

*Short Report***Difficulties encountered by health care workers with the use of N95 disposable masks and Elastomeric respirators during COVID 19 pandemic**

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*Sri Lankan Journal of Infectious Diseases 2021 Vol.11(1):18-22*DOI: <http://dx.doi.org/10.4038/sljid.v11i1.8344>**Abstract**

Shortage of N95 face masks has become a global problem during the COVID-19 pandemic. The study objective was to assess the experience of health care workers (HCWs) on use of N95 disposable (N95D) masks and reusable elastomeric respirators (ER). A self-administered questionnaire was given to HCWs at Sri Jayewardenepura General Hospital who used N95D masks and ER during June 2020. The 46 participants comprised mainly of nurses. Most HCWs believed that N95 masks were required for non-aerosol generating procedures. Adverse events were reported by all who used ER compared to 66% of HCWs who used N95D masks ($p < 0.01$). HCWs who used N95D masks for a longer duration had experienced more adverse events ($p < 0.05$). N95D masks should be conserved for settings where aerosol generating procedures are performed, due to shortage and adverse events. Use of N95D masks should be limited to shorter durations to minimize discomfort.

Keywords: COVID-19, Elastomeric respirators, Health Care Worker safety, N95 face masks, Infection Prevention and Control

Introduction

The currently prevailing COVID-19 pandemic has led to an unprecedented increase in the demand for N95 disposable (N95D) masks among HCWs and there was a severe global shortage in the supply chain at the beginning of the pandemic. Overanxious HCWs requesting N95D masks for unnecessary usage inside hospitals added to the problem. The shortage resulted in situations where N95D masks were not available for actual indications such as for use by HCWs in settings where aerosol generating procedures are performed as recommended by the World Health Organization (WHO).¹

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Some institutions resorted to reusing N95D masks^{2,3} which were originally meant to be discarded after single use while others looked for alternatives. ERs are recommended as safe and sustainable alternatives to conserve N95D masks.^{4,5} However, HCW experiences on adverse events when using ER for patient care have not been comprehensively studied.

At Sri Jayewardenepura General Hospital (SJGH), Sri Lanka, due to N95D mask shortage, ER (3M™ 3744 particulate filter, 3M™ 3200 reusable half face elastomeric mask respirator, 3M™ 3700 filter holder) had to be put into use. HCWs experience on using N95D masks and ER has not been studied in Sri Lanka. This study was conducted to assess the knowledge attitudes, practice and experience of HCW on the use of N95D masks and ER during the COVID-19 pandemic at SJGH.

Methods

This cross sectional study was conducted during June 2020 at SJGH. An anonymous self-administered questionnaire was filled by HCWs who had been using N95D masks and ER over the previous two months. A single education session on the ER cleaning method was conducted prior to the introduction of the ER.

Results

Of 46 participants, the majority were nurses (n=33, 71%) followed by health care assistants (n=6, 13%). The mean age was 33 years and 76% (n=35) were female. The mean work experience was 8 years. The majority of the study population (n= 30, 65.2%) had used both N95D masks and ER, thirteen (28.3%) had used only ER and three (6.5%) had used only N95D masks. Twenty four participants (52%) believed that wearing N95 masks properly is protective against SARS CoV 2. HCW knowledge on indications for wearing N95 masks and their practices are given in Table 1.

Forty one HCWs (89%) were aware of the correct steps of donning and doffing of N95 masks. However, only 28 (61%) had actually followed these steps. The leak test was performed by 24 (72%) users before using the N95D masks and by 19 (44%) users before using ER.

All 43 of the HCWs who used ER experienced some form of discomfort while 66% (22/33) of HCWs who used N95D masks experienced adverse events (p<0.01). Of the HCWs who had used both types of masks (n=30), all experienced adverse events with the use of ER while 21 HCWs (70%) experienced adverse events with the use of N95D masks (p<0.01).

The number of HCWs who experienced adverse events when using N95D masks for less than 2 hours at a stretch (9/17) was significantly lower than those who used N95D masks for more than 2 hours at a stretch (14/15) (p<0.05, OR: 15.75, 95% CI 1.67 - 148.12).

