

Compliance and Side effects of face mask use in medical team managing COVID-19: a cross-sectional survey in a tertiary care hospital

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Introduction

The necessity of wearing personal protective equipment specially facemasks to prevent the spread of COVID-19 to healthcare workers has been emphasized in the current COVID-19 pandemic. This survey aimed to estimate the compliance and perceived side effects causing non-adherence to their use in medical personnel.

Methods

This cross-sectional survey was conducted in the period from March to June 2021 including healthcare workers in a tertiary care isolation hospital in contact with COVID-19 cases. A designed online questionnaire was distributed to all teams and data were obtained with response rate 97.3%.

Results

The study included 302 participants. Adherence was recorded in 293 (97%) during shifts for mean duration of 6.84 ± 2.9 h. Nearly 53% reported changing masks during shift due mask damage, then contamination with secretions of COVID-19 or suspected patients. The causes of non-adherence were perceived dyspnea then headache in 65.3 and 17%. The most commonly reported side effects in all participants were dyspnea (87.4%), headache (42.7%), and 62.3% of the participants reported that these side effects began within 6h after wearing the mask and 41.1% said that these side effects disappear after less than 1h.

Conclusion

Adherence to use of protective facemask between medical teams during the COVID-19 in our hospital was very satisfactory. The main side effects were perceived dyspnea and headache and recorded after prolonged use. There is a need to follow the burden of these side effects to avoid non-adherence and to take measures to reduce hours of work shifts especially during pandemics.

Keywords:

adherence, compliance, COVID-19, difficult breathing, face mask, headache, healthcare workers, medical teams, personal protective equipment

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Introduction

The novel corona-virus SARS-CoV-2 has quickly spread worldwide [1,2]. COVID-19 has been a considerable hazard to individuals' well-being and countries' healthcare organizations and altered their communal, economic, and mental health. A previous study found that health care employees were 2.6 times more probably to catch COVID-19 compared to the general populace [3]. Recent guidelines acclaim wearing masks to diminish the hazard of COVID-19 transmission [4,5]. The personal protective equipment (PPE) has been clarified by WHO as a non-sterile gloves, gown, respirator mask, and goggles [5]. The use of PPE is commonly interpreted as irritating and distressing by health care employees [6].

The need for PPE to minimize the spread of infection to health care professionals (HCPs) was encountered

during the epidemic of severe acute respiratory syndrome (SARS) in 2003, the Ebola outbreak in 2014, and, lastly, the current COVID-19 pandemic [7–9]. During the Ebola outbreak in Western Africa, (an area where ambient temperature is high all over the year), PPE consequences were commonly linked to the hot weather, and it was endorsed that the use of PPE should not be longer than forty minutes [10].

Complaints such as breathing trouble, palpitation, headache, and dermatitis among HCPs were reported

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during the pandemic, due to wearing protective face masks. We aim to assess the medical staff compliance and further describe the possible side effects related to PPE use in a hospital in Egypt.

Methodology

Study design and setting

This study is a cross-sectional study conducted at Assiut university hospital, which is a tertiary healthcare center in Assiut city) during the period from March to June 2021. The main hospital has organized its departments on I.C.U, internal departments, Outpatients clinics, operating rooms, and others.

Study population

- (1) All medical and paramedical staff including nurses, lab, and radiology technicians who are working in areas with high risk of exposure to COVID-19.

Data collection

Collection of data was done by sending an online questionnaire directed to healthcare staff working in Assiut university hospital.

- (2) The online questionnaire sections: This online questionnaire is divided into 6 parts, framed as follows:
- (3) The 1st one illustrates the aim of this questionnaire and takes a consent form from all participants who approved to participate in our study before answering the questionnaire.
 - (a) The 2nd part includes all social and demographic data of the study participants including age, gender, residence, occupation, workplace, scheduled income, smoking status, the existence of comorbid disorders, and the history of past COVID-19 contagion.
 - (b) The 3rd part includes inquiry about the use of PPEs inside/outside work, duration of wearing PPE at work or outside work, and the possible side effect of wearing PPE [e.g., dyspnea, headache, blurring of vision, etc], the onset of the start of these side effects, and whether these side effects are continuous or not.
 - (c) The 4th part contains an inquiry about the causes of irregular use of masks and face shields, after how long these side effects commence and disappear.

All responses were gathered and re-assessed for missing data. The original language of the questionnaire was English; it was translated to Arabic by Professionals followed by back conversion to English by other independent experts. The survey was tested on pilot

sample of 30 workers who were excluded from the analysis. Survey completion takes roughly 10 min

Ethical considerations

This study received ethical approval from the local ethical committee of Aswan University, Egypt (Identifier: IRB:670/10/22). Information collected from study participants was kept confidential, and electronic informed consent for participation in the study was obtained from them.

