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N95 Masks – Challenges Faced

Dr Tanush Shah
(Senior Resident, Dept of ENT, DY patil medical college and Hospital Nerul, Navi Mumbai)

Haritosh Velankar
(Professor and Unit head, Dept of ENT, DY patil medical college and Hospital Nerul, Navi Mumbai)

Abstract
Since the outbreak of SARS-CoV2 pandemic, N95 masks have been widely used all over the world. These masks are recommended to be worn for longer duration by large number of people. Although wearing these N95 masks are being promoted by local, state and national authorities, the short term and long term effects of wearing these N95 masks have not been widely reported. In this study, a questionnaire was distributed to each of the 195 volunteers through google form. We were looking for subjective feelings of difficulty in breathing and other signs and symptoms of discomfort on usage of N95 masks. Around 84% volunteers said that they were wearing N95 masks on regular basis and 38.7% of the volunteers complained of shortness of breath while 48.1% complained of suffocation amongst other symptoms. Wearing N95 masks for longer duration significantly impairs the quality of life. Symptoms and signs of discomfort specially worsens on doing physical activity.
Keywords: ***N95 Masks, breathing difficulty, discomfort, shortness of Breath.***

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I. Introduction

In the current times of SARS Cov2 pandemic, N95 masks are being used all over the world. Especially healthcare workers are wearing them continuously at times for more than 8 hours/day. N95 masks meet filtration requirements of small airborne particles, fits tightly to the face and have been suggested to be more efficacious than surgical masks in reducing exposure to viral infections.

While there are a number of benefits of wearing N95 masks, there have been various problems also associated with usage of these mask.

Despite the protective function, the effects of mask wearing on respiratory microclimate, respiratory functions and individual sensations are important as well**.** Wearing N95 masks varies inhaled gas concentrations and respiratory resistances [1]. Wearing N95 masks elevated the carbon dioxide level while decreased oxygen level within the respirator which can be the cause of subjective complaints after wearing masks [2]. The increase in partial carbon dioxide level also affects breathing patterns and heart rate patterns[3].

It was reported that facemask caused less subjective discomfort feeling, lower perception of humidity, heat and breathe resistance than N95 respirator [4]. Wearing masks can affect a person's whole body thermal sensation [5]. Wearing N95 mask for longer duration may induce physiological stress on the person, making regular tasks more challenging, and causes headaches among healthcare providers.[6]

After exposure to masks forhours, the physiological function of nasal cavity may change due to the difference in humidification and temperature conditions within the mask. However, there is a lack of reported studies on the effects of wearing N95 respirators or surgical facemasks on human upper airway functions.

The findings of this study will be useful for the development and formulation of guidelines and policy for the long duration usage of N95 respirators and surgical facemasks.

Aims and Objectives

1. To evaluate the effects of long term usage of N95 masks on quality of life.
2. To evaluate the subjective feelings of discomfort caused by usage of N95 masks.
3. To know if there is any relation between the discomfort caused by usage of N95 mask and physical activity.

II. Materials and Methods

This study is an observational, non-interventional study done in our tertiary care hospital. The study was a questionnaire based survey done over 3 weeks from 1st July 2020 till 21st July 2020. A questionnaire was sent as an electronic form to the volunteers. The survey had number of questions based on subjective feelings of

the volunteers on wearing N95 masks after certain time frame. It also consisted of questions based on subjective feelings of the volunteers after doing some kind of physical activity while wearing N95 masks.

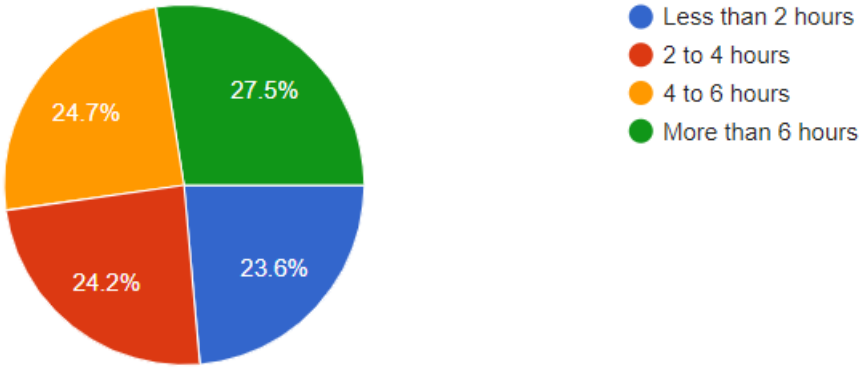
The inclusion criteria involved Individuals who have been wearing N95 masks from 12 years of age onwards. The exclusion criteria had individuals who have not worn N95 masks and those below the age group of 12 years.

III. Results

We got response from 196 volunteers and out of them 165 were using N95 masks regularly. 130 werefemale respondents and 66 were male. Out of all the respondents 131 were healthcare workers.

A total of 124 volunteers were in the age group of 21 to 30 years, 29 were in the age group of 31 to 40 years and the rest of the volunteers were distributed amongstother age groups.

