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### Original article

## Effect of wearing different face mask for prolonged period on fatigue and other medical problems in medical professionals in covid-19 pandemic – An Observational Study

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### ARTICLE INFO

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### ABSTRACT

**Background-** The coronavirus disease, which originated in the city of Wuhan, China, has quickly spread to various countries, with many cases having been reported worldwide. As of May 8th, 2020, in India, 56,342 positive cases have been reported. Masks can help prevent the spread of the virus from the person wearing the mask to others. HCW's need to wear the mask for prolonged period of time as they come in contact with various people and so there are many adverse effects of the mask on the body such as fatigue and other medical problems etc. Masks include mainly 3 types: N-95 respirators, surgical masks, cloth masks. **Methods-** The study was conducted at vikhe patil medical hospital and college of Physiotherapy, Ahmednagar. Pre and Post experiences of breathlessness and perception were compared. **Result-** In this survey, there are total 51 participants. In which, it was divided in 3 groups. i.e., surgical mask. Cloth mask, N-95 respirator. both males and females were included in the study.

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### Introduction

In December 2019, the novel corona virus known as SARS-COV2. Was discovered in Wuhan, China. Hundreds of thousand of instances were diagnosed around the world in a short period of time. The virus began to spread from one person to another 1.

Facemasks are critical components of personal protective equipment (PPE) for healthcare workers<sup>2</sup>. Various types of face masks available in market are worn for protection against inhalation of dust, pollutants, allergens, and pathogenic organisms. Recent news stories have stated the widespread use of face masks for protection against Swine flu (H1N1), Severe Acute Respiratory Distress Syndrome (SARS), Highly Pathogenic Avian Influenza (HPAI) virus<sup>3</sup>.

Face masks are divided into two general categories; Medical and Non-medical. Medical face masks include professional respirators (N-95), surgical and non-surgical face masks. Non-medical face masks consist of homemade masks, and filtered masks<sup>4</sup>.

#### Non medical face mask-

(1) Cloth mask-Wearing cloth masks helps slow the spread of the virus, which is primarily transmitted from person to person

through respiratory droplets produced when we talk, cough or sneeze. Some cloth face coverings have one-way valves or vents that make exhalation easier, but according to the CDC, this type of mask does not prevent the wearer from transmitting COVID-19 to others (source control), and for this reason the CDC does not recommend them.

#### Medical face mask-

##### (2) Surgical face mask-

Surgical masks (also called medical masks) are loose-fitting, disposable coverings for the nose and mouth. They are intended to be worn by healthcare workers. They are fluid resistant and protect the wearer against large droplets, splashes and sprays, according to the CDC. They also capture the wearer respiratory droplets, helping to protect patients against contamination.

Surgical masks are tested according to standards published by ASTM International as ASTM F2100-19.

#### Medical masks fall into three levels of barrier protection -

Level 1: low barrier protection

Level 2: moderate barrier protection

Level 3: maximum barrier protection<sup>5</sup>.

(3) N95 Mask - What an N95 mask is -

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N-This is a Respirator Rating Letter Class. It stands for "Non-Oil" meaning that if no oil-based particulates are present, then you can use the mask in the work environment.

95 -Masks ending in a 95, have a 95 percent efficiency. Masks ending in a 99 have a 99 percent efficiency.

3 microns - The masks filter out contaminants like dusts, mists and fumes. The minimum size of 3 microns of particulates and large droplets won't pass through the barrier, according to the

Centers for Disease Control and Prevention (CDC.)

Material - The filtration material on the mask is an electrostatic non-woven polypropylene fiber.

Valve: Some disposable N95 masks come with an optional exhalation valve. "The presence of an exhalation valve reduces exhalation resistance, which makes it easier to breathe (exhale,)" according to the CDC

Hospitals mandated all personnel and visitors to wear masks at all times to avoid the spread of COVID-19. Wearing masks for lengthy periods of time has a number of physiologic and psychological consequences, as well as the potential to reduce work efficiency. When masks are worn, activity cannot be performed as long or as efficiently as when they are not used. Additionally, wearing masks and PPE reduces the amount of time that an activity can be sustained. 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 headache. Tight fitting masks cause inadequate ventilation and increased levels of carbon dioxide (CO<sub>2</sub>) known as hypercapnia. As CO<sub>2</sub> is a known respiratory stimulant, a buildup of exhaled CO<sub>2</sub> between the mask and face will cause increased lung ventilation and respiratory activity. Symptoms of hypoxemia such as chest discomfort and tachypnea are also noted in healthcare professionals with prolonged mask use. Exhaled CO<sub>2</sub> builds up between the mask and face, and increased levels of CO<sub>2</sub>.