Table 1: HCW knowledge and practices on indications for wearing N95 face masks

Clinical scenarios	% of HCWs who believed it is necessary to wear N95 masks	% of HCWs who practiced wearing N95 masks
Correct Indications*		
For respiratory aerosols generating procedures (ex: intubation, ET suction)	89.1%	56.5%
During ENT surgical procedures	80.4%	52.2%
During dental procedures	76.1%	56.5%
Incorrect Indications**		
Always (while in hospital)	26.1%	30.4%
During taking history from suspected COVID 19 patients	78.3%	41.3%
During examination of suspected COVID 19 patients	89.1%	45.7%
When at risk of exposure to respiratory secretions during talking/ coughing/ sneezing	91.3%	52.2%
For all aseptic procedures	32.6%	34.8%
When at risk of exposure to blood and other sterile fluids	50.0%	47.8%
Being in a ward or unit of patients with respiratory symptoms for more than 15 minutes	71.7%	47.8%
During handling or transporting patients	60.9%	47.8%
During orthopaedic procedures like bone drilling	45.7%	43.5%

*Indications requiring N95 masks according to current guidelines

**Clinical scenarios that are not considered as indications for wearing N95 masks according to current guidelines

When considering the total duration of use of N95D masks during the previous two months, the number of HCWs who experienced adverse events when using N95D masks for less than 10 hours (8/17) was significantly lower than those who used N95D masks for more than 10 hours (14/16) ($p < 0.05$, OR: 7.87, 95% CI 1.35 - 45.83).

Table 2: The percentages of HCW who experienced symptoms during prolonged wear of N95D masks and ER

Symptoms experienced during prolonged wear over 2 hours	N95D masks	ER first time use
Dizziness	32.6%	41.3%
Headache	41.3%	54.3%
Sore throat	21.7%	26.1%
Shortness of breath	41.3%	54.3%
Pressure urticaria / skin irritation	32.6%	50%

The number of HCWs who experienced different adverse events during prolonged wear of N95D masks and ER are given in Table 2. All symptoms were experienced by a higher percentage of HCWs when wearing ER

compared to N95D masks though the difference did not reach a statistically significant level.

ER was reused by 40 (93%) of the users. The majority (n=36, 90%) had cleaned the masks by themselves although only 30 (75%) participants had followed the standard protocol for cleaning. More than half the users had experienced a bad smell (n=22, 55%), skin or nasal irritation (n=21, 52.5%), dizziness (n=25, 62.5%), and headache (n=30, 75%) and more than one third experienced nausea (n=17, 42.5%) and throat irritation (n=14, 35%) when reusing ER. In addition, when reusing the cleaned ER, 16 users (40%) experienced shortness of breath, seven (17.5%) felt that there was residual chemical hazard risk, one user (2.5%) felt the fit was poorer, and two users (5%) felt there was compromised integrity during inspection.

More than half the users (n=28, 60.9%) thought that it was rational to reuse N95 masks in a resource limited setting and 50% (n=23) of the population were not satisfied with the education received about use of the N95 masks. Most participants (n=37, 80.4%) had used an N95 mask after consideration of recommendations for its use in the clinical scenario they were facing

Discussion

Though WHO recommends the use of N95 masks only in settings where aerosol generating procedures take place¹, the majority of HCWs had believed it was necessary to wear N95 masks for non-aerosol generating procedures and used them for incorrect indications. This led to wastage that resulted in scarcity of N95D masks at SJGH and ER had to be put into use. However, ER caused more adverse events than N95D masks, and implementing correct guidelines for cleaning and training HCWs on proper cleaning techniques proved to be difficult.

Studies giving contradictory data on infective aerosol generation during non-respiratory procedures such as orthopaedic procedures with recommendation of N95 masks^{6,7} led to the belief that N95 masks are essential for such procedures. Good quality research evidence on modes of transmission of SARS CoV 2 and protection provided by different types of facemasks would have been helpful in convincing HCWs on correct indications for N95 masks. Unpleasant symptoms felt during use of both N95D masks and ER also show the importance of limiting use of N95 masks for recommended indications. The higher rates of adverse events experienced with ER show that it may not be a feasible alternative to N95D masks, especially for HCWs who have to wear N95 masks for prolonged periods such as inside intensive care units.

Since a high percentage of HCWs experienced adverse events with prolonged wear, it may be prudent to use N95 masks for shorter durations whenever possible (eg: during aerosol generating procedures in well ventilated settings). Updating guidelines on N95D masks usage based on good quality evidence is crucial to preserve available N95 masks for use during identified risk procedures, thereby protecting HCWs while avoiding wastage and unnecessary adverse effects. Furthermore, continuous reminders are required to ensure that HCWs follow correct technique for donning, doffing and performing leak tests before using N95 masks since incorrect technique may reduce the protection rendered by personal protective equipment.

Conclusion

Implementing proper guidelines and education sessions for HCWs on the identified risk situations and correct protocols for using N95 masks are crucial during this pandemic.

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