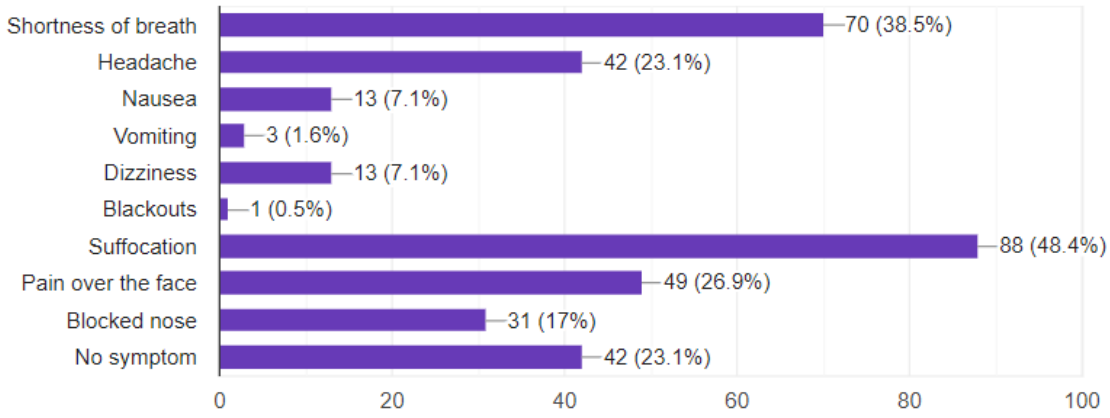
We divided the volunteers in accordance with the number of hours/day of usage of N95 masks.



We found out that the most number of volunteers (27.5%) were using N95 masks for more than 6 hours/day. 24.7% of volunteers were using N95 masks for 4 to 6 hours/day, 24.2% of volunteers were using N95 masks for 2 to 4 hours/day followed by the last group of 23.6 % of volunteers using these masks for less than 2 hours/day.

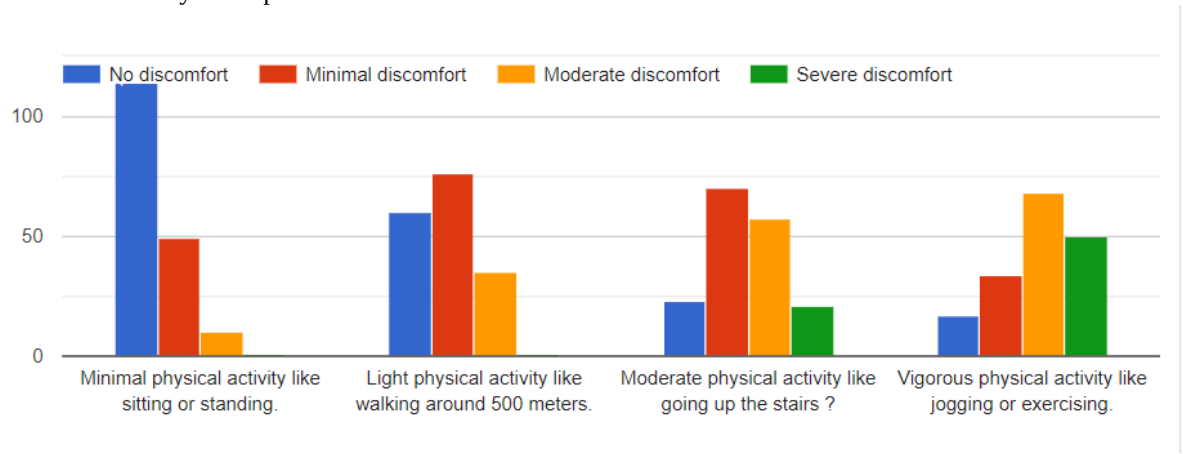
Only 59% of volunteers checked for air leak after wearing the N95 mask, while 76.6 % of volunteers said that they were more comfortable after wearing surgical mask compared to N95 mask.

Volunteers were asked if they had any of the symtoms listed in the chart below after an interval of 60 mins after the usage of N95 masks. Highest number of respondents (48.4%) told that they had subjective feeling of suffocation followed by shortness of breath (38.5%), facial pain (26.9%), headache (23.1%), Blocked nose (17%), nausea and dizziness (7.1%), vomiting (1.6%) and blackouts (0.5%). 42 respondents were asymptomatic.



A total of 109 respondents had subjective feeling of some or the other symptoms for 30 minutes after mask removal. In total 40 respondents said that they had some kind of allergic rash or skin rash on usage of N95 masks.

Respondents were asked to rate the level of discomfort caused on doing various physical activities for 10 minutes. One can see from the chart below that the level of discomfort was directly proportional to the increment in physical activity. On minimal physical activity like standing, 114 respondents told that there was no discomfort at all while not a single respondent complained of severe discomfort. On doing vigorous physical exercise, 68 respondents complained of moderate discomfort while 50 respondents complained of severe discomfort and only 17 respondents had no discomfort.



IV. Discussion

Right now with the SARS COV 2 pandemic in the backdrop, N95 masks are being used extensively. This study tried to answer if there was feeling of discomfort on longer duration of usage of these masks and if the discomfort increased with the increase in physical activity.

A large group of volunteers experienced suffocation, shortness of breath, headache among other symptoms which might be due to lower air permeability with N95 mask. Li y *et al*had demonstrated that the N95 respirator demonstrates lower air and water vapour permeability [7].

In our study 76.1% of respondents were more comfortable wearing a surgical mask compared to N95 mask which is in accordance to report which said that, facemask caused less subjective discomfort feeling, lower perception of humidity, heat and breathe resistance in comparison to N95 respirator [4].

According to a previous study, wearing N95 mask for longer duration may induce physiological stress on the wearer, making regular tasks more challenging, and causes headaches among healthcare providers [6]. Our study also showed most of the respondents were wearing masks for more than 6 to 8 hours/day and a significant number of respondents had some or the other symptoms including headaches.

Our study also showed that there is a significant increase in the level of discomfort with the increase in the physical activity.

V. Conclusion

In the current times of the SARS COV 2 pandemic everyone wants to be safe by wearing N95 masks while working or doing different activities. People should be made aware of the side effects of the prolonged usage of these masks as well as its effects on doing physical activities. Similar studies should be conducted, so that one can know how safe it is to wear mask for longer duration. Awareness should be brought to the aspect of minimalizing physical activity while wearing N95 masks and it is best to avoid exercise while wearing N95 mask.

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