Fatigue is a term used to describe an overall feeling of tiredness or lack of energy<sup>8</sup>. Without the proper exchange of gases, our body can't get the oxygen it needs. We will develop low blood oxygen levels, a condition called hypoxemia. When our body is low on oxygen, you feel tired. Fatigue comes more quickly when your lungs can't properly inhale and exhale air<sup>10</sup>. Health care professionals are more prone to this type of fatigue due to nature of extended hours of work, talking needed to assess and manage the patients<sup>9</sup>. Getting tired of using masks, and becoming tired due to the use of masks, both can be described as mask fatigue. Mask fatigue may be considered as a disorder if it interferes with physical, mental, psychological, or social functioning in healthy adults<sup>9</sup>.

## MATERIAL AND METHODS

### METHODOLOGY-

An Observational study is conducted at Dr. Vitthalrao Vikhe Patil college of Physiotherapy, Ahmednagar. Purposive Sampling is used in 51 normal Individual.

Inclusion criteria are Qualified medical professional, Age 21-60, Both genders, who wear mask for 7-8 hrs. daily. Exclusion criteria are

Already diagnosed with Cardiovascular & Respiratory Diseases, Diagnosed Neurological condition, Individual not willing to participate

### PROCEDURE-

The Institutional Ethical Committee of the College of Physiotherapy will have ethical clearance. The research will only include subjects that meet the inclusion and exclusion requirements. Each subject will be informed about the entire research procedure. Self made questionnaire regarding other medical problems and fatigue scale will be provided to them through google forms. Current experience of fatigue because of mask and before using the face mask was obtained from the subject. Then both past and current experience of fatigue and other medical problems compared statistically.

Fatigue- visual analogue scale to evaluate fatigue (VAS-F) was provided to subject through google form

Other medical problems- Self-made questionnaire was provided to the subject through google forms

Self made questionnaire and fatigue scale was provided to the subject through google forms. Current experience of fatigue and other medical problems because of mask and before starting the use of face mask was obtained from the subject. and then both past and current subjective parameters was compared statistically.

### This are the outcome measures used for the study:

1. Visual analogue scale to evaluate fatigue severity (VAS-F)- The scale consist of 18 items relating to the subjective experience of fatigue. Each item ask respondents to place an "X", representing how they currently feel, along a visual analogue line that extends between two extremes (e.g., from "not at all tired" to "extremely tired"). Each line is 100mm in length- thus score fall between 0 and 100.
2. Self made questionnaire for other medical problems

## RESULTS-

In this survey, there are total 51 participants.

In which, it was divided in 3 groups. i.e., surgical mask. Cloth mask, N-95 respirator. The number of participants in surgical mask was 11, in Cloth mask 16 and in N-95 respirator was 23. Mean age was 23 years in surgical mask, 23 year in cloth mask and 24 in N-95 respirators group.

The sample contained both males and females [Table 1]. They were asked to fill out the pre-form on day one, which detailed their experience prior to wearing the mask, and the post-form, which detailed their experience after they began to use the mask, was requested approximately seven days later.

As a result, both of the experiences were compared, and all of the data was analyzed with Graphpad InStat. The outcome variables were given a mean and standard deviation.

In three classes of face masks, demographic analysis for age and gender was performed [Table 1].

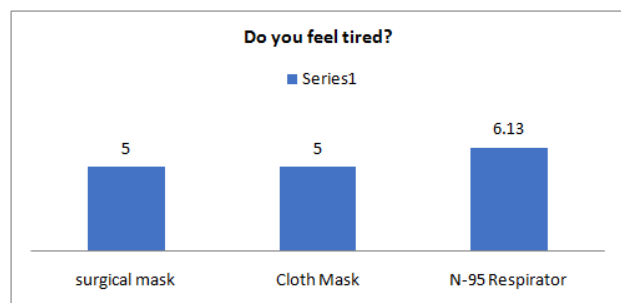
It was discovered that health care workers (HCWs) who wore face masks felt tired and had other medical issues such as headaches, ear pain, acne, and trouble breathing.

The majority of people who wear N-95 face masks report feeling more fatigued than those who wear surgical or fabric masks. Another finding was that people who wore surgical masks had other medical issues such as headaches, ear pain, and shortness of breath.

Groups	Means SD	P Value	Significance
Surgical Mask	3.87±0.83	<0.0001	Extremely significant
Cloth Mask	3.93±0.69		
N-95 Respirator	4.58±0.97		

In the table above, the mean value for surgical mask, cloth mask, and N-95 respirator is 3.87, 3.93, and 4.58, respectively. The p value was measured using ANOVA test in GraphpadInSta and was 0.0001, which is considered extremely important.

