Association of face mask use with self-reported cardiovascular symptoms during the COVID-19 pandemic

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Abstract

Introduction: Countries are mandating the use of face masks to stem the spread of coronavirus disease 2019 (COVID-19). Face mask use has been associated with discomfort due to its effects on thermoregulation, breathing and oxygenation. We evaluated the prevalence and severity of self-reported cardiovascular symptoms before and during face mask use.

Methods: This was a cross-sectional study of 1,001 participants residing in Singapore, who participated in a self-administered questionnaire between 25 April 2020 and 4 May 2020. Symptom severity before and during mask use, and health-seeking behaviour information were collected. The study outcome was self-reported worsening of cardiovascular symptoms and its association with the type of mask worn, duration of mask worn per day, and intensity of physical activities during mask use.

Results: The most common symptom reported during mask use was dyspnoea. Independent predictors for self-reported cardiovascular symptoms during mask use were moderate–high physical activity during mask use (odds ratio [OR] 1.634, 95% confidence interval [CI] 1.176–2.270, P = 0.003), duration of mask use for ≥3 h (OR 1.672, 95% CI 1.189–2.352, P = 0.003) and type of mask used, after adjusting for age, sex, healthcare-based worker status and presence of comorbidities. N95 mask was associated with worse symptoms when compared to surgical mask. Participants with ≥3 worsening symptoms or worsening dyspnoea, palpitations, fatigue and dizziness were more likely to seek medical help.

Conclusion: Face mask use has proven to be an effective way in curbing COVID-19 transmission. However, participants in this study had concerns regarding its use and these concerns should be urgently addressed to enable mask use policies to be enacted.

Keywords: Cardiovascular symptoms, COVID-19, face mask use

INTRODUCTION

The rapid global spread of the coronavirus disease 2019 (COVID-19) has seen an increase in the use of face masks for personal protection in hospital-based settings and public spaces. On 31 January 2020, there were 16 reported positive COVID-19 cases in Singapore, with an increasing overall number of cases to more than 58,000 as of 3 November 2020. The government distributed surgical and cloth masks in a bid to prevent community spread and has mandated mask use in public spaces from 14 April 2020.[1‑5] A similar strategy of universal mask use has been adopted by more than 120 countries worldwide.[6] The Centers for Disease Control and Prevention has recommended the use of face masks as an additional precautionary measure in public settings.[7]

Face mask use has previously been associated with wearer discomfort and poor compliance in both the general population and among healthcare workers.[7‑10] A study of N95 face mask use by healthcare professionals demonstrated an increase in de novo personal protective equipment (PPE)-associated headaches or exacerbation of existing headache disorders.[11]
Face mask use has also been shown to be associated with physiological changes. Surgeons wearing surgical masks during major surgeries had a decrease in oxygen saturation and an associated rise in heart rate postoperation compared to preoperative baseline values. The extent of decrease in oxygen saturation of haemoglobin correlated with the increased duration of operation. However, the association of face mask use and cardiovascular symptoms is unclear.

As such, with the mandatory use of face masks during the COVID-19 pandemic, it is crucial to understand how face mask use is associated with self-reported cardiovascular symptoms. This has potential implications on mask compliance, physical health and potentially diagnostic testing, with further increased strain on the already stretched healthcare systems as governments seek to implement mask use policies. With the mandatory use of face mask, and from our anecdotal experiences from specialist clinics, we hypothesised that face mask use would be associated with more self-reported cardiovascular symptoms. We also sought to evaluate the self-reported healthcare-seeking behaviour of these individuals experiencing cardiovascular symptoms related to mask use.

**METHODS**

This was a cross-sectional study that employed convenience sampling conducted from 25 April 2020 to 4 May 2020. The online survey was distributed to personal contacts via social media and through mailing lists. The study was conducted when face mask use was made compulsory in Singapore for the general population when outside of their homes. The study was open to participants aged ≥21 years who were residing in Singapore.