Statistical analysis

Statistical analysis carried out using version 20 of IBM SPSS Statistics (SPSS Inc., Chicago, IL, USA). Categorical data were expressed as numbers and percentages. Continuous data were presented as means±SD and/or Median. Test for normality was done by Shapiro-Wilkes test.

Results

The study included 302 participants and the age ranged from 18–65 years. Males and females constituted 27% and 73% of the participants respectively. Other basic characteristics of participants were shown in (Table 1).

Most of participants (97%) reported regular wearing masks at work with a mean duration of 6.84 ± 2.9 h while only 42.7% wore a face shield at work. Frequency of wearing facial masks by different specialties of healthcare personnel is illustrated in Fig. 1. Nearly half of the participants (53%) reported changing masks during work and the most common reported reason was damage to the mask, then contamination with secretions or food, after contact with COVID or suspected patients, or after passing too long duration wearing it (Table 2). Causes of irregular use of masks and face shields in the included healthcare personnel is illustrated in Fig. 2.

Regarding the adverse effects of using face protective masks, the most commonly reported were difficulty breathing (87.4%) followed by headache (42.7%), The median duration of wearing a mask daily was 6 h, 62.3% of the participants reported that these side effects began after 1 to 6 h after wearing the mask and 41.1% said that these side effects disappear after less than 1 h. Only 25.5% reported that these side effects are continues (Table 3).

Discussion

In this study, we described the demographic features, comorbid disorders, and work- circumstances of healthcare professionals in our hospital. We disclosed

Table 1 Basic characteristics and demographic data of healthcare participants included in the survey (n=302)

Age (years)	N=302
18–25	91 (30.1%)
26–45	180 (59.6)
46–65	31 (10.3%)
Sex, n (%)	
Male	73 (24.2%)
Female	229 (75.8%)
Residence, n (%)	
Urban	204 (67.5%)
Rural	98 (32.5%)
Occupation, n (%)	
Physician	67 (22.2%)
Pharmacist	24 (7.9%)
Nurse	145 (48%)
Staff	18 (6%)
Laboratory technician	27 (8.9%)
Radiology technician	21 (7%)
Workplace, n (%)	
ICU	104 (34.4%)
Outpatient Clinics	35 (11.6%)
Inpatient department	61 (20.2%)
Emergency	20 (6.6%)
Surgical operation	18 (6%)
Others	64 (21.2%)
Monthly income	
Less than 2000	72 (23.8%)
2000–5000	217 (71.9%)
More than 5000	13 (4.3%)
Smoking	
Non-smoker	212 (70.2%)
Current smoker	23 (7.6%)
Ex- smoker	17 (5.6%)
Passive smoker	50 (16.6%)
Chronic diseases	
No	228 (75.5%)
Hypertension	26 (8.6%)
DM	23 (7.6%)
Chest disease	11 (3.6%)
Renal diseases	7 (2.3%)
Cardiac diseases	5 (1.6%)
Hepatic diseases	2 (0.6%)
Others	21 (6.9%)
Past COVID-19 infection	
Yes	75 (24.8%)
No	227 (75.2%)

that mostly all participants (97%) reported wearing masks at work with a mean duration (6.84 ± 2.9), while only 42.7% wore face shields at work. The most common reported side effects were difficult breathing (87.4%) followed by headache (42.7%), 62.3% of the participants reported that these side effects begin after 1 to 6 h after wearing the mask and 41.1% said that these side effects disappear after less than 1 h. Only 25.5% reported that these side effects are continues.

Hoedl *et al.*, (2020) [11] found that almost all contributing subjects used facial masks. This might be

a sign of a higher compliance level among the included nurses concerning national along with global rules, this was approved with our study where nearly all participants (97%) reported wearing masks at work.

