

**Protective Effect and Community Acceptance of Different Types of Face Mask against COVID-19 in Surat City: A Case Control Study**Hita Rana<sup>1</sup>, Mohmmedirfan Momin<sup>2</sup>, Shashank Patel<sup>3</sup>, Pradipsinh Sodha<sup>4</sup><sup>1</sup>Assistant Professor, Department of Community Medicine, American International Institute of Medical Science, Udaipur, Rajasthan, India<sup>2</sup>Associate Professor, Department of Community Medicine, Government medical college, Surat, Gujarat, India<sup>3</sup>Assistant Professor, Department of Community Medicine, GMERS medical college, Valsad, Gujarat, India<sup>4</sup>Assistant Professor, Department of Pharmacology, American International Institute of Medical Science, Udaipur, Rajasthan, India

Received: 25-05-2024 / Revised: 23-06-2024 / Accepted: 26-07-2024

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Conflict of interest: Nil

**Abstract:****Introduction:** World Health Organization declared the COVID-19 crisis as a pandemic in March 2020. World Health Organization as well as various authorities issued health advice to prevent spread of COVID-19. Wearing face mask is regarded as one of the most effective ways to prevent COVID-19 transmission. It is essential to look into the factors influencing people's willingness to wear masks.**Objective:** To explore the preference of community towards various types of face masks and the extent of adoption towards it. To determine the protective effect of various types of facemasks.**Methodology:** 30 Cases were randomly selected from each zone of Surat city, so total sample size was 240 Cases and 240 Controls were selected by matching. Pre-designed, semi-structured questionnaire was used along with self-design Likert's scale at the end of interview to collect the information about community willingness and hurdles about mask wearing for face mask acceptance. Data was entered in MS Excel and was analyzed and compared using appropriate statistical methods.**Results:** Participants who wore mask were having 92% less risk of COVID-19 as compared to those who did not wear mask (OR: 0.0862, 95% CI: 0.0852-0.0872) and the difference between these two groups was statistically significant. ( $\chi^2$ : 51.2007, DF: 1,  $p=0.00001$ ) Participants who wore triple layer and N-95 were having 79% less risk of COVID-19 as compared to those who wore cloth or cloth mask (OR: 0.213, 95% CI: 0.11-0.31) the difference between these two groups was statistically significant. ( $\chi^2$ : 52.4879, DF: 1,  $p=0.00001$ ) There was also various factors contributing towards community willingness for face mask wearing. Effectiveness, comfort level, affordability, troublesome, appearance, health consciousness, misbeliefs, personal habits, fear, government action etc. factors were significantly contributing in prevention of COVID-19 infection.**Conclusion:** Protective effect of N95 mask is substantially higher as compared to no mask or cloth mask. Mask-wearing can be helpful in reducing the risk of silent transmission. There was a significant role of prophylactic measures like face masks in prevention and control of COVID-19 infection.**Keywords:** COVID-19, N-95 Mask, Tripple Layer Mask.

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**Introduction**

Acute respiratory tract infections (ARTIs) are the most common diseases affecting all individuals irrespective of age or gender. These diseases are typically caused by various microorganisms including various bacteria and viruses, such as *Streptococcus pneumoniae*, *Haemophilus influenzae*, *Moraxella catarrhalis*, Influenza A or B ("the flu"), respiratory syncytial virus (RSV), parainfluenza, adenovirus, coronaviruses, and others. [1] In terms of contagious ability and

emergencies, the greatest infections are typically associated with RSV, Influenza A or B, and coronaviruses. These infections have also caused several epidemics and pandemics. [2] The 2019-novel coronavirus disease (COVID-19) is caused by SARS-CoV-2. It is transmitted from human to human, which was first reported in China. It has caused a Public Health Emergency of International Concern and declared Pandemic by WHO. [3] Since the emergence of the new SARS-CoV-2 in

