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ASSESSMENT OF FACE MASK USE AMONG PERIPARTUM WOMEN AT MOWBRAY MATERNITY HOSPITAL DURING THE COVID-19 PANDEMIC.

BY

SAMUEL ADUSEI

SUPERVISOR: DR CHANTAL STEWART

CO-SUPERVISOR: DR TRACEY ADAMS

(ID: ADSSAM001)

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DECLARATION

I, Samuel Adusei, declare that the submitted dissertation is my original work. The dissertation is part of my Master of Medicine in Obstetrics and Gynaecology specialist degree at the University of Cape Town. The work is authentic and has not been submitted for any other degree or to any other University. The work has not been previously published.

I declare that all material and results not original to this study have been cited appropriately and accordingly. The study was conducted according to academic guidelines, and ethical approval was obtained before conducting the research. The research was conducted under the supervision of academic supervisors within the Department of Obstetrics and Gynaecology...

Signed by candidate 28/12/22

Samuel Adusei Date
(Student)

Signed by candidate 28/12/22

Dr C. J Stewart Date
(Supervisor)

Signed by candidate 28/12/22

Dr Tracey Adams Date
(Co supervisor)

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ABBREVIATIONS

ACE	Angiotensin Converting Enzyme
ARDS	Acute Respiratory Distress Syndrome
CDC	Centre for Disease Control and Prevention
ICNARC	Intensive Care National Audit and Research Centre
MOU	Midwife Obstetric Unit
PCR	Polymerase Chain Reaction
SARS	Severe Acute Respiratory Syndrome
WHO	World Health Organization

ABSTRACT

Background: The current global COVID-19 pandemic has resulted in loss of life worldwide. According to the John Hopkins dashboard on COVID-19, 6 446 935 out of 595 645 271 infected patients lost their lives. There were 12 562 636 cases in Africa and 257 083 lost their lives as of 11th August 2022. South Africa recorded 4 007 080 cases with 101 982 mortalities and the Western Cape was one of the highest hit provinces in the same period (662 113 cases). Primary prevention for COVID-19 includes social distancing, hand washing, using alcohol-based hand sanitisers, and, mostly importantly, face mask use. Of these, face mask use is the least adhered to. Effective face mask use and reasons for use or non-use among a vulnerable population such as peripartum women are still unknown.

Objective: To assess face mask use and associated factors among peripartum women at Mowbray Maternity Hospital during the COVID-19 pandemic.

Method: An analytical cross-sectional study was used to assess the proportion of peripartum women who effectively wore face masks. Effective face mask use was measured with the WHO tool on mask usage in the context of COVID-19. A total of 500 women who visited the facility from the 1st of October 2020 to 31st October 2020 were first observed for effective face mask use before selection into the study to curb response bias. A structured interviewer-administered questionnaire was used to assess knowledge and perceived reasons for face mask use among 250 selected peripartum women. Data were analysed in STATA version 15.0. Frequencies and percentages were reported for categorical variables. Graphs and percentages were used to report the proportion of women who effectively used face masks in each of the stages of labour. The chi-square or Fisher's exact test (where necessary) were used to determine the association between effective face mask use and each independent variable. A multiple logistic regression model with a significance level set at $p<0.05$, was employed to determine the factors associated with effective face mask use.

Results: Eighty-two percent of all women who visited the hospital wore their face mask effectively. Out of the 250 respondents, the proportion of effective face mask use was 78% (proportion = 78.0%; 95% CI = 72.3% - 83.0%); 90.0% had adequate knowledge of face mask use. More than half of the respondents, 133 (53.2%), agreed that they used face masks because they "felt susceptible to getting COVID-19 in the hospital". One major reason for using face masks among most respondents ;227 (90.8%) was that "having COVID-19 will be troublesome as it may spread to loved ones". Second/third stage of labour (aOR = 0.38; 95% CI = 0.17 – 0.83; p = 0.016), and secondary education (aOR = 0.25; 95% CI = 0.08 – 0.77; p = 0.016) were associated with ineffective mask usage, whereas disagreement with perception that pressure from mass media and government reminded them of the need to put on a face mask (aOR = 3.58; 95% CI = 1.44 – 8.93; p = 0.006), and adequate knowledge (aOR = 4.10; 95% CI = 1.49 – 11.28; p = 0.006) were factors associated with effective face mask use.