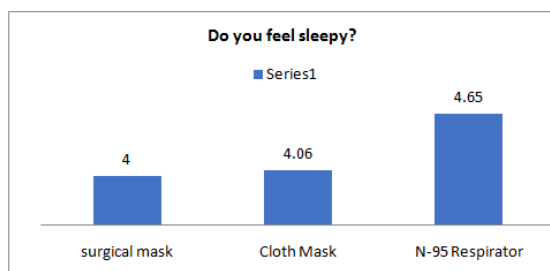
#### GRAPH 2 SHOWING COMPARISON BETWEEN 3 GROUPS OF MASK IN; DO YOU FEEL TIRED WHILE USING FACE MASK?



#### INTERFERENCE:

When three types of masks were compared in the graph above, it was discovered that people wearing N-95 respirator masks felt more exhausted (6.13) than those wearing surgical masks (5) or cloth masks (5).

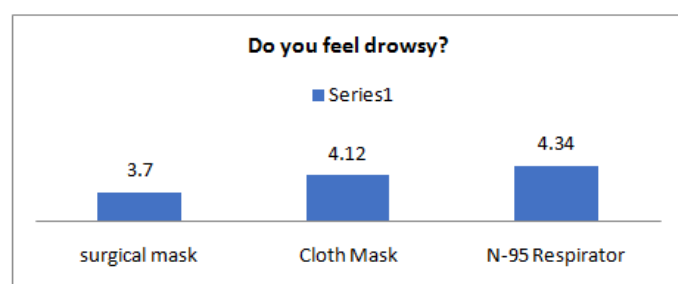
#### GRAPH 3- SHOWING COMPARISON BETWEEN 3 GROUPS OF FACE MASK IN; DO YOU FEEL SLEEPY WHILE USING FACE MASK DURING WORKING HOURS?



#### INTERFERENCE:

Three mask classes were compared in the graph above based on how sleepy they felt during working hours as a result of wearing them. When compared to surgical masks(4) and cloth masks(4.06), people wearing N-95 respirator masks feel more sleepy(4.65).

#### GRAPH 4 – SHOWING COMPARISON BETWEEN 3 GROUP OF FACE MASK IN; DO YOU FEEL DROWSY WHILE USING FACE MASK DURING WORKING HOURS?

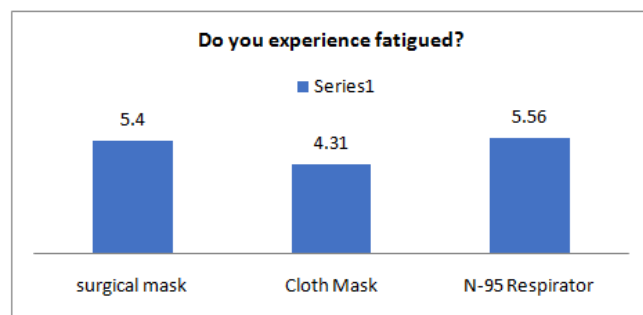


#### INTERFERENCE:

Three mask classes were compared in the graph above based on how drowsy they felt when wearing them during working hours.

It was discovered that people wearing N-95 respirators felt drowsier (4.34) than those wearing cloth masks (4.12) or surgical masks (3.7).

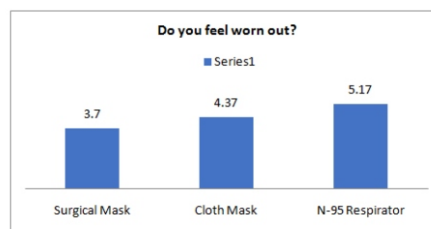
#### GRAPH 5– SHOWING COMPARISON BETWEEN THE 3 GROUP OF FACE MASK IN; DO YOU EXPERIENCED FATIGUED WHILE USING FACE MASK DURING WORKING HOURS?



#### INTERFERENCE:

In the graph above, three types of masks were compared, and it was found that people wearing N-95 respirators felt more fatigued (5.56) than those wearing surgical masks (5.4), and that those wearing cloth masks felt very little fatigue (4.31).

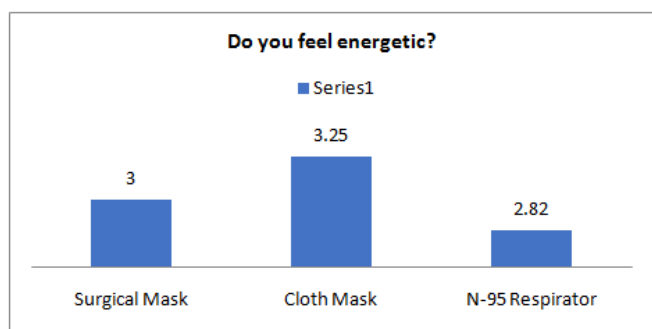
#### GRAPH 6- SHOWING COMPARISON BETWEEN 3 GROUP OF FACE MASK IN; DO YOU FEEL WORN OUT WHILE USING FACE MASK DURING WORKING HOURS?



