3 (5.2)	
Complete Secondary Education	18.2 (8.4)	0.050++	9.6 (4.0)	0.105++	8.6 (4.8)	0.015++
Complete Undergraduate Education	17.5 (8.3)		9.3 (4.1)		8.2 (4.6)	
Graduate Degree	18.7 (8.0)		9.7 (3.9)		9.0 (4.6)	
Occupation						
Not a health professional	17.1 (8.7)		9.0 (4.3)		8.1 (4.8)	
Physicians	18.6 (7.4)	0.001++	9.8 (3.6)	0.007++	8.8 (4.5)	0.000++
Nursing professionals	20.4 (7.1)		10.5 (3.3)		9.8 (4.3)	
Other health professionals	18.0 (7.7)		9.5 (4.0)		8.5 (4.4)	
Contact with patients with respiratory symptoms						
Never	17.0 (8.6)		8.9 (4.2)		8.0 (4.8)	
Rarely	17.5 (7.8)		9.3(3.8)		8.2 (4.5)	
At least once a month	21.0 (7.8)		10.8 (4.0)		10.2 (4.5)	
At least once a week	20.0 (7.5)	0.000++	10.4 (3.4)	0.001++	9.6 (4.4)	0.000++
At least once a day	20.2 (7.2)		10.5 (3.4)		9.7 (4.2)	
Continuous and daily contact	20.3 (7.4)		10.4 (3.5)		9.9 (4.2)	
Have you had direct contact with someone diagnosed with COVID-19?						
No	17.4 (8.4)	0.000+	9.16 (4.1)	0.000+	8.1 (4.7)	0.000+
Yes	21.3 (6.8)		10.9 (3.2)		10.4 (4.1)	

+Mann-Whitney U; ++Kruskal Wallis

Source: Created by the authors, 2021.

lack of adequate and correct knowledge and information[16]. The results thus reinforce the need for adequate information so that the public can adopt the appropriate practice of face mask use[13].

Most of the participants said they always used masks in public venues for self-protection. This result is consistent with the findings of the study among the population in the state of Paraíba when they said they used masks both for self-protection and to protect others in public venues[16]. Thus, affirmative responses are aligned with WHO recommendations regarding the practice of mask use to protect the healthy population. This prevents the spread of the virus among symptomatic and asymptomatic individuals as a way to contain the high rate of transmissibility in public places[4].

Additionally, when asked if they wore masks when they had symptoms of influenza-like-illnesses, a significant portion of the participants also answered affirmatively. This measure is a component of the WHO guidelines for symptomatic individuals - how to use a mask when in contact with others to contain the progression of the disease. It should be noted that when masks become wet, they must be properly discarded and replaced with new ones[4].

The use of masks, both for self-protection and the protection of others, was higher among nursing professionals, when compared to the other participants. This finding corroborates the current scenario, considering that these professionals work on the front line of COVID-19, providing direct care for patients according to each case. Because of the nature of their work, they perform specialized technical procedures and are the main providers of patient care in hospitals[17], and are thus more prone to contracting the pandemic disease, which justifies the results found. In the Brazilian context, a study among nurses to evaluate the practice of face mask use during the pandemic showed that this practice was greater in healthcare and public environments, in addition to being greater for self-protection than for the protection of others[18].

Moreover, individuals who have ongoing and daily contact with patients also had the best overall mask use scores for self-care and to protect others, in accordance with WHO guidelines[5], as a way to avoid community transmission. However, it should be noted that, given the pandemic scenario, all individuals should wear masks in public environments, regardless of whether they are in contact with suspected or confirmed cases. When analyzing the score of mask use at home, most participants said they never used them when presenting symptoms of influenza-like-illness and never used them when family members presented these symptoms. These data are of concern, considering that, when a family member is infected, the other members are in charge of caring for them[19] and are thus susceptible to contracting the disease[20].

Still regarding mask use at home, a cross-sectional study conducted in Hong Kong indicated unsatisfactory levels of mask use among adults, in which only 19.5% of the participants used face masks when caring for other family members with respiratory infections, and 29.1% when they had symptoms[20]. In Brazil, in the capital of Paraíba, a low frequency of mask use at home was also identified. The authors indicated that individuals with symptoms of influenza-like-illnesses should use masks, even at home[16].

On the other hand, regarding mask use in health services, the data of the present study showed greater adherence both in the presence of influenza-like symptoms and to protect against influenza-like-illnesses. The Chinese study also found that individuals reported always using masks in healthcare settings, both in clinics (35.7%) and hospitals (48.1%), presenting the highest percentage, although the study had a small sample. One of the justifications for this occurrence indicated by the authors was the understanding of the high transmissibility of diseases in hospital environments[20]. Brazilian studies have demonstrated that the best use of masks occurs in healthcare settings, both by the general population and specific groups, thus corroborating the results of the present study[16,18].

An important result of this investigation was that individuals who reported having had contact with people diagnosed with COVID-19 and/or people with symptoms of influenza-like-illnesses presented higher mask use scores, both for self-protection and to protect others. This result corroborates a study conducted with 3,981 Brazilian individuals across the country during the COVID-19 pandemic, in which contact with people with respiratory symptoms increased the chances of mask use twofold[7]. This result reflects people's greater concern with the use of this equipment among individuals who have had some type of contact.

Limitations of this study include the online data collection format, which generates potential par-

ticipant selection bias by restricting the sample to individuals who have access to the Internet. In addition, not all individuals know how to fill out an online questionnaire, limiting their participation.

CONCLUSION

The results show that the practice of face mask use was not carried out in its entirety by the population of the state of Rio de Janeiro even in the face of the impact of the COVID-19 pandemic. In addition, masks were used more frequently for self-protection than to protect others.

According to the objective of identifying the frequency with which the population uses or does not use face masks, and in which circumstances this practice is lacking, the results show the low rates of this practice among the population of the state of Rio de Janeiro in face of the pandemic in which it is. This investigation provides information based on social experiences which can help managers develop actions aimed at educating and raising awareness of educational practices related to mask use.

Considering the severity of the COVID-19 pandemic and its sanitary, social, and economic implications, further studies should be conducted to understand the impact of the strategies adopted to minimize the spread of infection, especially the practice of face mask use by adults.

CONFLICT OF INTEREST

The authors have declared that there is no conflict of interest.

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