Conclusion: Generally, effective face mask use was high amongst respondents but was lowest in the second/third stage of labour. Knowledge of effective face mask use was also high. Even though the use of face mask is of historic value now, it is worth noting these important factors associated with mask use, to ensure compliance during future respiratory pandemics like COVID-19.

There is a need for health professionals at the hospitals to educate peripartum women with secondary education about the dangers of COVID-19 and the risk of spread, especially in the hospital.

CHAPTER ONE

1.0 INTRODUCTION

1.1 Background of the study

The incidence of acute respiratory infections is increasing in society. Respiratory diseases, from seasonal flu to emerging outbreaks, continue to affect us. People in many countries died from the 2003 SARS pandemic and suffered more from the subsequent outbreaks of H5N1 and H1N1 (Mackenzie et al., 2014). Subsequently, a new SARS-like coronavirus was discovered in the Middle East in June 2012 – human beta coronavirus 2c EMC/2012 (HCoV-EMC). The recent 2019 novel coronavirus disease (COVID-19) pandemic occurred with much faster spread, morbidity, and mortality (WHO, 2020).

The 2019 novel coronavirus disease (COVID-19) SARS-CoV-2 (severe acute respiratory syndrome) spread by respiratory secretions from human to human, was declared a public health emergency by WHO after starting in the city of Wuhan, China in December 2019 and spreading worldwide. It has a high morbidity and infectivity rate. The elderly and those with relevant comorbidities such as diabetes, hypertension, asthma, and conditions of immunosuppression are the most vulnerable groups, often needing mechanical ventilation. However, several patients do not have overt signs and symptoms (fever/respiratory) although they are infectious (Kowalski et al., 2020).

The transmission is produced mainly by symptomatic patients, but also asymptomatic individuals in the incubation period (which may last more than 14 days) are a source of occult transmission. In most asymptomatic cases, the swab polymerase chain reaction (PCR) results turn negative in about 3 days, whereas symptomatic patients usually have detectable viruses for 12 to 20 days (Chen, Jiang, & Zhao, 2020). There is still little knowledge about transmission in the recovery phase.

According to the John Hopkins dashboard on the current global statistics on COVID-19 accessed on the 11th of August 2022, of the 592 645 271 infected cases, 6 446 935 people lost their lives to the pandemic. In Africa, out of a total of 12 562 636 infected cases, 257 083 died with 11 721 612 recoveries and the remaining 583 941 are active cases ranging from mild, moderate to severe. The case fatality rate was calculated to be 2%.

South Africa was not exempt, with its total case count as of 11th August 2022 being 4 007 080 and a case fatality rate of 2.5% (101 982). Common complications of COVID-19 include pneumonia, acute respiratory distress syndrome (ARDS), septic shock, cardiac injury, and acute kidney injury (Schwartz et al, 2020).

Pregnant women do not appear more likely to contract the infection than the general population; however, pregnancy can alter the body's immune system and response to viral infections in general, which can occasionally cause more severe symptoms (ICNARC Report, 2020). Contrary to an initial study on the impact of COVID-19 on pregnancy that suggested that pregnant women were not at a higher risk of complications (Chen et al,2020), recent studies by Collin et al, 2020 and Ellington et al, 2020 conducted in Sweden and the United States respectively revealed the opposite. Pregnant and postpartum women are at higher risk of COVID-19 complications.

