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Impact of Prolonged use of Facemask on Healthcare Workers During COVID 19 Pandemic

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ABSTRACT

Introduction: The Novel coronavirus originated in Wuhan, China in December 2019. In March 2020, WHO had declared the outbreak of COVID 19 as a pandemic. The disease had spread to millions of individuals through respiratory droplets. It has challenged the health sector of the world. The medical professionals involved in its management are mandated to wear masks and personal protective equipment (PPE) for a prolonged period of time for their protection.

Objective: To identify various ill effects of facemasks and its possible solutions which will inturn guide to decrease those effects and increase compliance of facemasks during COVID 19 pandemic.

Methodology: This is a cross sectional study done in Birat Medical College and teaching hospital. All respondents filled up a specifically designed questionnaire containing fifteen questions which included various possible effects of facemasks.

Results: A total of 103 health care providers working in Birat Medical College and teaching hospital were included in the study. Majority were female (56.3%). The mean age of individuals was 29.62 years. The most commonly used mask was surgical mask (95%).The common effects experienced were pain behind ears(76.1%), excessive sweating in perioral region(72.8%) and headache(70.9%).Some of them had generalized nasal discomfort(60.2%), nasal itching(41.7%), dry nose (20.4%) and skin rashes around lips(49.4%). 27.2% had acne over face and 16.5% had halitosis.

Conclusion: Prolonged use of facemasks during COVID 19 has adverse effects like pain behind ears, excessive sweating in perioral region, headaches, acne.The solutions to these problems can be thought of in preparation for future pandemics. Frequent breaks, proper skin care of the face, improved hydration and designing of comfortable masks are recommended for future management of adverse effects related to its prolonged use.

INTRODUCTION

The nose is a complex organ with multiple functions. The primary function of the nose is to humidify, warm the inspired air and also aids at removing harmful particles from entering into the lower respiratory tract. It also serves as an organ of olfaction.[1] The nasal mucosa is the first part of airways to come in direct contact with the external environment. It is a highly vascular part containing arterioles, arteriovenous anastomosis and venous sinusoids with a large surface area of 150cm square.(1) The function of cilia is affected even by slight fluctuation in the external environment. Dry conditions hinder ciliary action thereby stopping ciliary movements at temperature below 10 degree celsius and temperatures above 45 degree celsius.[1]

From the dawn of human civilization to present time, multiple pandemics have occurred. Small pox, Plague, Influenza, Spanish flu are few of them. Some of these pandemics gave a threat to human civilization.Currently, we are facing COVID-19 pandemic which started in Wuhan, China in November 2019.The WHO had declared the

outbreak of COVID as a public health emergency of International concern on 30th January 2020 and pandemic on 11th March 2020.(Reference:https://www.who.int/publications/m/item/covid-19-public-health-emergency-of-international-concern-(pheic)-global-research-and-innovation-forum, and https://www.who.int/director-general/speeches/detail/who-director-general-s-opening-remarks-at-the-media-briefing-on-covid-19---11-march-2020) Its etiology is viral with symptoms like cough, fever, shortness of breath etc. Its common symptoms are those of upper respiratory tract infection.

In Nepal, the first case of COVID 19 was detected on the 23rd January 2020 in a 32 years male who was a student at Wuhan University of Technology.

Currently, we are fighting the second wave of the pandemic. The new variant is defined by a set of 17 mutations. One of those is the N501Y mutation in the spike protein that the virus uses to bind to human ACE2 receptor.[2] Changes in this part of spike protein may be the reason for the virus becoming more infectious and spreading more easily among people.. The electron micrograph of negative stained 2019 CoV particle were generally spherical with some pleomorphism and diameter varied from 60 to 140nm.[3] The virus is transmitted through air-borne droplets or spray, which have been identified as the major routes for cross-infection. The function of a mask is to stop the spread of the virus, which attaches to aerosol airborne particles or respiratory fluid droplets.Masks' protective performance largely depends on : filtration effeiciency and fit(facepiece leakage).[4] The filtration efficiency of surgical mask is better than cloth mask.[(4)]COVID 19 virus airborne aerosol particles are smaller than 5micrometer, and respiratory droplets are between 10 and 5 micrometer.[5]N95 masks could protect wearers from particles of 300nm and above which is enough to filter out COVID-19.[4] Consequently surgical masks and N95, P100FFR, and PARR masks can protect people from COVID 19.[4]

SARS-CoV-2spreads by the respiratory droplets. Healthcare teams working for the treatment of COVID 19 patients are extremely at risk of getting infected by the virus. Healthcare professionals involved in the treatment of the COVID-19 areadvised to wear proper Personal protective equipments(PPE) during their work to protect themselves from getting infected. Personal protective equipment includes a set of facemasks, face shields, gowns, gloves and shoe cover. Facemasks are of vital importance for protection of the upper airway which will help to avoid exposure of nose and airway from the droplets causing the disease. However, wearing facemasks for prolonged duration of time can cause variousuneasiness to the person and can lead to decrease in work efficiency. Owing to prolonged usage of facemasks, there might be an increase in heat beneath the mask which in turn decreases the water carrying capacity of air in the nose resulting in sensation of dry nose.[6]