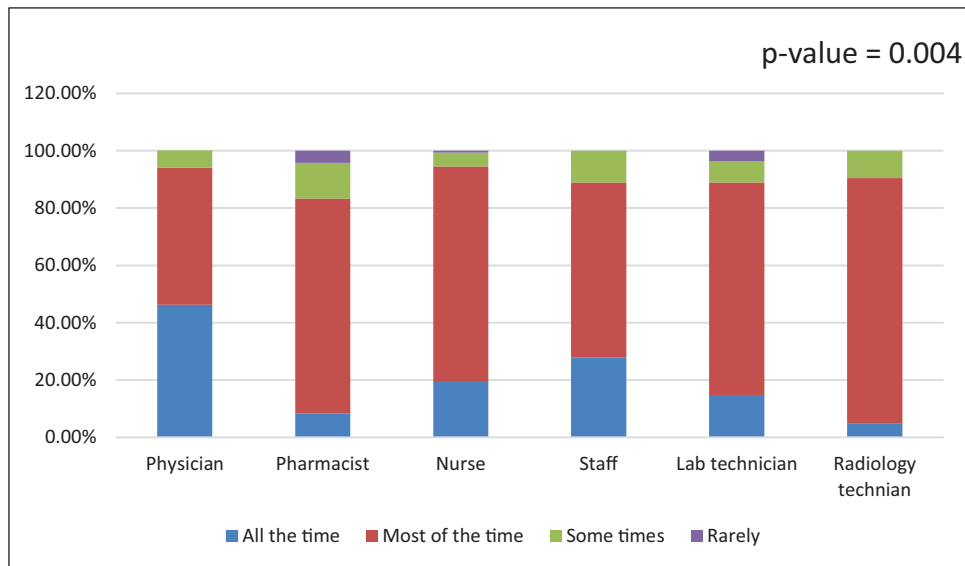
We observed that the most commonly reported side effects related to PPE use were difficult breathing (87.4%) followed by headache (42.7%), In harmony, a prior study found that retro-auricular ache was the most described symptom (81%), and chest troubles were reported in over 78% of participants. During the pandemic, a recent study observed some complaints such as palpitation, headache, breathing trouble, and dermatitis related to extended PPE use among health care professionals [12].

By our results, Farronato *et al.*, (2020) [13] reported that breathing troubles encountered in 63.5% of patients, which is far higher than in the literature. The authors stated that breathing difficulty was associated with masks that lack valves. In 2019, Chughtai and his colleagues [14] studied the effect of wearing surgical mask on HCPs. They included 148 participants. They found that breathing difficulty was reported in only 12.2%. The effect of wearing N95 mask was studied by Rebmann *et al.* (2013) [15]. They found that 21% removed their masks after few minutes due to breathing troubles. In the present study, participants used non-valved masks and breathing difficulty encountered in 25.1%. CO₂ retention could explain sensation of breathing difficulty encountered with the use of masks that lack valves. It was observed that there was high levels of anxiety and stress in HCPs during the pandemic [16,17]. This could be a contributing factor that can explain breathing troubles and palpitation.

Wearing facial masks was associated with higher dyspnea scale in healthy subjects[18,19]. However, another report found that over one hour wearing surgical mask in moderate work load, breathing difficulty was not increased in healthy subjects [20] and that wearing close face masks, surgical masks, and N95 masks did not suggestively deteriorate dyspnea at any exercise power in healthy personnel [21,22]. A previous study showed that wearing a face mask does not increase dyspnea during average exercise; however, it deteriorates dyspnea during forceful exercise [23]. Therefore, since patients with cardio-pulmonary disorders will observe breathing troubles more effortlessly than healthy ones [24], when advising exercise rehabilitation to cases wearing cloth face masks, it would be noted that dyspnea is worsened with exercise of more than seven meters, when compared with wearing facial mask.

Masks can cause respiratory struggle. It is hard to respire against this struggle. Comfort is one of the

Figure 1

Frequency of wearing facial masks by different specialties of healthcare personnel ($n=302$).**Table 2** Pattern of Using facemasks and PPEs inside/outside work in the included subjects ($n=302$)

Wearing mask at work	$N=302$
Yes	293 (97%)
No	9 (3%)
Duration of wearing mask at work	
Mean \pm SD	6.84 \pm 2.9
Median (min – max)	6 (0–24)
How often	
All the time	71 (23.5%)
Most of the time	208 (68.9%)
Sometimes	20 (6.6%)
Rarely	3 (1%)
Changing mask during work	
Yes	160 (53%)
No	142 (47%)
Wearing face shield at work	
Yes	129 (42.7%)
No	173 (57.3%)
Wearing mask outside work	
Yes	193 (63.9%)
No	109 (36.1%)
Wearing face shield outside work*	
Yes	20 (6.6%)
No	171 (56.6%)
Duration of wearing mask daily	
Mean \pm SD	6.93 \pm 2.3
Median (min – max)	6 (0–16)

*only 191 (63.2%) of participants responded to this question.

most significant issues providing mask adherence. Furthermore, in addition to dyspnea, masks may also cause a feeling of incompatibility, fatigue, and general discomfort on the face [25]. Dyspnea may also fluctuate depending on the type and load performed during the mask usage. Surgical masks similarly cause