Pregnant women and their foetuses represent a high-risk population during infectious disease outbreaks. A systematic review and meta-analysis aiming to assess the impact of COVID-19 on maternal and neonatal outcomes identified the following: out of 24 articles including 1100 selected pregnancies with COVID-19, 89% had Covid pneumonia, 8% ICU admission, and 5 COVID-related maternal deaths. Of the neonatal outcomes, 3 stillbirths, 3 neonatal deaths, 2% NICU admissions, and 19 out of 444 neonates were COVID-19 positive, implying vertical transmission (Di Toro et al, 2021).

A high risk of vertical transmission of COVID-19 in the late third trimester has also been reported by Chen et al (2020).

Physiological changes in pregnancy and COVID-19

Pregnancy-related physiological and mechanical changes make women more vulnerable to infections in general, especially when the cardiorespiratory system is involved. Additionally, because of the shift from T-helper 1 to T-helper 2 immune system, the pregnant woman becomes more susceptible to viral infections with foetal protection (Nelson, 2015). This immunological shift mandates a special approach to pregnancies affected by COVID-19 virus. Due to susceptibility to severe infections, there is often delay in diagnosis and treatment in those with innocuous symptoms such as nasal congestion and pharyngitis. COVID-19 coryzal symptoms might mimic gestational rhinitis in pregnancy allowing for unchecked viral shedding and community transmission. About 18% Of COVID-19 patients experience respiratory difficulties (Guan et al, 2020). However maternal dyspnoea from physiological changes such as increased oxygen demand from heightened metabolism and physiological anaemia, must be distinguished from the pathological process of COVID-19. Pulmonary volumes such as functional residual capacity and residual volumes diminish progressively in pregnancy with diaphragmatic splinting by the gravid uterus. These changes result in markedly reduced total lung capacity at term making it difficult to expel adequately pulmonary secretions (Gardner et al, 2004). This is important in the context of COVID-19 pneumonia as the pregnant woman would be more easily at risk of hypoxemic respiratory failure in pregnancy with inadequate expectoration of pulmonary secretions (Shi et al., 2020).

Risk of transmission in labour

During labour and delivery, many women forcefully exhale, resulting in the possibility of aerosol generation. The birth attendant at this stage of labour may be exposed to these droplets. In addition, the birth attendant is also greatly exposed to vaginal secretions, predisposing them to an additional risk of viral transmission.

It is therefore important for obstetricians and midwives to wear N95 masks for maximal protection (WHO, 2020).

Prevention of COVID-19

Pharmaceutical and non-pharmaceutical measures against respiratory infections are available. Pharmaceuticals such as vaccines and antiviral medications are highly effective in eradicating respiratory infections, as evidenced in the case of smallpox. Newer vaccines have been developed with different therapeutic profiles for controlling this novel virus. However, as vaccines and antiviral medications take time to develop and are limited in supply, they are unable to sufficiently contain an outbreak caused by new pathogens, especially in the early stages of the outbreak (Chan et al, 2020). Non-pharmaceutical interventions, on the other hand, are not only able to aid in the control of the early stages of a new outbreak but are also useful in everyday disease prevention in the general population (Remuzi et al, 2020). Measures such as frequent hand washing have been proven to be effective in preventing the transmission of viral infections (odds ratio [OR] 0.45) (Koh, 2020). Non-pharmaceutical interventions are a cheap and non-invasive method to reduce mortality and morbidity from respiratory infections. Aside from hand washing, the use of face masks is useful in infectious disease control, especially in circumventing droplet transmission (Lu et al, 2020). The use of face masks and respirators is strongly recommended by the World Health Organization (WHO) and the Centres for Disease Control and Prevention (CDC) as a standard for transmission-based precaution (WHO, 2014). For example, surgical and N95 masks can block the transmission of SARS by

68% and 91%, respectively (Wang et al, 2020). Face masks, when fitted properly; effectively disrupt the forward momentum of particles expelled from a cough or sneeze, preventing disease transmission (Patel et al, 2020).