**INTERFERENCE:**

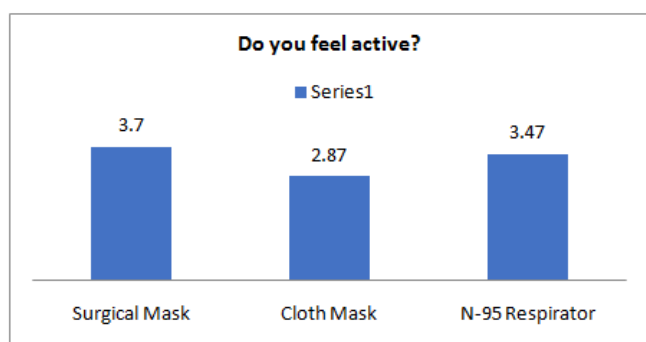
In the graph above, three types of masks were compared, and it was found that people wearing N-95 respirators felt more fatigued (5.17) than those wearing cloth mask (4.37) and surgical mask (3.7).

**GRAPH 7- SHOWING COMPARISON BETWEEN 3 GROUP OF FACE MASK IN; DO YOU FEEL ENERGETIC?**

**INTERFERENCE:**

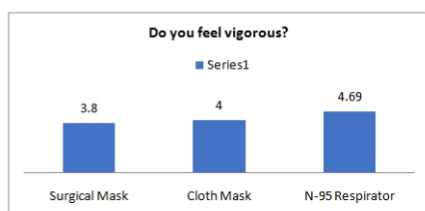
In the graph above, three types of masks were compared, and it was discovered that people wearing cloth masks feel less energetic (3.25) than those wearing N-95 respirators (2.82) or surgical mask (3).

**GRAPH 8- SHOWING COMPARISON BETWEEN 3 GROUP OF FACE MASK IN; DO YOU FEEL ACTIVE?**

**INTERFERENCE:**

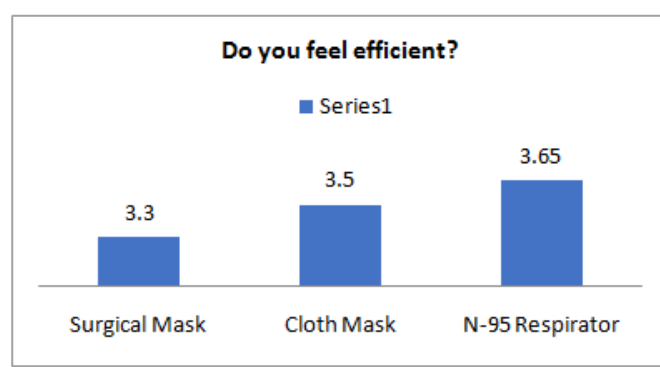
Three types of masks were compared in the graph above, and it was discovered that people who wear surgical mask (3.7) and N-95 respirators (3.47) felt less involved than those who wear cloth masks (2.87).

**GRAPH 9- SHOWING COMPARISON BETWEEN 3 GROUP OF FACE MASK IN; DO YOU FEEL VIGOROUS?**

**INTERFERENCE:**

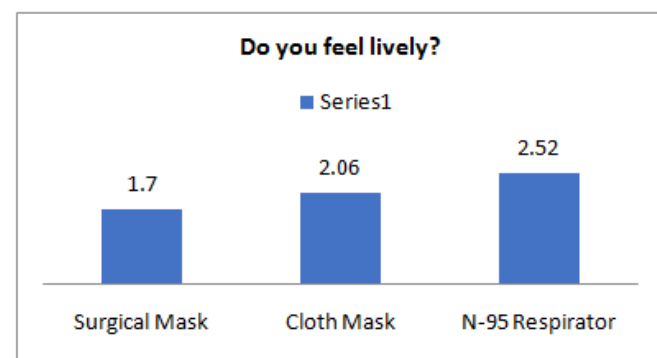
The graph above, three types of masks were compared, and it was found that people who used N-95 respirators felt more fatigued (4.69) than those who used surgical and cloth masks, and that those who used cloth mask (4) and surgical mask felt very little fatigue (3.8).