China, one aspect was evident: its high contagion rate. This high infection rate resulted in the spread of the virus in China, Europe and, the rest of the world, including India. [4] As of 10 March, >48,000 confirmed cases and ~3000 deaths were reported across the globe. Finally, the WHO declared COVID-19 as a pandemic on 11 March 2020. Notably, after 15 March, a sharp rise in the number of infected cases and death rate was observed, and by the end of March, the number of infected individuals increased to more than 640,000 and the death rate crossed >18%. [5]

Once the spread of COVID-19 started in India there was strong need to stop the spread and for that the state health machinery strongly emphasized the need for Covid-appropriate behaviour viz. social distancing, masking, and proper hand sanitizing. [6]

In addition to the accepted pharmacological and non-pharmacological interventions, traditional medicines (Ayurvedic medicines) are also being used to boost the innate immunity of individuals and to manage early uncomplicated cases of COVID-19 infection, as adjuvant to conventional management protocols. [6]

One of the effective and non-pharmacological prophylactic interventions which is convenient to the community was face mask wearing. Mask wearing reduced primary infection by 6% (odds ratio (OR): 0.94; 95% CI: 0.75-1.19 for RCTs) to 61% (OR: 0.85; 95% CI: 0.32-2.27; OR: 0.39; 95% CI: 0.18-0.84 and OR: 0.61; 95% CI: 0.45-0.85 for cohort, case-control and cross-sectional studies respectively). RCTs suggested lowest secondary attack rates when both well and ill household members wore masks (OR: 0.81; 95% CI: 0.48-1.37). While RCTs might underestimate the effects due to poor compliance and controls wearing masks, observational studies likely overestimate effects, as mask wearing might be associated with other risk-averse behaviour. Conclusion is that wearing a face masks may reduce primary respiratory infection risk up to 6-15%. [7]

The observations are consistent with suggestions that mask wearing can help in combat pandemics associated with respiratory disease. Results suggested that individuals using homemade fabric masks should take care to wash or sterilize them on a regular basis to minimize the possibility of spread of aerosolized fomites. [8]

### Objectives

- To explore the preference of community towards various types of face masks and the extent of adoption towards it.
- To determine the protective effect of various types of facemasks.

### Methodology

The study protocol was reviewed and approved by Scientific Review Committee (SRC) and Human Research Ethical Committee (HREC). After ethical clearance, the data collection procedure was started. The COVID-19 cases list was obtained from concerned authority. Cases were first divided in 8 zones of Surat city. From each zone of Surat city 30 cases were selected by using random number table method on the basis of inclusion criteria. Controls were selected by matching, for each case one control was selected.

After selection of the cases, house of the case was visited and face to face interview was conducted after explaining the purpose of the study and obtaining consent. If any house was locked at first visit, two more trials were done for that household. After three visit, if the household was not approachable than other case was selected from the list by random number table method. Everyday approximately 3 to 5 cases were approached. A pre-tested, semi structured questionnaire was used, which collected information on socio-demographic characteristics, community preference towards preventive measures like wearing mask, type of mask and community acceptance towards mask.

The Likert's Scale was used to collect the information about community willingness and hurdles about mask wearing. There were total 19 self-designed, semi structured quotes regarding factors affecting face mask wearing.

**Statistical Analysis:** Data was entered in MS Excel and analyzed by using SPSS software version 26. Cross tabulations were prepared for various variables and association was tested between related variables. Summary statistics like mean and standard deviation was calculated. Different graphs and charts were prepared for data presentation at appropriate places.

**Univariate analysis:** Univariate analysis was done for quantitative variable using mean, standard deviation. The categorical variables were described using proportion. Appropriate graphs were prepared. **Bivariate analysis:** Association of important parameters with various outcomes was studied using bi-variate analysis. Chi square tests of significance were applied for different variables. Odds ratio was calculated.

Likert's scale analysis was done with thematic analysis. Quotes were categorized in various themes according to their meaning and themes were further sub divided in to various sub themes. There was total 4 major themes in which whole scale was divided. Frequency and mean were used to elaborate the themes and sub-themes.