The appropriate use of face masks and respirators is important to provide the desired level of protection; however, it requires knowledge, training, and supervision. Compared with other types of personal protective equipment (PPE), adherence to the face mask and respirator use is traditionally low, despite expert recommendations (Eastwood et al, 2009). Societal and cultural variations are important factors that influence the use of masks. The contrast between face mask use as a hygienic practice (i.e., in many Asian countries) or as something only unwell people do (i.e., in European and North American countries) have induced stigmatisation and racial aggravations, for which further public education is needed (Tsang,2020).

Outside the hospital environment, the effectiveness of face masks in containing the spread of airborne diseases in the general population has been diminished, largely due to improper use and lack of user compliance (Jefferson et al, 2009). An Australian study showed that among the three methods used to handle an influenza pandemic – vaccination, isolation, and mask-wearing, willingness to comply with mask-wearing was the lowest (Taylor et al, 2009). Another Australian study found that, while adherence to mask-wearing significantly reduced the risk for influenza-like infections, less than 50% of the participants in their study wore face masks regularly (MacIntyre et al, 2009). In a study conducted in Singapore during the SARS outbreak, only 4% of the respondents had worn a face mask in the preceding three days (Quah et al, 2004). This highlights a need to uncover the determinants of mask-wearing, identify the issues, and overcome the barriers associated with mask-wearing compliance. In the context of COVID-19, South Africa made wearing face masks in public compulsory from 1st May 2020.

Key strategies to control the speed and extent of viral spread within health care settings have been advocated by national government guidelines and the WHO (Swaminathan et al.,

2007). These include infection control practices, instructions for the use of PPE, and dissemination of antiviral medications. In the setting of COVID-19, where antiviral medications and vaccine trials are still ongoing, the readily available preventive measure is the use of PPE in health care settings to minimize and prevent the spread of the virus. There are several different types of PPE, including eye protection with goggles, gowns, gloves, and face masks (N95, surgical, cloth mask). Improper donning and doffing of these PPEs may increase one's chance of being infected with the virus. It is therefore essential to train users on the recommended guidelines for donning and doffing.

Since this study seeks to study effective face mask usage, it is imperative to look at the different types of masks available in the setting of the current pandemic. N95 respirators are typically disposable and commonly referred to as filtering face-piece respirators; thus, a negative pressure particulate respirator with a filter is an integral part of the face-piece. It offers more protection against airborne particles than surgical and cloth masks and has the highest filtration efficiency among them. They are worn in high-hazard procedures such as in theatre when general anaesthesia is administered and in labour wards where aerosolization is high (WHO, 2020).

Cloth masks are reusable material masks. They have no integral filter; however, the CDC has recommended that people wear cloth face coverings in public and places where social distancing is hard to maintain. With significant community-based transmission, these helps prevent the spread of COVID-19 regardless of whether people are symptomatic or not (CDC, 2020). They are easy to obtain and simple to make at home.

Surgical masks on the other hand (medical masks) are loose-fitting disposable coverings for the nose and mouth, 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's respiratory droplets, helping to protect patients against contamination (MacIntyre et al., 2016). They have relatively higher bacterial filtration efficiency and sub-micron particulate filtration efficiency than cloth masks.

This study aims to determine the proportion of peripartum women who effectively use this face mask during labour and immediately postpartum, as well as to elucidate the reasons for the use and non-use of face masks.

1.2 Statement of the Problem

The current global COVID-19 pandemic is decimating the human population. With its increasing morbidity, mortality, and high infectivity, many more people are easily infected, and depending on the person's underlying health status, he or she may develop complications (WHO, 2020)

Apart from death, some of the commonly recognized complications of patients with coronavirus disease 2019 include pneumonia, acute respiratory distress syndrome (ARDS), diffuse alveolar damage, sepsis, septic shock, cardiac injury, arrhythmia, cardiomyopathy, acute kidney injury, liver dysfunction, multi-organ failure, thromboembolism, and gastrointestinal bleeding (Schwartz et al, 2020).