The online questionnaire was self-administered and in English. The questionnaire comprised seven sections that included information on demographics, past medical history, medication list, type and duration of face mask use, physical activity, presence of cardiovascular symptoms before and during mask use, and health-seeking behaviour [see Supplemental Digital Appendix]. Healthcare workers who worked in a healthcare-based setting were also identified. Participants documented severity of chest pain according to the Canadian Cardiovascular Society functional status classification of class I, II, III or IV and severity of dyspnoea according to the New York Heart Association functional status classification of class I, II, III or IV. The severity of other symptoms was scored from none, mild, moderate to severe.

The extent of physical activity was measured with the internationally validated International Physical Activity Questionnaire — short version (IPAQ-short), which has been tested for validity and reliability for national population-based prevalence studies on participation in physical activity. The questionnaire consists of four generic items in quantifying vigorous, moderate, walking and sitting activities, which allow for internationally comparable standards of comparison on health-related physical activity. Metabolic equivalent (MET) minutes for each category of physical activity were summed up to give the total MET minutes of physical activity a week. This was categorised into low, moderate and high physical activity on the IPAQ-short score.

The study evaluated self-reported cardiovascular symptoms before and during mask use. We investigated the presence of worsening symptoms during mask use as compared to before mask use. The primary study outcomes were the associations between self-reported symptoms and type of mask worn, duration of mask worn per day and intensity of physical activities during mask use. Worsening symptom was defined as an increase in the intensity of any magnitude of any symptom during mask use, compared to baseline intensity before mask use.

Categorical variables were expressed as number (percentage) and continuous variables as mean (±1 standard deviation). Pearson’s chi-square tests (or Fisher’s exact test, where appropriate) were used to examine categorical variables, while Student’s t-tests were used to evaluate continuous variables. Univariable and multivariable logistic regression analyses were performed to identify independent factors associated with a composite measure of worsening symptoms. The multivariable logistic regression model included sex, age, moderate to high physical activity, duration of mask use (≥3 h), presence of comorbidities and type of mask (cloth, surgical and N95 face mask). As studies on the association of face mask and symptoms have used surgical masks as their reference, this study also chose surgical face mask as the reference for the type of mask used in the multivariable model. A P value < 0.05 was deemed significant for this study. All statistical analyses were performed using IBM SPSS Statistics version 25.0 for Windows (IBM Corp, Armonk, NY, USA).

The institutional review board exempted the study from full review as the research involved a survey without identifiers (NHG DSRB reference number: 2020/00445). Implied consent was provided by participants when they took part in the study.

**RESULTS**

A total of 1,001 respondents participated in this study. A majority of the participants were Chinese (88.0%), and the mean age was 41.4 ± 14.5 years with a female majority (68.6%). Most of the participants were non-smokers (93.7%). Healthcare setting-based workers accounted for 47.3% of the participants. Physical activity during mask use, based on the IPAQ-short scoring system, was low in 78.1%, moderate in 19.8% and high in 2.1% of the participants.

In terms of the type of mask used by the participants, 69.7% wore surgical masks, 26.6% wore cloth masks and the
remaining 3.7% wore N95 face masks. A large proportion of participants wore masks for ≥3 h per day (47.7%). About a third of the participants (33.9%) had medical comorbidities, with hyperlipidaemia (15.6%) being the most prevalent. The baseline characteristics of the study participants are shown in Table 1.

The most common reported cardiovascular symptoms during mask use were dyspnoea (n = 395, 39.5%), fatigue (n = 359, 35.9%), palpitations (n = 215, 21.5%) and dizziness (n = 158, 15.8%). Similarly, the most common symptoms that increased in severity during mask use were dyspnoea (34.5% of the study population had worsening breathlessness), followed by fatigue (33.0%) and palpitations (19.0%).

Overall, 532 (53.1%) participants reported worsening of symptoms during face mask use. One hundred and thirty-two (13.2%) participants reported worsening of two symptoms, 95 (9.5%) reported worsening of three symptoms and 110 (11.0%) reported worsening of four or more symptoms. Statistically significant increase in severity of all symptoms, except leg swelling, was found during mask use compared to the baseline before mask use [Table 2]. In particular, there was significant self-reported worsening of chest pain (9.6% vs.