**GRAPH 10- SHOWING COMPARISON BETWEEN 3 GROUP OF FACE MASK IN; DO YOU FEEL EFFICIENT?**

**INTERFERENCE:**

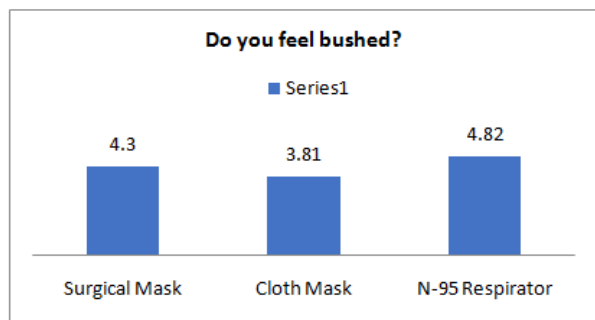
In the graph above, three types of masks were compared, and it was found that people wearing N-95 respirators were more fatigued (3.65) than those wearing cloth masks (3.5) and those wearing surgical masks were less fatigued (3.3).

**GRAPH 11- SHOWING COMPARISON BETWEEN 3 GROUP OF FACE MASK IN; DO YOU FEEL LIVELY?**

**INTERFERENCE:**

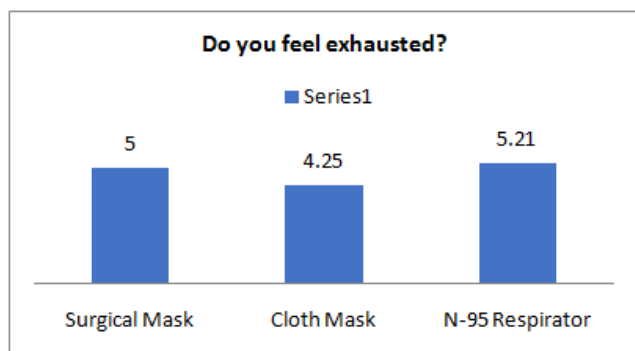
In the graph above, three types of masks were compared, and it was discovered that people who wear surgical masks feel more lively (1.7) than those who wear cloth masks (2.06) or N-95 respirators (2.52).

**GRAPH 12- SHOWING COMPARISON BETWEEN 3 GROUP OF FACE MASK IN; DO YOU FEEL BUSHED?**

**INTERFERENCE:**

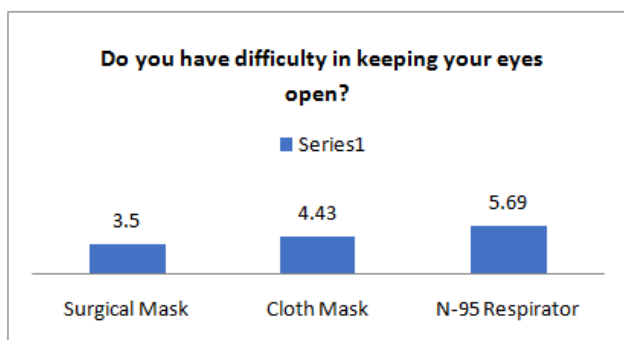
Three types of masks were contrasted in the graph above, with those wearing N-95 respirators experiencing fatigued (4.82) compared to surgical masks (4.3) and fabric masks (3.81).

**GRAPH 13- SHOWING COMPARISON BETWEEN 3 GROUP OF FACE MASK IN; DO YOU FEEL EXHAUSTED?**

**INTERFERENCE:**

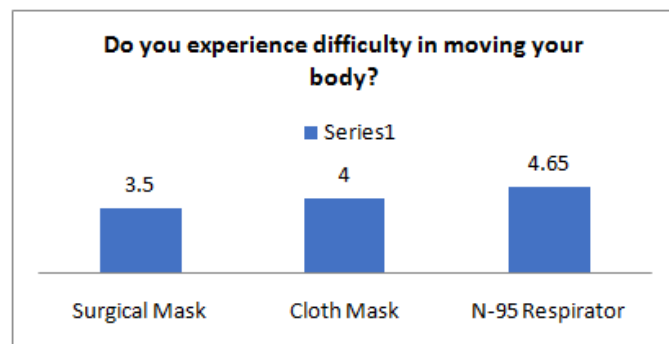
Three types of masks were contrasted in the graph above, with those wearing N-95 respirators experiencing fatigued (4.82) compared to surgical masks (4.3) and fabric masks (3.81).