The report from the systematic review and a meta-analysis by Di Toro et al., (2021) where 1100 pregnant women and a significant number of neonates were affected with adverse outcomes implies that steps must be taken to prevent maternal and neonatal infection.

As is evident from the above complications, it is important for a multidisciplinary public health approach in implementing the needed measures to curb the spread and effects of COVID-19.

1.3 Justification

Mowbray Maternity Hospital is a secondary-level referral hospital which treats women with complicated pregnancies referred from the Midwife Obstetric Units of False Bay, Retreat, Hanover Park, Gugulethu and Mitchells Plain. They are situated within the Western Cape province of South Africa.

With the above description, it is worth noting that it has a large drainage area, with many pregnant women with their attendant problems attending the facility.

This facility has therefore been chosen to offer an appropriate setting for the study objective.

1.4 Objectives of the Study

1.4.1 General Objective

To assess the use of face masks and associated factors among peripartum women at Mowbray Maternity Hospital during the current COVID-19 pandemic

1.4.2 Specific objectives

The following specific objectives were pursued:

1. To determine the proportion of women in the peripartum period (first and the second stage of labour, and immediate postpartum period) that effectively use face masks at Mowbray Maternity Hospital during the COVID-19 pandemic.

2. To describe the demographics of these women

3. To assess perceived reasons for the use or non-use of face masks as well as knowledge of benefits in the peripartum period at Mowbray Maternity Hospital.

4. To determine factors associated with effective face mask use among women in the peripartum period at Mowbray Maternity Hospital

1.5 Conceptual framework

1.5.1 Summary of framework

The Health Belief Model (HBM) is a change in health behaviour and psychological model created by Rosenstock in 1966 to predict behavioural reactions to care received from patients with acute or chronic illnesses (Rosenstock, 1966). It consists of four components – perceived susceptibility, perceived severity, perceived barriers, and perceived benefits. The use of HBM to predict more general health habits (e.g., the public's actions in their use of face masks in the community) has become more comprehensive in recent years. Tang and Wong (2004) proposed a modified version of the HBM which has an additional component (i.e., cues to action). The HBM offers a planning structure that has commonly been used to describe other aspects of preventive behaviour and to design initiatives for prevention.

Perceived susceptibility: Perceived susceptibility refers to the extent to which one thinks he or she is at risk of becoming infected. It is a major force driving compliance to mask-wearing. A higher perception of susceptibility is linked to higher compliance with mask-wearing.

Perceived benefits: The presumed benefits in the present sense relate to how effective face masks are believed to be in preventing society and/or persons from transmitting diseases. Significant associations exist between perceived benefits and the probability that a person was willing to wear a face mask.

Perceived severity: The degree to which a person is compliant with a health intervention depends on how much a person fears a disease or outbreak and how anxious he/she is that his / her home is a quarantined residence.

Perceived barriers: The potential obstacles apply in the present sense to factors that may discourage or inhibit individuals from using face masks.

Cues to action: In addition to individual beliefs, environmental factors also impact one's decision regarding whether to wear masks. Family, culture, media, and government play a

major role in promoting preventive measures (e.g., using face masks), especially during an outbreak of a community-level disease.

Refer to Figure 1 below for the perceived benefits, severity, barriers, and susceptibility factors included in this study.