Table 1. Baseline characteristics of the study population (N=1,001).

| Variable                                      | n   (%) |
|-----------------------------------------------|-------|
| **Age** (yr)                                  | 41.4±14.5 |
| **Gender (female)**                           | 687 (68.6) |
| **Ethnicity**                                 |       |
| Chinese                                       | 881 (88.0) |
| Malay                                         | 34 (3.4) |
| Indian                                        | 38 (3.8) |
| Eurasian                                      | 7 (0.7) |
| Caucasian                                     | 4 (0.4) |
| Others                                        | 37 (3.7) |
| **Marital status**                            |       |
| Single                                        | 426 (46.7) |
| Married                                       | 544 (54.3) |
| Divorced                                      | 19 (1.9) |
| Separated                                     | 3 (0.3) |
| Widowed                                       | 9 (0.9) |
| **Smoking**                                   |       |
| Current                                       | 21 (2.1) |
| Ex-Smoker                                     | 42 (4.2) |
| Non-Smoker                                    | 938 (93.7) |
| **Occupation**                                |       |
| Government                                    | 467 (46.7) |
| Private/self-employed                        | 328 (32.8) |
| Retired/not working                           | 129 (12.9) |
| Student                                       | 77 (7.7) |
| **Healthcare-based worker**                   | 473 (47.3) |
| **Housing Type**                              |       |
| One-room flat                                 | 9 (0.9) |
| Two-room flat                                 | 23 (2.3) |
| Three-room flat                               | 86 (8.6) |
| Four-room flat                                | 257 (25.7) |
| Five-room flat                                | 228 (22.38) |
| Condominium                                   | 250 (25.0) |
| Landed housing                                | 148 (14.8) |
| **Education**                                 |       |
| Primary                                       | 5 (0.5) |
| Secondary                                     | 105 (10.5) |
| Tertiary                                      | 890 (88.9) |
| No formal education                           | 1 (0.1) |
| **Physical activity**                         |       |
| High                                          | 21 (2.1) |
| Moderate                                      | 198 (19.8) |
| Low                                           | 782 (78.1) |

*Data presented as mean±standard deviation.

Table 2. Baseline characteristics of the study population (N=1,001).

| Variable                                      | n   (%) |
|-----------------------------------------------|-------|
| **Type of mask use**                          |       |
| Cloth                                         | 266 (26.6) |
| Surgical                                      | 698 (69.7) |
| N95                                           | 37 (3.7) |
| **Duration of mask use per day (h)**          |       |
| 0                                             | 98 (9.8) |
| 1                                             | 288 (28.8) |
| 2                                             | 138 (13.8) |
| ≥3                                            | 477 (47.7) |
| **Comorbidities**                             |       |
| Hypertension                                  | 121 (12.1) |
| Hyperlipidaemia                               | 156 (15.6) |
| Diabetes mellitus                             | 50 (5.0) |
| Myocardial infarction                         | 8 (0.8) |
| Heart failure                                 | 1 (0.1) |
| Atrial fibrillation                           | 19 (1.9) |
| Other heart disease                           | 30 (3.0) |
| Asthma                                        | 67 (6.7) |
| Chronic obstructive pulmonary disease         | 3 (0.3) |
| Obstructive sleep apnea                       | 20 (2.0) |
| Other lung disease                            | 3 (0.3) |
| Cancer                                        | 21 (2.1) |
| Anxiety                                       | 22 (2.2) |
| Depression                                    | 18 (1.8) |
| **Medication**                                |       |
| Antihypertensives                             | 118 (11.8) |
| Cholesterol medications                      | 130 (13.0) |
| Diabetes medications                          | 46 (4.6) |
| Cardiac medications                           | 29 (2.9) |
| Inhalers                                      | 34 (3.4) |
| **Health-seeking behaviour**                  |       |
| Visits to any healthcare sector in the past 2 weeks | 31 (3.1) |
| Hospital admission for cardiac-related problems in the past 2 weeks | 3 (0.3) |
| **Threshold of duration of observing symptoms before seeking medical attention (day)** |       |
| <1                                            | 173 (17.3) |
| 1                                             | 228 (22.8) |
| 2                                             | 199 (19.9) |
| ≥3                                            | 401 (40.0) |

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2.4%, \( P < 0.001 \) and dyspnoea (39.5% vs. 5.8%, \( P < 0.001 \)) during mask use as compared to before mask use.