**GRAPH 13- SHOWING COMPARISON BETWEEN 3 GROUP OF FACE MASK IN; DO YOU FEEL EXHAUSTED?**

**INTERFERENCE:**

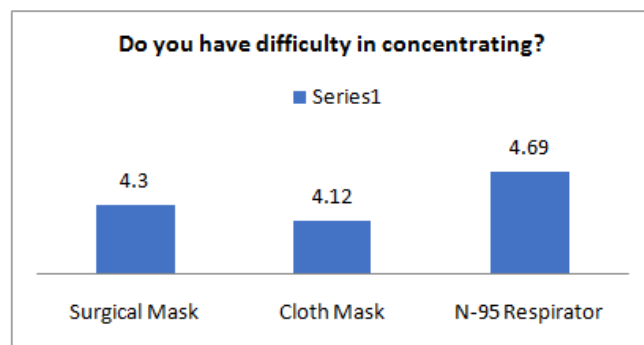
In above graph shows, 3 groups of mask were compared in which those who wear N-95 respirator experienced fatigued (5.69) as compared to cloth mask (4.43) and surgical mask (3.5)

**GRAPH 15- SHOWING COMPARISON BETWEEN 3 GROUP OF FACE MASK IN; DO YOU EXPERIENCED DIFFICULTY IN MOVING BODY BECAUSE OF FACE MASK?**

**INTERFERENCE:**

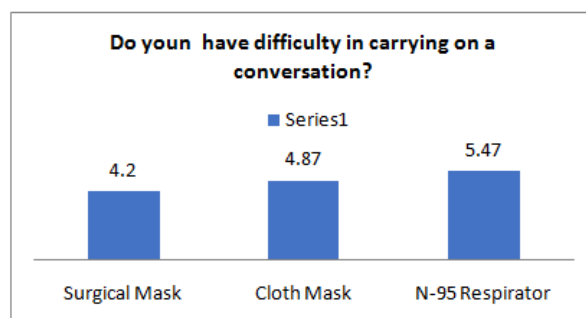
In above graph shows, 3 groups of mask were compared in which those who wear N-95 respirator experienced fatigued (4.65) as compared to cloth mask (4) and surgical mask (3.5)

**GRAPH 16- SHOWING COMPARISON BETWEEN 3 GROUP OF FACE MASK IN; DO YOU HAVE DIFFICULTY IN CONCENTRATING BECAUSE OF FACE MASK?**

**INTERFERENCE:**

In above graph shows, 3 groups of mask were compared in which those who wear N-95 respirator experienced fatigued (4.69) as compared to surgical mask (4.3) and cloth mask (4.12)

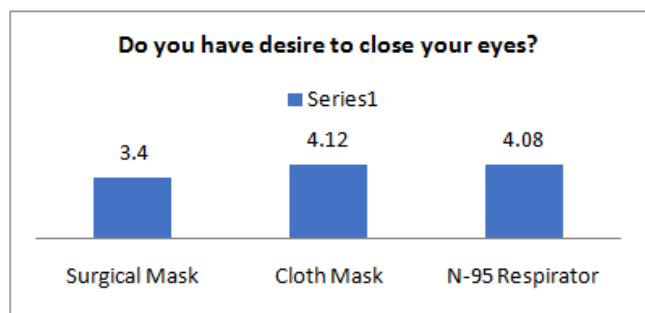
**GRAPH 17- SHOWING COMPARISON BETWEEN 3 GROUP OF FACE MASK IN; DO YOU HAVE DIFFICULTY IN CARRYING ON A CONVERSATION BECAUSE OF FACE MASK?**



**INTERFERENCE:**

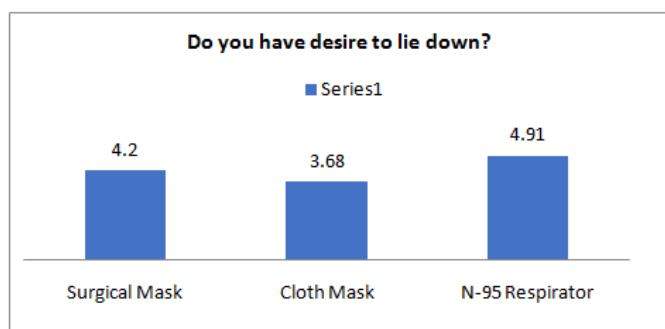
In above graph shows, 3 groups of mask were compared in which those who wear N-95 respirator experienced fatigued (5.47) as compared to cloth mask (4.87) and surgical mask (4.2)

**GRAPH 18- SHOWING COMPARISON BETWEEN 3 GROUP OF FACE MASK IN; DO YOU HAVE DESIRE TO CLOSE YOUR EYES BECAUSE OF FACE MASK?**