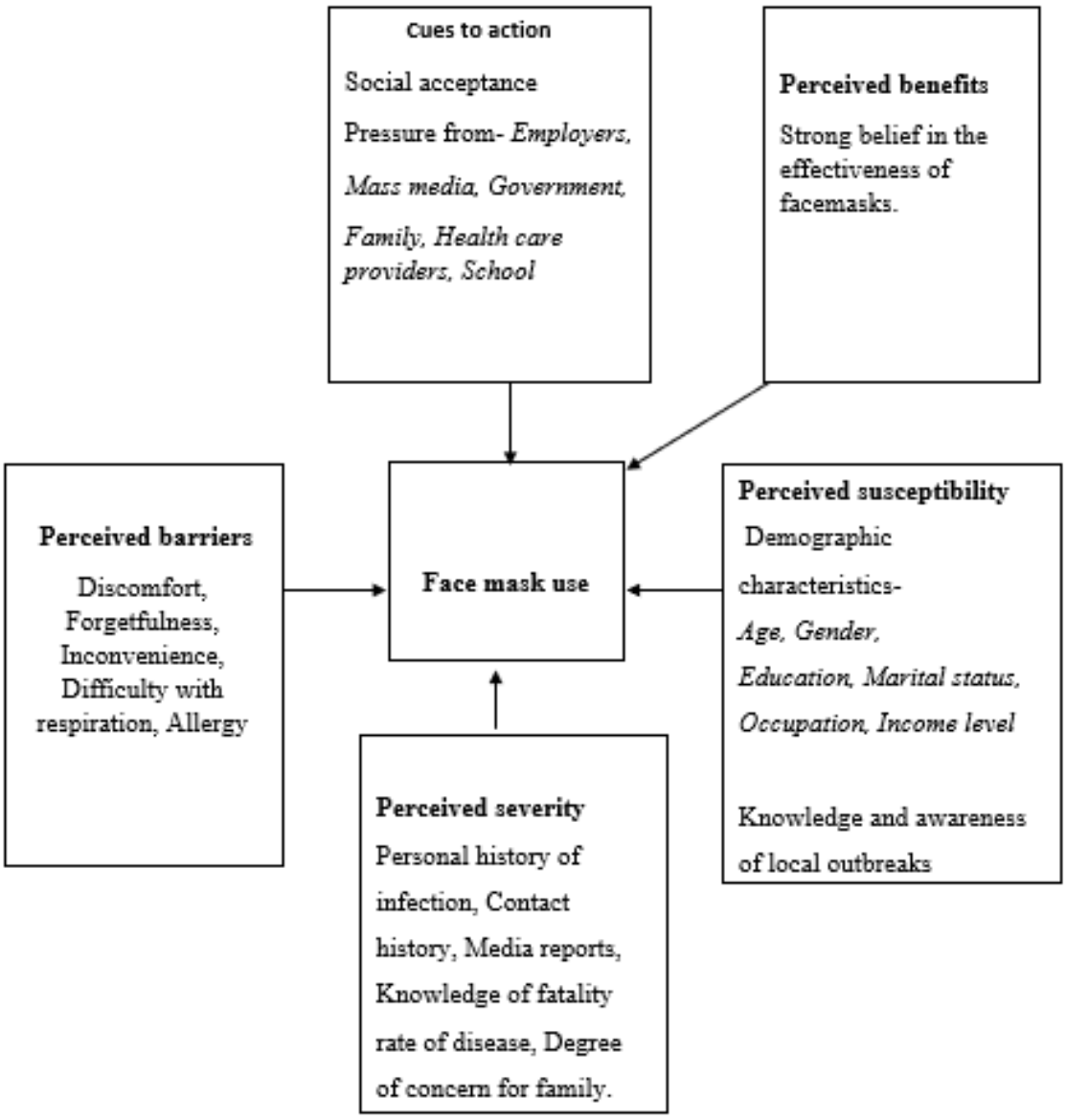

Figure 1.1: Conceptual framework

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 Introduction

It also focuses on the overview and epidemiology of COVID-19, pregnancy and COVID-19, face mask use (effective use and proportion of face mask use), and factors influencing the use of face mask according to the health belief model determinants and socio-demographic characteristics.