Compared to wearers of surgical masks, wearers of N95 masks experienced statistically significant worsening of palpitations (odds ratio [OR] 2.244, 95% confidence interval [CI] 1.097–4.588, \( P = 0.027 \)), fatigue (OR 3.757, 95% CI 1.878–7.513, \( P < 0.001 \)), dizziness (OR 2.805, 95% CI 1.366–5.760, \( P = 0.005 \)) and fainting spells (OR 5.020, 95% CI 2.045–12.324, \( P < 0.001 \)). There was no difference in worsening of cardiovascular symptoms between the participants wearing surgical and those wearing cloth masks.

As the largest proportion of the study population (47.7%) agreed that ≥3 h of mask use per day was associated with the development of cardiovascular symptoms, we used ≥3 h of mask use per day as the threshold for comparison. Mask use of ≥3 h per day was associated with worsening dyspnoea (53.9% vs. 46.1%, \( P = 0.004 \)), palpitations (54.7% vs. 45.3%, \( P = 0.030 \)), fatigue (59.1% vs. 40.9%, \( P < 0.001 \)) and dizziness (56.1% vs. 43.9%, \( P = 0.026 \)) as compared to mask use of <3 h per day.

On multivariable logistic regression analysis, the use of N95 face mask (OR 2.275, 95% CI 1.030–5.020, \( P = 0.042 \)), the duration of face mask use of ≥3 h per day (OR 1.672, 95% CI 1.189–2.352, \( P = 0.003 \)) and moderate to high physical activity during face mask use (OR 1.634, 95% CI 1.176–2.270, \( P = 0.003 \)) were found to be independent predictors of self-reported worsening cardiovascular symptoms after adjusting for sex, age, healthcare setting-based worker and the presence of comorbidities [Table 3 and Figure 1].

Two weeks before the study period, 3.1% of participants sought medical treatment for cardiovascular-related symptoms and 0.3% of participants required hospital admission for cardiac-related conditions. Of the participants who experienced cardiovascular symptoms, 331 (33.1%) reported that they would seek medical help, while 354 (35.4%) would self-monitor their symptoms as they felt that the symptoms were most likely related to mask use [Figure 2].

Seven hundred and eighty-two (78.1%) participants reported that they would observe their symptoms for ≤3 days before seeking medical help. Participants who were more likely to seek medical help included those who reported worsening symptoms during face mask use (OR 2.572, 95% CI 1.962–3.373, \( P < 0.001 \)) and those who reported worsening of ≥3 symptoms (OR 2.005, 95% CI 1.397–2.876, \( P < 0.001 \)).

