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A comparative study of the adverse effects due to use of N95 and cloth mask

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Abstract--Introduction: Covid -19 infection spread rapidly from person to person. Social distancing, hygiene and mask are among various preventive measures for spread of this infection Prolonged use of N95 and surgical masks causes physical adverse effects such as headaches, difficulty breathing, acne, skin breakdown, rashes, and impaired cognition. Some facial masks are secured by anchoring to the ears, causing damage to the external ears and retroauricular skin areas because of pressure, prolonged exposure, or both. Methods: This was questionnaire bases study. Questionnaire was distributed to participants. 200 N95 mask wearer and 200 cloth mask wearers were included in study. Results: Dermatological adverse effects were more in participants wearing N95 mask. Also, N95 mask wearer have to speak louder during conversation. There is statistically significant between

N95 and cloth wearer in terms of dermatological and speech difficulties. Conclusion: Mask prevents spread of covid- 19 infection from person to person. There are many adverse effects of masks. In view of adverse effect related to skin and speech difficulty cloth mask is better.

Keywords---Adverse Effects, N95 Mask, Cloth Mask, COVID-19.

Introduction

The first case of the COVID-19 pandemic in India was reported on January 30, 2020. As on May 17, 2020, the Ministry of Health and Family Welfare, Government of India has reported 90927 confirmed cases from 33 states with 2872 deaths.¹ The CDC and WHO recommend wearing N95 masks during care of patients with highly transmissible diseases such as tuberculosis, SARS, and COVID-19. The N in N95 stands for NIOSH, the National Institute for Occupational Safety and Health of the United States and 95 indicates filter efficiency of particles. Thus, an N95 mask is 95% effective at filtering airborne particles including very small ones. In comparison, while surgical masks provide a barrier against large respiratory particles, they are ineffective at providing protection from smaller particles. Surgical masks also do not prevent leakage around the mask when the user inhales. Therefore, surgical masks are ineffective and do not provide enough protection when performing direct care for patients with COVID-19.²

Surgical face masks and N95 masks were previously shown to be effective against influenza, tuberculosis, and SARS in Hong Kong.³

In April 2020, the World Health Organization (WHO) recommended the use of masks only for symptomatic, ill individuals and health care workers and did not recommend its widespread use. In June 2020, they changed this recommendation to endorse the general use of masks in, e.g., crowded places.⁴

The N95 face-mask protects against respiratory droplets, the number 95 signifying that it is at least 95% efficient in filtering particles with a median diameter $>0.3 \mu\text{m}^2$, and the letter N that the mask is not resistant to oil.⁵

Prolonged use of N95 and surgical masks causes physical adverse effects such as headaches, difficulty breathing, acne, skin breakdown, rashes, and impaired cognition. It also interferes with vision, communication, and thermal equilibrium. Headaches related to prolonged mask use can be attributed to mechanical factors, hypercapnia, and hypoxemia. Tight straps and pressure on superficial facial and cervical nerves are mechanical features causing headaches.⁶

Recently, with a global shortage of N95 and surgical masks, the Centers for Disease Control and Prevention (CDC) recommended that healthy individuals substitute cloth masks for use in public.⁷

Some facial masks are secured by anchoring to the ears, causing damage to the

external ears and retroauricular skin areas because of pressure, prolonged exposure, or both.⁸

As long as there is no vaccine and no specific treatment, the first pandemic of the 21st century is fought with methods from the 14th to the 19th centuries: Distancing, hand washing, and covering mouth and nose with a piece of cloth. On a global scale, face masks have become an increasingly important part of national strategies to fight the current corona pandemic. Given that school closures already have come to an end, or will have to end eventually, the question of wearing face masks at schools during the next phase of the pandemic is heavily discussed, particularly, where new cases pop up in spots of waxing and waning infections, or in some states, in the form of additional waves of infection.⁹

Material and Methods

The study was conducted at MMMCH Hospital. The objective was to search for already documented adverse effects and risks of N95 and cloth mask (mouth–nose-covering). Questionnaire was prepared based on already documented side effects. Peer review of questionnaire was done. Questionnaire was distributed to participants through offline methods. 400 participants were included in study. 200 participants wearing N95 mask and 200 wearing cloth mask. The questions in the questionnaire will have two options YES or NO. In the questionnaire, the participants will be asked to answer “Yes” to the questions if the adverse symptoms were observed after using the mask, and “No” if there will be no symptoms observed. Participants who answered “Yes” were asked when the phenomenon occurred.