## Result

The study group comprised of 280 (58.30%) Males and 200 (41.70%) Females. The mean age of the total participants was 43.47±12.92 years. The mean age of male was 44.86 years while female had 41.54 years. The mean age of total cases were 46.209±12.92 years and mean age for controls were 40.929±12.92 years. Almost half of the males (55.0%) were cases followed by (45.0%) females.

Majority of the participants were of 31-45 years (42.70%) followed by 46-60 years (28.30%). Majority of the females 29 (48.3%) were from South west zone while majority of the males 39 (65.0%) were from Central and East-B zones of Surat city. The study participants comprise total of 10 (2.1%) Illiterate, 19 (4.0%) Primary, 58 (12.1%) Secondary, 149 (31.0%) Higher Secondary, 239 (49.8%) Graduate, 5 (1.0%) Post-graduate.

**Table 1: Protective effect of mask among cases and controls (n=480)**

Mask usage	Cases		Controls		Total	
	n	%	n	%	n	%
Mask used	178	74.1	233	97.0	411	85.7
Mask not used	62	25.9	07	3.0	69	14.3
Total	240	50.0	240	50.0	480	100

Table 1 describes the distribution of cases and controls as per mask usage. (n=480) Participants who wore mask were having 92% less risk of COVID-19 as compared to those who did not wear mask (OR: 0.0862, 95% CI: 0.0852-0.0872) and the difference between these two groups was statistically significant. ( $\chi^2$ : 51.2007, DF: 1, p=0.00001)

**Table 2: Different types of mask use among cases and controls (n=411)**

Type of Mask	Cases		Controls		Total	
	n	%	n	%	n	%
Triple layer and N-95	78	43.8	183	78.5	261	63.6
Cloth mask and Clothing	100	56.2	50	21.5	150	36.4
Total	178	43.3	233	56.7	411	100

Table 2 describes the effect of different types of mask use on cases and controls (n=411) Participants who wore triple layer and N-95 were having 79% less risk of COVID-19 as compared to those who wore cloth or cloth mask (OR: 0.213, 95% CI: 0.11-0.31) the difference between these two groups was statistically significant. ( $\chi^2$ : 52.4879, DF: 1, p=0.00001)

**Table 3: Observations of various factors affecting control of COVID-19 infection based on Likert's scale (n=480)**

Quotes	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
I shouldn't be forced to wear a mask	3.3	48.4	18.5	28.6	1.2
I don't think wearing a mask works – it just gives people a false sense of security	2.2	34.0	11.9	49.0	2.9
Face masks disrupt my breathing.	6.4	61.5	13.0	18.7	0.4
Face masks cause me to overheat.	1.9	23.7	35.4	36.8	2.3
Face masks are unsafe because they force you to touch your face.	1.8	14.8	31.1	48.8	3.5
Wearing a face mask is too much of a hassle.	1.6	24.1	29.0	42.4	2.9
It is difficult to get a face mask.	1.6	24.1	29.0	42.4	2.9
Face masks are too expensive.	1.0	15.6	12.1	60.7	10.5
If everyone else wears a mask, then it doesn't matter if I do or not	6.4	61.5	13.0	18.7	0.4
I don't wear face masks because I do not like how I appear (look) in them.	1.0	15.6	12.1	60.7	10.5
Everyone, including people who do not have symptoms, should wear a cloth covering face if they leave their home to prevent possible transmission of the Coronavirus.	8.8	61.9	16.0	13.0	0.2
Face masks provide few health benefits.	1.8	14.8	31.1	48.8	3.5
I worry about the health risks of wearing a mask	0.6	18.3	20.0	58.0	3.1
I worry that if I wear a cloth face covering out in public, other people will think I am infected with the Coronavirus.	2.0	34.8	10.9	51.0	1.2