2.2 Overview of COVID-19

SARS-CoV-2 is a single-stranded, enveloped, positive-sense RNA (+ ssRNA) virus (Kampf, Todt, Pfaender, & Steinmann, 2020; Kramer, Schwebke, & Kampf, 2006). It has been found to be a new human-infecting beta coronavirus (Lu ***et al***., 2020). SARS-CoV-2 genome phylogenetic analysis suggests that the virus is closely related (with 88 percent identity) to two bat-derived SARS-like coronaviruses collected in eastern China in 2018 (bat-SL-CoVZC45 and bat-SL-CoVZXC21) and genetically distinct from SARS-CoV (with approximately 79% similarity) and MERS-CoV (Lu et al., 2020).

Huanan Seafood Wholesale Market is widely acknowledged as the centre for the propagation of the disease.

Person-to-person transmission between close contacts, is thought to occur primarily through respiratory droplets produced when an infected person coughs or sneezes. Fomites may be a source of transmission, as SARS-CoV has been found to persist on surfaces for up to 4 days, (Kramer *et al*., 2006) and other coronaviruses for up to 9 days (Kampf *et al*., 2020).

2.3 Epidemiology of COVID-19

Adult male patients with a median age between 34 and 59 years were the most affected (Huang *et al*., 2020). People with chronic comorbidities such as cardiovascular, cerebrovascular diseases, and diabetes are more likely to be infected with SARS-CoV-2 (Chen *et al*., 2020). The highest proportion of severe cases occurs in adults≥60 years of age with these comorbidities (Wang *et al*., 2020). According to the CDC, about 14.3million total COVID-19 cases have been reported globally among children, with varying severities as of 11th August 2022 (https://Covid.cdc.gov/covid-data-tracker/#demographics).

The clinical features of infected paediatric patients vary, but most have had mild symptoms with no fever or pneumonia, and have a good prognosis (Shen & Yang, 2020). They do, often have milder manifestations; therefore, making parents not seek early treatments leading to an underestimate of COVID-19 incidence in this age group.

2.4 Pregnancy and COVID- 19

Recent studies by Collin et al., 2020 and Ellington et al., 2020 conducted in Sweden and the United States, respectively, revealed the opposite of an initial study on the impact of COVID-19 on pregnancy that suggested that pregnant women were not at a higher risk of COVID-19 complications (Chen et al., 2020). According to Kim et al, 2022, who conducted a study in South Korea between January ,2020 and February 2021, pregnant women admitted with COVID-19 were at higher risk of requiring oxygen therapy (Kim et al, 2022), reinforcing the initial assertion that pregnant women are at higher risk of COVID-19 complications.

Regarding vertical transmission (transmission from mother to child during antenatal or labour), emerging research now suggests that this is possible (Lamouroux et al, 2020). However, the available proof has significant limitations (Wang c et al, 2020). Two studies have reported evidence of IgM SARS-CoV-2 in neonatal serum at birth (Dong L et al, 2020). This will

indicate a neonatal immune response to in utero infection, assuming IgM does not cross the placenta.

A systematic review and meta-analysis aimed to assess the impact of COVID-19 on maternal and neonatal outcomes identified the following: out of 1100 selected pregnancies with COVID-19, 89% had COVID pneumonia, 8% ICU admission, and 5 COVID- related maternal deaths. Of the neonatal outcomes, there were 3 still births, 3 neonatal deaths, 2% NICU admissions. Nineteen out of 444 neonates were COVID -19 positive, implying vertical transmission (Di Toro et al, 2021).

A high risk of vertical transmission of COVID-19 in the late third trimester has also been reported by Chen et al. (2020).

A review of 73 articles on maternal and neonatal outcomes in COVID-19 positive patients by Smith et al. (2020), reported a higher incidence of new-borns of COVID-19 positive mothers admitted to neonatal intensive care unit (NICU) compared to the general population. This finding reinforces the effect and impact of COVID-19 on pregnancy.

In another study by Sunder et al. (2022), foetal growth restriction and miscarriage were identified complications of COVID-19 after adjusting for confounders.