| Table 2. Differences in the severity of cardiovascular symptoms before and during mask use (\( N=1,001 \)). |
|---|
| Variable | \( n (% ) \) | Before use | During use | \( P \) |
| Chest pain/discomfort | | | | |
| Mild activity | 11 (1.1) | 40 (4.0) | <0.001 |
| Moderate activity | 7 (0.7) | 41 (4.1) | |
| At rest | 6 (0.6) | 15 (1.5) | |
| Dyspnoea | | | | |
| Mild activity | 14 (1.4) | 160 (16.0) | <0.001 |
| Moderate activity | 32 (3.2) | 205 (20.5) | |
| At rest | 12 (1.2) | 30 (3.0) | |
| Palpitations | | | | |
| Mild | 42 (4.2) | 176 (17.6) | <0.001 |
| Moderate | 6 (0.6) | 39 (3.9) | |
| Severe | 0 (0.0) | 0 (0.0) | |
| Nausea | | | | |
| Mild | 5 (0.5) | 89 (8.9) | <0.001 |
| Moderate | 1 (0.1) | 6 (0.6) | |
| Severe | 1 (0.1) | 1 (0.1) | |
| Fatigue | | | | |
| Mild | 47 (4.7) | 285 (28.5) | <0.001 |
| Moderate | 8 (0.8) | 65 (6.5) | |
| Severe | 1 (0.1) | 9 (0.9) | |
| Dizziness | | | | |
| Mild | 15 (1.5) | 136 (13.6) | <0.001 |
| Moderate | 0 (0.0) | 21 (2.1) | |
| Severe | 0 (0.0) | 1 (0.1) | |
| Fainting or near fainting | | | | |
| Mild | 5 (0.5) | 46 (4.6) | <0.001 |
| Moderate | 0 (0.0) | 8 (0.8) | |
| Severe | 0 (0.0) | 0 (0.0) | |
| Cold sweats | | | | |
| Mild | 14 (1.4) | 49 (4.9) | <0.001 |
| Moderate | 0 (0.0) | 2 (0.2) | |
| Severe | 0 (0.0) | 0 (0.0) | |
| Leg swelling | | | | |
| Mild | 8 (0.8) | 9 (0.9) | 0.406 |
| Moderate | 2 (0.2) | 3 (0.3) | |
| Severe | 0 (0.0) | 0 (0.0) | |

**Figure 1:** Diagram shows the independent predictors of worsening cardiovascular symptoms during face mask use in the COVID-19 pandemic.
Participants with dyspnoea (OR 2.163, 95% CI 1.607–2.911, \(P < 0.001\)), palpitations (OR 1.493, 95% CI 1.048–2.128, \(P = 0.026\)), fatigue (OR 2.438, 95% CI 1.793–3.315, \(P < 0.001\)) and dizziness (OR 1.653, 95% CI 1.107–2.469, \(P = 0.014\)) were more likely to seek medical help.

**DISCUSSION**

There has been increasing evidence that face mask use is an effective strategy in mitigating the spread of COVID-19.\[14\] Our study described the association of face mask use with self-reported cardiovascular symptoms. The main findings of our study are as follows: (1) the most common cardiovascular symptoms reported during face mask use were dyspnoea, fatigue and palpitations; (2) moderate to high physical activity during face mask use, duration of mask use ≥3 h and the use of N95 masks were independent predictors of worsening cardiovascular symptoms during face mask use; and (3) close to a third of the study population would seek medical help if they experienced cardiovascular symptoms, with 78.1% of the participants willing to observe their symptoms for ≤3 days before seeking help.

Dyspnoea was the most common symptom reported by our study population. Dyspnoea severity worsened during mask use. These findings are in line with published reports on breathing difficulties with surgical mask use in 38% of adults\[8,17\] and a significant increase in the perception of increased breathing resistance when using both surgical masks and filtering face piece respirators.\[8,18\] A possible explanation for this is that the use of face mask during physical activities may result in a reduction in oxygen saturation and hence, an increase in stress to the heart. A study on surgeons with surgical masks during major surgeries demonstrated a decrease in oxygen saturation with an increase in heart rate. The extent of decrease in oxygen saturation correlated with the duration of operation.\[12\] Another study on participants with face mask undergoing treadmill exercises found an increase in heart rate, respiratory rate, transcutaneous carbon dioxide and increased mask dead space apparent heat index.\[8\] During face mask use, exhaled carbon dioxide may be trapped together with heat and moisture, which can decrease blood oxygenation. Furthermore, the masks may also cause a component of airway resistance.\[12\] Another reason for the increased perception of breathlessness may be thermal intolerance due to face mask,\[8,18,20\] although it has been found that this thermal impact may be minimal if face masks were worn over a short period of 1 h at a low to moderate workload.\[8,21\] This increase in mean core temperature may be related to the increased energy expenditure to overcome the breathing resistance of the face masks, which may interfere with respiratory heat exchange and heat dissipation from the skin.\[8,22\]