I forget to wear a face mask when going out.	1.9	37.9	18.7	40.9	0.6
Face masks make people seem untrustworthy	1.4	17.1	7.0	57.6	16.9
I don't think the coronavirus is as big a threat as "they" make it out to be	1.2	23.3	13.6	58.2	3.7
Deaths from coronavirus doesn't seem worth shutting everything down when you consider the numbers that die every year from the flu	1.8	18.7	12.8	61.7	4.9
I do not wear face masks because I want to prove a point against authority.	0.6	0.6	1.6	70.6	26.5

Table 3 describes observations of various factors affecting control of COVID-19 infection based on Likert's scale (n=480). These observations were analyzed with thematic analysis. Whole table was divided in to four themes which were further divided into sub themes.

Theme-1 was named as "AWARENESS" which has one sub theme 1.1 named "EFFECTIVENESS". This theme showed that majority (51.7%) of the participants agreed that they shouldn't be forced to wear a mask while (51.9%) of the participants disagreed that mask wearing does not works effectively in controlling COVID-19 infection.

Theme-2 was named as "FACTORS CONCERNING WEARING A MASK" which has four sub themes. 2.1 named "COMFORT LEVEL" which shows that majority of the participants has disrupt breathing, overheat and found it too much hassle to wear it. 2.2 named "AFFORDABILITY" which shows majority (71%) participant's disagreement that face masks were too expensive. 2.3 named "TROUBLESOME" and 2.4 named "APPEARANCE". 69% participants had trouble to continuously wearing a mask but on the other hand majority (70%) of the participants disagreed that if they wear face mask their appearance may not look good.

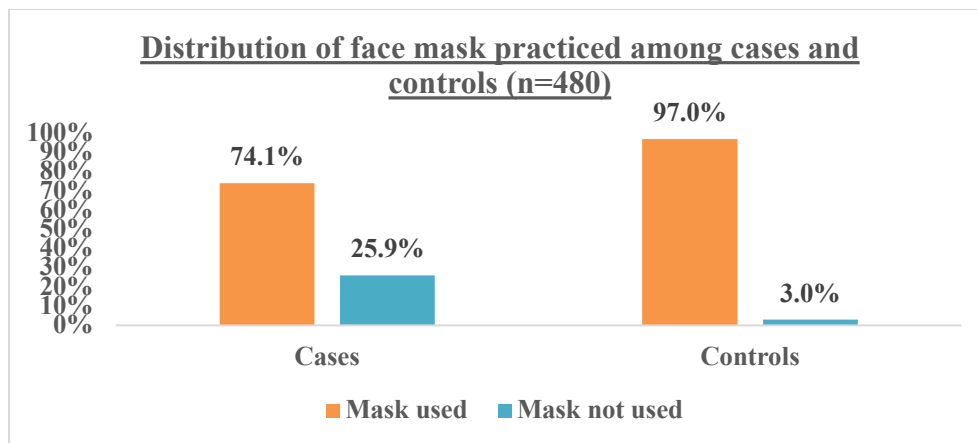
Theme-3 was named as "PERSONAL FACTORS" which has three sub themes. 3.1 named "HEALTH CONCIOUSNESS" which shows 70.7% participants agreed that everyone, including people who do not have symptoms, should wear a cloth covering face to prevent the transmission of

infection. 3.2 named as "MISBILIEFS" reflects that majority (61%) participants don't have any misbelieves regarding face masks. 3.3 named "PERSONAL HABIT" which shows majority (60%) participants had develop mask wearing as personal habit and 3.4 named "FEAR" which shows 72% of participants don't have any fear of masked people.

Theme-4 was named as "PUBLIC HEALTH AUTHORITY" which has three sub themes. 4.1 named "FORCE" which shows (30%) of the participants believed that coronavirus is not as big threat as it shows and mask wearing was forced to them. 4.2 named "GOVERNMENT ACTION" which shows that 32% participants believes that there was no need of lockdown during COVID-19 pandemic. 4.3 named "AUTHORITY RESISTANCE" in which only 3% participants don't want to wear mask because they want to proves against some authority.