**INTERFERENCE:**

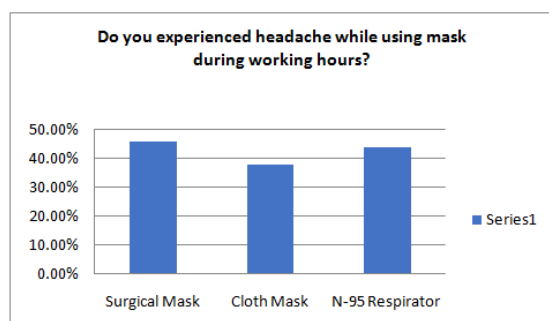
In above graph shows, 3 groups of mask were compared in which those who wear cloth mask experienced fatigued (4.12) as compared to N-95 respirator (4.08) and surgical mask (3.4)

**GRAPH 19- SHOWING COMPARISON BETWEEN 3 GROUP OF FACE MASK IN; DO YOU HAVE DESIRE TO LIE DOWN BECAUSE OF FACE MASK?**

**INTERFERENCE:**

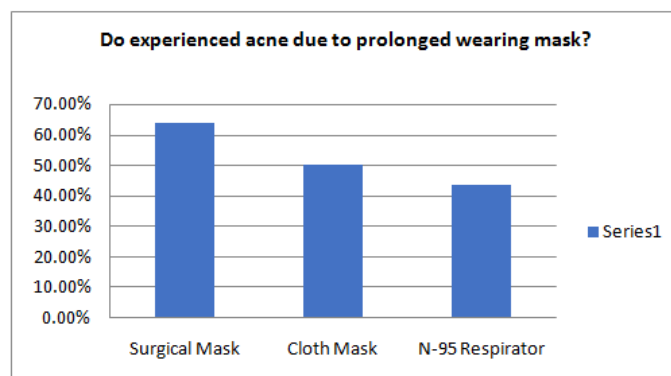
In above graph shows, 3 groups of mask were compared in which those who wear N-95 respirator experienced fatigued (4.91) as compared surgical mask (4.2) and cloth mask (3.68)

**GRAPH 20- SHOWING COMPARISON BETWEEN 3 GROUP OF FACE MASK IN; DO YOU EXPERIENCED HEADACHE WHILE USING MASK DURING WORKING HOURS?**

**INTERFERENCE:**

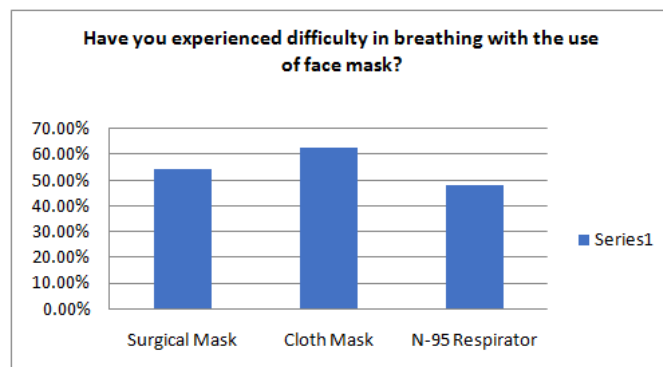
In above graph shows, 3 groups of mask were compared in which those who wear surgical mask experienced more headache (45.45%) as compared N-95 respirator (43.47%) and cloth mask (37.50%)

**GRAPH 21- SHOWING COMPARISON BETWEEN 3 GROUP OF FACE MASK IN; DO YOU EXPERIENCED ACNE DUE TO PROLONGED WEARING MASK?**

**INTERFERENCE:**

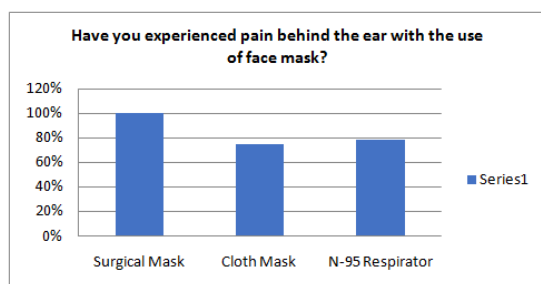
In above graph shows, 3 groups of mask were compared in which those who wear surgical mask experienced acne (63.63%) as compared cloth mask (50.00%) and N-95 respirator (43.47%)

**GRAPH 22- SHOWING COMPARISON BETWEEN 3 GROUP OF FACE MASK IN; HAVE YOU EXPERIENCED DIFFICULTY IN BREATHING WITH THE USE OF FACE MASK?**

**INTERFERENCE:**

In above graph shows, 3 groups of mask were compared in which those who wear cloth mask experienced difficulty in breathing (62.50%) as compared surgical mask (54.54%) and N-95 respirator (47.82%)