Another symptom during mask use that has been described in the current literature is the physiological responses in heart rate. Roberge et al. found a significant increase in heart rate of 9.4 beats per minute in those wearing surgical masks compared to those without.\[8\] This is in keeping with our present findings of an increased perception of palpitations during face mask use.
Worsened self-reported severity of cardiovascular symptoms during face mask use was associated with the prolonged duration of use and the use of high breathing resistance face mask. Studies on healthcare workers wearing different types of face masks while performing usual work duties over a 7-h period found that the perceptions of heat and moisture were significantly stronger with N95 face masks as compared to surgical face masks. Another recent study found that N95 face mask use was associated with PPE-associated headaches when the N95 face mask and the protective eyewear were used for ≥4 h per day. This also affected the perceived overall performance of healthcare workers. Another study found that the increase in heart rate associated with face masks depended on the type of mask used, with significant increase in heart rate demonstrated in those with full-face respiratory protective equipment compared to those with half-face and valve respiratory protective equipment. In the case of surgical masks, the breathing resistance has also been described to be lower than other personal face masks due to the loose fit to the face, which may explain the lower prevalence of worsening symptoms in those wearing surgical masks.

Some studies have suggested that face mask intolerance may be attributed to the discomfort associated with mask use. For example, discomfort may stem from psychological reactions secondary to highly thermosensitive areas of the face underneath the mask, rather than symptoms associated with exertion. The unpleasant sensation of having the mask stuck to the face during respiration may translate into emotional responses that are associated with breathlessness and increased respiratory rate. These factors, in relation to its consequent physiological and psychological impact, may have also led to intolerance and noncompliance to face mask use. However, these assumptions are mainly theoretical. Our study did not find any significant association between worsening symptoms and previous anxiety and depression (P = 0.410). Nevertheless, the impact of psychological stressors from face mask use, resulting in anxiety and claustrophobia, cannot be ignored.

Although our current findings revealed an association of increased self-reported cardiovascular symptoms with face mask use, it is crucially important to emphasise that face mask use remains an effective strategy in mitigating COVID-19 transmission. This study highlights that the use of face mask can be associated with more self-reported cardiovascular symptoms. Our findings raise awareness among healthcare providers, researchers and policymakers regarding face mask-associated symptoms and their potential implications on health-seeking behaviours of patients.

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Conflicts of interest
Sia CH is a member of the SMJ Editorial Board and was thus not involved in the peer review and publication decisions of this article.

Supplemental digital content
Appendix at https://links.lww.com/SGMJ/xxx

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APPENDIX

Questionnaire on the association of face mask use with self-reported cardiovascular symptoms during the COVID-19 pandemic.

A. Demographic information

| A1. Age (in years) | 1. Male 2. Female |
|--------------------|------------------|
| A2. Gender         | 1. Chinese 4. Eurasian 2. Indian 5. Caucasian 3. Malay 6. Others |
| A3. Ethnicity      | 1. Single 4. Divorced 2. Married 5. Widow 3. Separated |
| A4. Marital status | 1. Government 4. Student 2. Private/self-employed 5. Not working 3. Retired |
| A5. Occupation     | 1. Government 4. Student 2. Private/self-employed 5. Not working 3. Retired |
| A6. Do you work in healthcare sector | 1. Yes 2. No |
| A6. Smoking        | 1. Current 3. Non-smoker 2. Ex-smoker |
| A7. Housing        | 1. 1-room flat 5. 5-room flat 2. 2-room flat 6. Condominium 3. 3-room flat 7. Landed housing 4. 4-room flat |

B. Mask Type

| B1. Type of mask | 1. Cloth 2. Surgical 3. N95 |
|------------------|-----------------------------|
| B2. Duration of mask worn / day | 1. None 2. 1-hour 3. 2-hours 4. 3-hours or more |

C. Past Medical history

1. High blood pressure 1. Yes 0. No
2. High cholesterol 1. Yes 0. No
3. Diabetes 1. Yes 0. No
4. Previous Heart attack 1. Yes 0. No
5. Heart failure 1. Yes 0. No
6. Irregular heart rate (atrial fibrillation) 1. Yes 0. No
7. Other heart problems 1. Yes 0. No
8. Asthma 1. Yes 0. No
9. Chronic obstructive pulmonary disease (COPD) 1. Yes 0. No  
10. Obstructive sleep apnea (OSA) 1. Yes 0. No  
11. Other lung problems 1. Yes 0. No  
12. Cancer 1. Yes 0. No  
13. Anxiety 1. Yes 0. No