In a study done by Terri Rebmannet. al, various subjective symptoms while wearing masks were evaluated which were shortness of breath increasing over time, headaches, light headedness, perceived exertion and impeded communication.[7]In the study done by P.K. Purushothamanet. al, 30.4% of participants had sense of nasal stuffiness, 30% had dry nose, 26.1% developed feeling of hot burning sensation in nose and 22.9% have developed nasal obstruction following prolonged usage of facemask.[6] Similarly, a study by Lim et al, had focussed on headaches related to the use of facemask.[8]A study by Foo et al, discussed about the adverse skin reactions like rashes, acne, itching while using mask.[9]

There were difficulties using facemasks continuously for long hours. The rationale of the study is to identify those difficulties which will pave the pathway to think about solutions to those difficulties and ultimately lead to improved compliance of use of masks. The aim of this study is to evaluate various experiences of healthcare workers while using facemasks for a continuously long duration which is more than four hours.

In this study, we are going to assess whether the prolonged usage of the facemask will have any effects on the facial skin and nose. These effects may lead to noncompliance of use of facemasks by the user and ultimately its improper use which inturn can increase risk of spread of COVID 19 among the healthcare workers.

METHODOLOGY

We conducted a cross-sectional study among 103 healthcare workers of Birat Medical College and Teaching Hospital, Morang. The study was conducted for a month from 1st August to 31st August 2021. Simple random sampling technique was used.All the medical professionals including doctors, nurses, attendants etc working in hospitals and exposed to the COVID19 environment were included in the study. Ethical clearance was taken from the Institutional Review Committee of Birat Medical College. Informed well written consent was obtained from each participant. The data were collected in a specifically designed questionnaire(table 1). This questionnaire was composed of17 questions. It includedthe type and number of masks used, nasal discomfort, dry nose, burning nose, itching of nose, acne, skin rashes, excessive sweating, pain behind ears, dry mouth, halitosis, nasal block, headache, altered sense of smell and breathing on exertion. An informed written consent was taken. This questionnaire was distributed among the healthcare providers and were explained in local language to the participants. They were given 5-10 minutes to fill up the questionnaire.

The medical professionals using masks for continuously more than four hours during COVID 19 pandemic were included in the study. The participation was voluntary and the anonymity of participants and data was assured. The collected data was entered in Ms Excel and result was analyzed using SPSS software version 20.

Table 1: Questionnaire[6]

No.	Questions:	Response
1.	What type of mask do you use?	-cloth mask -Surgical mask -N95 mask -respirators -others
2.	How many mask do you use at a time?	-one -two -more than two
3.	Do you experience any nasal discomfort?	yes/ no
4.	Do you have dry nose?	yes/no
5.	Do you have itching over nose?	Yes/no
6.	Have you experienced acne over face?	Yes/no
7.	Do you feel burning sensation over nose?	Yes/no
8.	Have you felt excessive sweating around mouth?	Yes/no
9.	Have you felt skin rashes around mouth?	Yes/no
10.	Have you experienced pain behind ears?	Yes/no
11.	Have you had dry mouth?	Yes/no
12.	Do you experience halitosis?	Yes/no
13.	Have you experienced breathing on exertion?	Yes/no
14.	Do you have nasal block?	Yes/no
15.	Have you felt altered sense of smell?	Yes/no
16.	Do you experience headache?	Yes/no
17.	Do you have pain in nose?	Yes/no

RESULTS

A total of 103 health care providers who were working in Birat Medical College and Teaching Hospital were given the questionnaire. Majority of the respondents were female, 58(56.3%). The mean age of participants was 29.62 years and the age ranged from 20-62 years. Among them, 28 (27.2%) participants were consultants, 24(23.3%) participants were nurses, 13(12.6%) participants were intern doctors, 10(10.3%) participants were medical officers, 7(6.8%) participants were health assistants and remaining 21(20%) participants were from other categories like security guards, sweepers etc.

The commonly used type of mask was surgical mask which was 98(95.1%) The second most commonly used type of mask was cloth mask which was 5(4.9%). It was found that 55(53.4%) of the participants used two masks at a time. 45(43.7%)participants used one mask at a time. Few participants 3(2.9%) used more than two masks at a time.

Table 2: Types of masks used

	Frequency(n)	Percentage (%)
Cloth mask	5	4.9%
Surgical mask	98	95.1%
N 95 mask	0	0
Respirators	0	0
Total	103	100%

Table 3: Number of masks used

	Frequency(n)	Percentage(%)
One mask	45	43.7%
Two masks	55	53.4%
More than two masks	3	(2.9%)
Total	103	100%

The most common problem of the nose experienced by the health care providers was generalized nasal discomfort found in 62 (60.2%) participants followed by nasal itching which was present in43 (41.7%) of participants. Dry nose was found in 21 (20.4%) healthcare workers while sensation of burning nose was experienced by 18(17.5%) of participants. 16 (15.5%) of participants had nasal block and13 (12.6%) of people had altered sense of smell .Similarly, other problems experienced were pain behind ears which was found in 79(76.7%)of individuals. Excessive sweating in perioral region was told by 75 (72.8%) of participants.73(60.9%) of participants had complained of headache. Skin rashes in the area of face covered by mask was developed in 50 (49.4%) of participants. The complain of breathing difficulty on exertion was told by 50 (48.5%) of participants. Dry mouth was experienced by 32 (31.1%) of individuals. Acne over face was developed in 28 (27.2%) of participants. 17 (16.5%) of healthcare providers had halitosis.