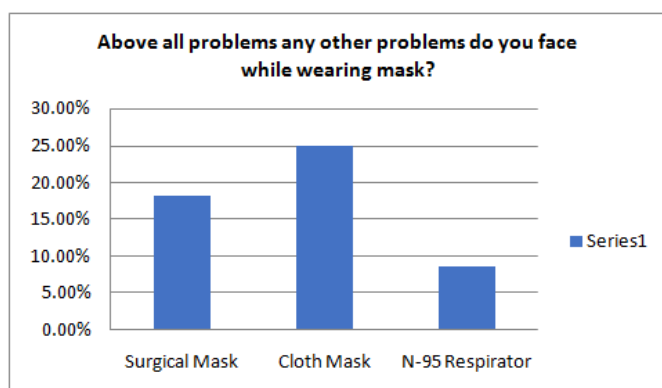
**GRAPH 23- SHOWING COMPARISON BETWEEN 3 GROUP OF FACE MASK IN; HAVE YOU EXPERIENCED PAIN BEHIND THE EAR WITH THE USE OF FACE MASK?**



#### INTERFERENCE:

In above graph shows, 3 groups of mask were compared in which those who wear surgical mask experienced pain behind the ear (100%) as compared to N-95 respirator mask (78.26%) and cloth mask (75.00%)

#### GRAPH 24- SHOWING COMPARISON BETWEEN 3 GROUP OF FACE MASK IN;ABOVE ALL PROBLEMS ANY OTHER PROBLEMS DO YOU FACE WHILE WEARING MASK?



#### INTERFERENCE:

In above graph shows, 3 groups of mask were compared in which those who wear cloth mask experienced other medical problems (25.00%) as compared to surgical mask (18.18%) and N-95 respirator (8.69%)

#### DISCUSSION-

During the Covid-19 pandemic, this research was performed to see how various types of face masks affected exhaustion and other medical problems in health care workers. Facemasks are vital components of personal protective equipment (PPE) for healthcare staff to control the spread of corona virus and other diseases as the corona virus spreads across the world. As a result, health-care staff must wear the face mask for an extended period of time during their working hours.

An observational research was conducted on 51 health care workers over the age of 20. Out of 51 participants, 11 wore a surgical mask (group A), 16 wore a cloth mask (group B), and 23 wore an N-95 respirator (group C). The baseline data in this study was not evenly distributed among the groups. The level of energy after wearing the face mask during working hours was measured using a visual analogue scale to determine fatigue (VAS-F), and a self-made

questionnaire was used to assess other medical issues. There were 18 questions on the visual equivalent fatigue scale, and the results showed that people who used N-95 respirators were more fatigued than those who used fabric or surgical masks. And, when comparing surgical and cloth mask users, cloth mask users felt more fatigued than surgical mask users. And the difference between the three mask classes is considered extremely significant (p-value <0.00001).

As seen in the graphs, those who wore surgical masks had more headaches (45.45%), acne (63.63%), discomfort behind the ear (100%), and other issues than those who wore fabric or N-95 respirators. And, as opposed to surgical and N-95 respirators, fabric masks have more trouble breathing (62.50%).

The study made by author Elisheva Rosner did study on adverse effect of prolonged mask use among healthcare professionals during covid-19. Total 343 healthcare workers participated in this study concluded that, prolonged use of N-95 and surgical mask by healthcare professionals during covid-19 has caused adverse effect such as headache, rash, acne, skin breakdown and impaired cognition in the majority of those surveyed. Frequent breaks, improved hydration and rest, skin care and potentially newly designed comfortable mask recommendation for future management of adverse effects related to prolonged mask use1.

As a result, we can conclude that the N-95 mask posed greater challenges in all areas. However, when it comes to defence, the N-95 mask provides the best protection against airborne diseases and droplet contamination. As a result, medical practitioners who are all vulnerable to various infectious diseases as a result of the current pandemic must protect themselves using the best available options. As a result, even though it causes the greatest difficulties, N-95 would be the best mask to wear during medical practice.

#### CONCLUSION-

As a result, it appears that N-95 respirators induce more fatigue than cloth or surgical masks. Furthermore, surgical masks cause other medical issues such as headaches, acne, breathing difficulties, and ear pain. However, when it comes to safety, the N-95 respirator provides the best security.

As a result, using an N-95 respirator on a regular basis is a better option than using a cloth mask or a surgical mask.

#### CONFLIT OF INTEREST – None

#### FUNDING OF SOURCES – None

**ACKNOWLEDGMENTS-** I would like to thank God and my family for being the guiding star in my life. The poverty of words has never been so profound than now, when I wish to express my feeling of gratitude, respect and affection to all my esteemed professors for helping me in this venture.

I thank all teachers of COPT, who immensely helped and rendered their valuable advice, precious time, knowledge and relevant information regarding my study. I would like to thank my study participants without whom this project could not have been possible.

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