### Discussion

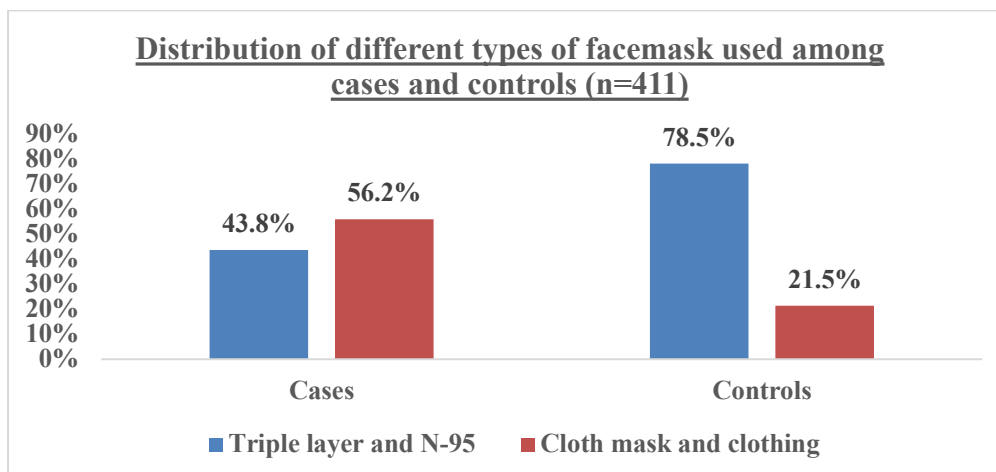
In present study there was a significant association between use of mask and COVID-19 infection. ( $\chi^2$ : 51.2007, DF: 1,  $p=0.00001$ ). Participates who wore mask were having 92% less risk of COVID-19 as compared to those who did not wear mask (OR: 0.0862, 95% CI: 0.0852-0.0872) (Figure-1) similarly in the study of Julii Brainard et.al. from United Kingdom shows that mask wearing helps in reducing primary infection by 6% to 61% (OR: 0.85; 95% CI: 0.32–2.27; OR: 0.39; 95% CI: 0.18–0.84 and OR: 0.61; 95% CI: 0.45–0.85 for cohort, case-control and cross-sectional studies respectively).[9]



**Figure: 1** Distribution of face Mask practice among cases and controls (n=480)

According to this present study, participants who wore triple layer and N-95 were having 79% less risk of COVID-19 as compared to those who wore cloth or cloth mask (OR: 0.213, 95% CI: 0.11-0.31) the difference between these two groups was statistically significant. ( $\chi^2$ : 52.4879, DF: 1,  $p=0.00001$ ) (Figure-2) Similarly one study of Christoph Josef Hemmer et al also shows that the protective effect is likely to be strongest for N95 type masks (aOR 0.04; [0.004; 0.3]) rather than

other types of masks (aOR 0.33; [0.17; 0.61]). It also reduces the risk of infection and disease for their wearer (moderate degree of certainty). [7] Results from Sima Asadi et.al. Indicates that mask wearing can provide some benefits, especially with early interventions, but often the results lack statistical significance. [8] This may be due to detailed study on facemask wearing was hard to carry out.



**Figure: 2** Distribution of different types of facemasks used among cases and controls (n=411)

The association between protective effect of mask and occurrence of COVID-19 infection was statistically significant among cases and controls. Participants who wore triple layer and N-95 were having 79% less risk of occurrence of COVID-19 as compared to control. There were also various factors contributing towards community willingness for face mask wearing. Effectiveness, comfort level, affordability, troublesome, appearance, health consciousness, misbeliefs, personal habits, fear, government action etc. factors were significantly contributing in prevention of COVID-19 infection. Thus, present study concluded that there was a significant role of face masks, types of face mask and community

acceptance towards face mask in prevention and control of COVID-19 infection.

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