D. Medications

1. Blood pressure lowering medications 1. Yes 0. No  
2. Cholesterol lowering medications 1. Yes 0. No  
3. Diabetes 1. Yes 0. No  
4. Heart Medications 1. Yes 0. No  
5. Inhalers 1. Yes 0. No

E. Physical activity while wearing a mask in the last 7 days

Refer to International Physical Activity Questionnaire website:  
https://sites.google.com/site/theipaq/questionnaire_links

F. Symptoms before and after mask use in the last 4 weeks

| Symptoms                  | Before Mask Use                                      | After Mask Use                                      |
|---------------------------|------------------------------------------------------|-----------------------------------------------------|
| F1. Chest Pain/Discomfort| 0. Symptoms while at rest                           | 0. Symptoms while at rest                           |
|                           | 1. Symptoms with mild activity (<2 blocks or <1 flight of stairs) | 1. Symptoms with mild activity (<2 blocks or <1 flight of stairs) |
|                           | 2. Symptoms with moderate activity (>2 blocks or >1 flight of stairs) | 2. Symptoms with moderate activity (>2 blocks or >1 flight of stairs) |
|                           | 3. None                                               | 3. None                                              |
| F2. Shortness of Breath  | 0. Symptoms while at rest | 0. Symptoms while at rest | 0. Symptoms while at rest |
|                           | 1. Symptoms with mild activity                       | 1. Symptoms with mild activity                       |
|                           | 2. Symptoms with moderate activity                   | 2. Symptoms with moderate activity                   |
|                           | 3. None                                               | 3. None                                              |
| F3. Palpitations (Awareness of heart beat) | 1. None 3. Moderate | 1. None 3. Moderate | 1. None 3. Moderate |
|                           | 2. Mild 4. Severe                                    | 2. Mild 4. Severe                                    |
| F4. Nausea                | 1. None 3. Moderate | 1. None 3. Moderate | 1. None 3. Moderate |
|                           | 2. Mild 4. Severe                                    | 2. Mild 4. Severe                                    |
| F5. Tiredness             | 1. None 3. Moderate | 1. None 3. Moderate | 1. None 3. Moderate |
G. Health seeking behavior

|   | 2. Mild | 4. Severe | 2. Mild | 4. Severe |
|---|---------|-----------|---------|-----------|
| F6. Dizziness | 1. None | 3. Moderate | 1. None | 3. Moderate |
|     | 2. Mild | 4. Severe | 2. Mild | 4. Severe |
| F7. Fainting or near-fainting | 1. None | 3. Moderate | 1. None | 3. Moderate |
|     | 2. Mild | 4. Severe | 2. Mild | 4. Severe |
| F8. Cold sweats | 1. None | 3. Moderate | 1. None | 3. Moderate |
|     | 2. Mild | 4. Severe | 2. Mild | 4. Severe |
| F9. Leg swelling | 1. None | 3. Moderate | 1. None | 3. Moderate |
|     | 2. Mild | 4. Severe | 2. Mild | 4. Severe |

G1. Recent visit to any healthcare sector in past two weeks for the above physical symptom | 1. Yes | 2. No |
G2. Did you require hospital admission | 1. Yes | 2. No |
G3. How long would you observe symptoms before seeking medical attention | 1. 1 day | 3. 3 days |
|     | 2. 2 days | 4. 4 or more days |
G4. Given the symptoms you have reported, would you (Choose all that apply): | 1. Seek medical help |
|     | 2. Visit a pharmacy to self-medicate |
|     | 3. Self-medicate at home |
|     | 4. Self-monitoring symptoms as symptoms are likely due to mask use |
|     | 5. Read up more on symptoms |
|     | 6. Ask another person for advice |
|     | 7. Do nothing |