Study design: Cross Sectional Study

Selection of participants: Questionnaire was given to patient’s relatives and other patients coming for routine investigation in OPD. All participants will be included in study those who will meet the inclusion criteria.

Inclusion criteria

- 1) Age more than 18 years
- 2) Participants who want to participate in study.

Exclusion criteria

- 1) History of skin disease and under active treatment for same illness
- 2) History of allergic disease and under active treatment for same illness
- 3) History of headache and under active treatment for same.

Statistics

- P-value <0.05 will be considered significant.
- Statistical analysis will be done using latest version of SPSS.

Results

The study was conducted on 400 participants. 200 participants wearing n95 mask were taken in study while 200 participants were of cloth mask. The highest reported side effect was headache.

Neurological Adverse Effect

HEADACHE: In present study we found headache in 70 % cases of n95 mask and in 68 % cases of cloth mask. Most of the headache incidence occur after 3 hours in both cases that is 50% in N95 and 58.82 % in cloth mask. P value is 0.6 which is insignificant.

Ophthalmological Adverse Effect

1. **Fogging Of Glasses:** In present study we found fogging in 56 % of N95 mask user and 65 % of cloth mask user. Most of the cases of fogging were reported during first 15 mins. P value is 0.06 which is insignificant.
2. **Dry Eye:** In present study we found that symptoms of dry eye were seen in 62% of cases of N95 and 70% cases of cloth mask. Most of the cases of dry eye was seen after 3 hours of mask wearing. P value is 0.1 which is insignificant.

Dermatological Adverse Effect.

1. **Facial Skin Itching:** In present study we found facial skin itching in 30 % cases of n95 mask and in 21 % cases of cloth mask. P value is 0.04, which is statistically significant. Most of the facial skin itching incidence occur after 3 hours. P value is 0.04 which is significant.
2. **Facial Rash:** In present study we found facial rash in 23% cases of N95 mask and in 15 % cases of cloth mask. P value is 0.04, which is statistically significant. Most of the facial rash incidence occur after 3 hours.
3. **Acne:** In present study we found facial acne in 31 % cases of n95 mask and in 22 % cases of cloth mask. P value is 0.04, which is statistically significant. Most of the acne incidence occur after 3 hours.

Ent Adverse Effect

1. **Vhi Score:** Mean VHI score of N95 mask is 6.3 and mean VHI score of cloth mask is 4.2. P- value is 0.001, which is statistically significant.

- 2. Nasal Bridge Scarring:** In present study we found nasal bridge scarring was found in 40% of cases of N95 mask and 25% cases of cloth mask. Most of the cases were seen in prolonged mask user more than 3 hours a day. P value is 0.01 which is insignificant.
- 3. Ear Pinna Pain:** In present study we found ear pinna pain in 68% of cases of N95 mask and 59% cases of cloth mask. Most of the cases were seen in prolonged mask user more than 3 hours a day. P value is 0.6 which is insignificant.

General

Sweating: In present study we found sweating in 35% of cases of N95 mask and 34% cases of cloth mask. Most of the cases were seen in prolonged mask user more than 3 hours a day. P value is 1 which is insignificant.

Table 1
Percentage of adverse effects among N95 and cloth mask wearer.

S.No	Symptoms	N95 (%)	Cloth Mask (%)	P Value
1	Headache	70	68	0.6
2	Dryness In Eyes	62	70	0.1
3	Fogging On Glasses	56	65	0.06
4	Acne	31	22	0.04
5	Facial Itching	30	21	0.04
6	Facial Rash	23	15	0.04
7	Nasal Bridge Scarring	40	25	0.01
8	Sweating	35	34	1
9	Ear Pinna Pain	68	59	0.06
10	Speak Louder (VHI Score)	6.3	4.2	0.001

Fig 1
Bar chart showing percentage of various adverse effect among N95 and cloth mask.