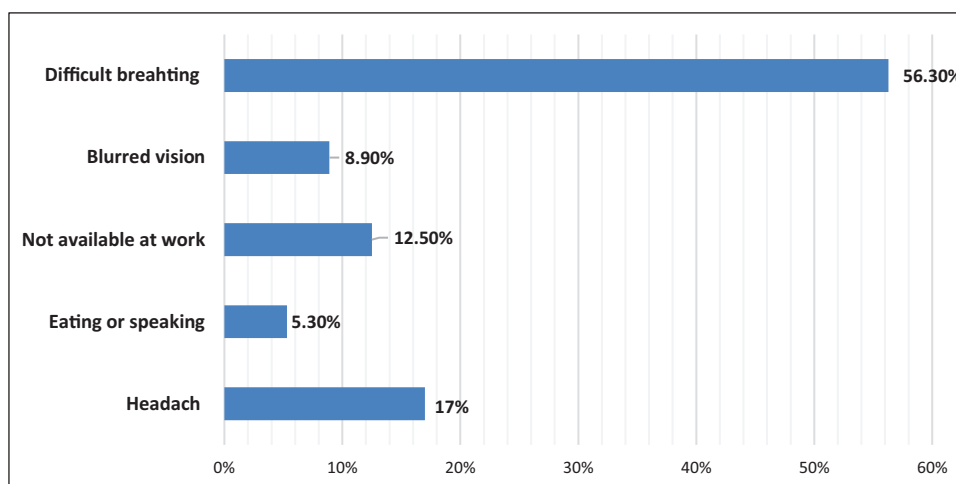
discomfort, but to a less degree than N95 masks [26]. In a recent study, the use of masks during exercise considerably increased the total discomfort score. Subjects felt ominously more heat, moisture, salinity, lethargy, respiratory struggle, and itching during the exercise with the mask. In addition to these complaints, the participants found the masks to be similarly close-fitting and discordant with their faces either before or after exercise [27].

In this study, the headache was reported in 42.7%. In harmony, previous reports found that long-lasting wearing of face masks can cause complaints such as headache, dizziness, inattention, and nervousness [28]. Furthermore, Galanis *et al.*, (2021) [29] summarized that the most predominant physical complaint from PPE use was a headache. In a recent review, the headache was one of the mutual PPE-associated complaints [30].

We found that the median duration of wearing a mask daily was 6 h, while, Unoki *et al.*, (2021) [30] disclosed that the median time of constant wearing PPE was 4 h, likewise another study reported that the median duration of wearing PPE constantly was 5 h [31]. moreover, Tabah *et al.* (2020) [32] described a rise of over eighty percent in the adverse events of PPE if worn for further than 3 h.

Lastly, the current study has some limitations. First, the study included a small number of participants. This may affect the symptom rates. In addition, this study is single-center, and PPE use may vary in other hospitals. A large multi-center study with a large of

Figure 2



Causes of irregular use of masks and face shields in the included healthcare personnel ($n=302$)

Table 3 Recorded side effects of wearing the mask in the included healthcare personnel ($n=302$)

Side effects during wearing a mask	Number they are mentioned
Difficult breathing	264 (87.4%)
Headache	129 (42.7%)
Lack of power	73 (24.2%)
Anxiety	48 (15.9%)
Blurring vision	35 (11.6%)
Nausea	26 (8.6%)
Neck pain	11 (3.6%)
Eye pain	18 (6%)
After how long these side effects begin	
Less than 1 h	103 (34.1%)
1–6 h	188 (62.3%)
More than 6 h	11 (3.6%)
After how long these side effects disappear	
Immediately After removing the mask	88 (29.1%)
Less than 1 h	124 (41.1%)
1–6 h	79 (26.2%)
More than 6 h	11 (3.6%)
Are these side effects continues	
Yes	77 (25.5%)
No	220 (72.8%)

HCPs is needed to disclose the effects of wearing PPE for extended duration. Lastly, a possible selection bias, and lastly, variances in the timing and extent of the dissemination of contagion, healthcare funds, and healthcare organizations may influence the incidence of the mask-related adverse events.

Conclusion

Adherence to use of protective facemask between medical teams during the COVID-19 in our hospital was very satisfactory. The main side effects were perceived dyspnea and headache and recorded after prolonged use. There is a need to follow the burden of these side effects to avoid non adherence and to

take measures to reduce hours of work shifts especially during pandemics.

Recommendations

A critical and ultimate measure to diminish the spread of SARS-COV2, we acclaim full compliance with PPE and encourage the face masks to use. Increasing awareness of psychologic and physiologic problems can improve efficiency of work by addressing the adverse symptoms that may decrease use of face masks. Substantial precautions such as frequent breaks and shorter rotations, should be taken by health care authorities, to minimize the adverse effects associated with PPE.

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Conflicts of interest

There are no conflicts of interest.

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