Table 4:Results of use of facemasks

No.	Questions:	Yes	No
1.	Do you experience any nasal discomfort?	62(60.2%)	41(39.8%)
2.	Do you have dry nose?	21(20.4%)	82(79.6%)
3.	Do you have itching over nose?	43(41.7%)	60(58.3%)
4.	Have you experienced acne over face?	28(27.2%)	74(71.8%)
5.	Do you feel burning sensation over nose?	18(17.5%)	85(82.5%)
6.	Have you felt excessive sweating around mouth?	75(72.8%)	28(27.2%)
7.	Have you felt skin rashes around mouth?	50(49.4%)	53(50.6%)
8.	Have you experienced pain behind ears?	79(76.7%)	24(23.3%)
9.	Have you had dry mouth?	32(31.1%)	71(68.9%)
10.	Do you experience halitosis?	17(16.5%)	86(83.5%)
11.	Have you experienced breathing on exertion?	50(48.5%)	53(51.5%)
12.	Do you have nasal block?	16(15.5%)	87(84.5%)
13.	Have you felt altered sense of smell?	13(12.6%)	90(87.4%)
14.	Do you experience headache?	73(60.9%)	30(39.1%)
15.	Do you have pain in nose?	10(9.7%)	93(90.3%)

DISCUSSION

In this time of COVID-19 pandemic, besides vaccination, the other measures that protect us from SARS-CoV-2 infection are wearing a mask, wash your hands and maintaining social distance.Among these three, wearing a facemask is very crucial for health care providers as they are at constant risk of acquiring infection from patients.This study looks into the various health problems arising after regular and prolonged use of facemasks by healthcare providers.In our study, majority participants used surgical mask which could be due to easy availability of it. Although N95 masks had better filtration efficiency, its high cost might be the reason for not being used by medical personnals.

We found that generalized nasal discomfort was experienced by 60.2% of the participants.Our study showed that 72.8% of participants had excessive sweating around the perioral region. In a study byPurushottam P.K et al, 67.6% of healthcare workers had developed excessive sweating around the mouth. This can lead to frequent touching of face masks and ultimately contamination of hands leading to more disseminated infections.[6]

In the study by Purushottam PKet al, 48.8% of participants had nasal discomfort.[6]Prolonged use of facemask prevent transpiration, increase perspiration and temperature around perioral region. It causes reduced heat loss from the body by convection, conduction, evaporation and radiation.[(10)] There will be a relative increase in warmth and dampness of expired air causing condensation of moisture over facemask. This will hinder heat loss and increase heat burden and ultimately result in sweating in the perioral region.DuBois et al stated that skin temperature of > 34.5 degrees Celsius is not acceptable due to increased thermal sensation and results in discomfort to wearers.[11]

In our study, 76.7% of individuals had pain behind the ears which is similar to the results of study done by Purushottam P.K. et al. The pain behind the ears occurred possibly due to tight fitting masks.[(10)] In our study, 60.9% of individuals had headache. Headache related to prolonged useof a mask can be attributed to mechanical factors, hypercapnia and hypoxemia.[2]In study by Romer E et al, 74.1% respondents reported headache. [2] Tight straps and pressure on superficial facial and cervical nerves are mechanical factors causing headache. [1] Tight fitting masks cause inadequate ventilation and increased levels of carbon dioxide i.e. hypercapnia. Headaches have been ascribed to both hypoxemia and hypercarbia.[12]

49.4% of participants had developed skin rashes in the perioral region. 27.2% of individuals had developed acne. Urticaria and contact dermatitis can occur from sensitivity to the components of mask and PPE.[1] Some may react to the Thiouram which is found in ear loops of surgical mask.[13] Foo et al analysed healthcare workers during the SARS pandemic in 2003 at Singapore and reported that 51.4% experienced itch induced by facemasks.[9]

Zuo et al showed that pre-existing acne, rosacea and seborrhoic dermatitis were exacerbated by using facemasks.[14]This exacerbation might be the result of the sweating over the area covered by the mask which may cause increase in oily nature of the skin.

CONCLUSION

Use of facemask for prolonged period of time is associated with various health problems. Few of them are nasal discomfort, nasal itching, pain behind ears, headache and excessive sweating in perioral region. Since facemasks are essential for protection from COVID 19, certain strategies like can be followed to reduce these effects which will inturn increase effective use of masks.

LIMITATION OF THE STUDY: Study was conducted in a single institution and hence results cannot be generalized. Multi institutional study with a large number of participants would have yielded better results.

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CONFLICT OF INTEREST: None

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