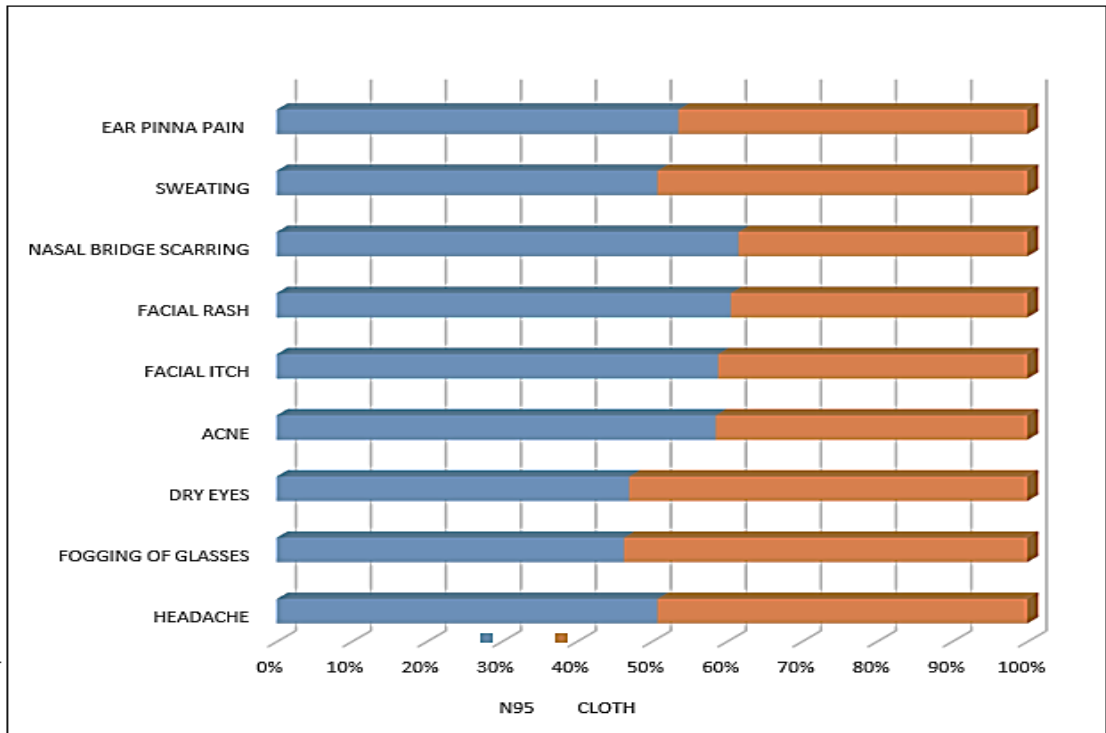


Table 2
Chronology of various adverse among N95 and cloth mask

Symptom	Mask	0-15 mins (%)	16-60 mins (%)	1 - 3 hour (%)	>3 hour (%)
Headache	N95	7.14	21.42	25	50
	Cloth	4.44	7.35	29.41	58.82
Fogging of Glasses	N95	75	20	5	0
	Cloth	90	10	0	0
Facial Itching	N95	3.33	26.66	30	40
	Cloth	0	4.76	19.09	76.19
Facial Rash	N95	4.34	8.69	34.78	52.17
	Cloth	0	3.33	30	66.66
Acne	N95	6.45	12.9	32.25	48.38

	Cloth	4.5	9	22.72	63.63
Nasal Bridge Scarring	N95	0	10	20	70
	Cloth	0	5	20	75
Ear Pinna Pain	N95	8.82	19.11	22.05	50
	Cloth	0	13.55	27.11	59.39
Sweating	N95	14.28	17.14	18.57	50
	Cloth	0	11.76	29.41	58.58

Discussion

Our study was done to explore the adverse effect of wearing mask. In spite of vaccination, wearing mask remain the one of best method to prevent from COVID-19 infections. There were many participants who reported adverse effect of wearing mask. According to the literature available there are many adverse effects of wearing mask. Reported side effects were headache, dry eye, fogging of glasses, skin itching, facial rash, nasal bridge scarring, acne, ear pinna pain, sweating and difficulty in hearing. Sweating, dehydration sweating under mask is the main cause of various symptoms.

Rosner et al⁶ and shubanshu K e al¹¹ reported headache in 71.4 % and 58% of cases respectively while our study reported side headache in 70 % of N95 mask wearer. Hu k et al reported skin rash in 23% of cases, results are similar to our study. Techasatian et al⁹ reported acne in 39.9% of cases they conducted study on mask, we reported acne in 31 % of N95 mask. Mean VHI score of N95 mask is 6.3 and mean VHI score of cloth mask is 4.2. Arffe et al¹² reported voice problem in participants wearing mask, they found mean VHI score of 7.92. In present study we found that symptoms of dry eye were seen in 40% of cases of N95 and 33% cases of cloth mask. Most of the cases of dry eye was seen after 3 hours of mask wearing. Evelina M et al¹³ showed that dry eye was seen in 52% in regular protective mask user cases and 33% in regular ordinary mask user. In present study we found nasal bridge scarring was found in 40% of cases of N95 mask and 30% cases of cloth mask. Hu k et al¹⁴ found nasal bridge scarring in 68.9 % cases as common adverse skin reactions among HCWs wearing N95 masks. Matusaik L et al¹⁵ reported sweating in 21.3 % cases, our results showed that sweating was present in 35% of N95 mask user and 34% cases of cloth mask user.

Limitations

There are many limitations of this study like small sample size, study was conducted in one hospital and persons wearing two masks were not included in this study. There are other types of masks like surgical, knit mask which were not included in this study. Further studies are needed using these types of masks. Larger population and multiple hospital studies are needed to get more accurate results,

Conclusion

Use of mask can prevent spread of infection from person to person. There are many adverse effects of mask like headache, dry eye, fogging of glasses, skin itching, facial rash, nasal bridge scarring, acne, ear pinna pain, sweating and difficulty in hearing, sweating. The present study showed that N95 masks had significantly higher dermatological adverse effect and speaking difficulties. Result of other adverse were insignificant.

References

1. N VR, Patil SB. Indian Publications on SARS-CoV-2: A bibliometric study of WHO COVID-19 database. *Diabetes Metab Syndr.* 2020 Sep-Oct;14(5):1171-8.
2. Center for Disease Control and Prevention (2020) NIOSH-approved N95 particulate filtering facepiece respirators: Ancillary respirator information.
3. Offeddu V, Yung CF, Low MSF, Tam CC. Effectiveness of masks and respirators against respiratory infections in healthcare workers: a systematic review and meta-analysis. *Clin Infect Dis.* 2017;65(11):1934–42
4. World Health Organization . WHO-Advice on the Use of Masks in the Context of COVID-19: Interim Guidance, 6 April 2020. World Health Organization; Geneva, Switzerland: 2020. (accessed on 7 November 2020)
5. Khoo KL, Leng PH, Ibrahim IB, Lim TK. The changing face of healthcare worker perceptions on powered air-purifying respirators during the SARS outbreak. *Respirology* 2005;10: 107–10
6. Rosner E (2020) Adverse Effects of Prolonged Mask Use among Healthcare Professionals during COVID-19. *J Infect Dis Epidemiol* 6:130
7. Centers for Disease Control and Prevention. How to protect yourself and others. 2020. Available from. Accessed 2020 Oct 28.
8. Yan Y., Chen H., Chen L. Consensus of Chinese experts on protection of skin and mucous membrane barrier for health-care workers fighting against coronavirus disease 2019. *Dermatol Ther.* 2020:e13310.
9. Techasatian L, Lebsing S, Uppala R, Thaowandee W, Chaiyarit J, Supakunpinyo C et al. The Effects of the Face Mask on the Skin Underneath: A Prospective Survey During the COVID-19 Pandemic. *J Prim Care Community Health.* 2020 Jan-Dec;11
10. MacIntyre CR, Wang Q. Physical distancing, face masks, and eye protection for prevention of COVID-19. *Lancet.* 2020 Jun 27;395(10242):1950-1.
11. Shubhanshu K, Singh, A. Prolonged Use of n95 Mask a Boon or Bane to Healthcare Workers During Covid-19 Pandemic. *Indian J Otolaryngol Head Neck Surg* 2021 Jan;(1):1-4.
12. Arffa RE, Krishna P, Gartner-Schmidt J, Rosen CA. Normative values for the voice handicap index-10. *J Voice* 2012;26:462–65.
13. Evelina Marinova, Dimitar Dabov & Yani Zdravkov (2020) Ophthalmic complaints in face-mask wearing: prevalence, treatment, and prevention with a potential protective effect against SARS-CoV-2, *Biotechnology & Biotechnological Equipment*, 34:1, 1323-35.
14. Hu K, Fan J, Li X, Gou X, Li X, Zhou X. The adverse skin reactions of health care workers using personal protective equipment for COVID-19. *Medicine.* 2020;99:24

15. Suryasa, I. W., Rodríguez-Gómez, M., & Koldoris, T. (2021). Get vaccinated when it is your turn and follow the local guidelines. *International Journal of Health Sciences*, 5(3), x-xv. <https://doi.org/10.53730/ijhs.v5n3.2938>
16. Matusiak Ł, Szepietowska M, Krajewski P, Białynicki-Birula R, Szepietowski JC. Inconveniences due to the use of face masks during the COVID-19 pandemic: A survey study of 876 young people. *Dermatol Ther.* 2020;33(4):e13567.