Maira et al., (2022) conducted a study in Brazil to collect and analyse data from different sources, in order to have a general overview of COVID-19-related maternal deaths between 20-43 years. From the study, 20 COVID-19 related maternal deaths were identified, with 16 occurring in the postpartum period.

Similarly, a study by Asalkar et al. (2022) found that, among 871 COVID-19 cases diagnosed in pregnancy, 9 died from COVID pneumonia with 5 of the deaths occurring in the 3rd trimester.

Budhram et al., (2021) conducted a population-based cohort study among 36 hospitals in South Africa assessing pregnancy outcomes of hospitalized pregnant women with Covid-19. Out of 271 admitted COVID- 19 cases, 32 deaths occurred compared to 7 among women admitted for other indications. There were 179 preterm births, 25 stillbirths and 12 neonatal deaths.

These data seek to confirm the debilitating effect of COVID-19 in pregnancy with adverse feto-maternal outcomes.

2.5 Face mask

This sub-section illustrates face mask use, the proportion of people who use face masks when required, as well as the technique for effective use of face masks.

2.5.1 Face mask use

Face masks have been widely used to prevent COVID-19. However, evidence that face masks provide effective protection against the disease is lacking (WHO, 2020). Nevertheless, when caring for patients with respiratory infections, they are widely used by health professionals as part of droplet precautions. Suggesting vulnerable individuals avoid crowded environments and rationally use surgical face masks when exposed to high-risk areas would be prudent.

Recommendations on face mask use differ across countries and, once local epidemics begin, the use of masks increases considerably, including the use of N95 respirators in community settings (without any other protective equipment). The rise in general public use of face masks exacerbates the global supply shortage with rising costs. This results in supply challenges to healthcare workers in the frontline.

To prioritise local demand, a few countries (e.g., Germany and South Korea) banned the exportation of face masks (To et al., 2020). There was a call by WHO for an increase in the production of protective equipment, including face masks by 40% (WHO, 2020).

It is also important to note that inappropriate usage of face masks, such as not changing disposable masks, could jeopardize the protective effect and even increase the risk of infection. Currently, WHO advises that people wear face masks if they have respiratory infections or are taking care of people who do. To avoid potential asymptomatic or pre-symptomatic transmission, it would be fair to suggest that people in quarantine wear face masks if they need to leave home for any reason. In addition, vulnerable groups, such as older adults and those with existing medical conditions should wear face masks where appropriate.

The universal use of surgical mask could be considered if supplies permit. However, it was important to investigate the use of face masks among vulnerable groups such as pregnant women especially at the peak of the pandemic and when most women in South Africa had no access to vaccinations. South Africa made masks wearing mandatory under partial easing of restrictions from May 1, 2020, when the COVID-19 pandemic was at its peak.

It lifted the mandatory use of mask-wearing in indoor public spaces, removed restrictions in gatherings and eased rules for travellers at Ports of entry on the 23$^{rd\ of}$ June 2022. This happened after a decline in the peak of COVID -19 wave and when it realised that the limited 5th wave was driven by sub variants and not a new variant of concern.

2.5.2 Technique for face mask use

The technique of using a face mask refers to the way a face mask is worn and taken off (Centre for Health Protection, 2019). This includes performing hand hygiene before wearing the face mask, selecting appropriate mask size, ensuring correct positioning of the mask to cover the nose, mouth, and chin and avoid touching the face mask once secured on the face. The mask should also be removed and disposed of correctly (Centre for Health Protection, 2019).

According to a cross-sectional study conducted in a primary care outpatient setting in Hong Kong to assess the technique of face mask use, although 88.4% of the study participants

believed they knew the correct steps for wearing a face mask, only 52.0% answered the questions correctly (Ho HSW, 2012). This study subjectively assessed the technique of face mask-wearing by asking participants whether they knew the correct steps.

2.5.3 Proportion of people who effectively use face mask during a respiratory pandemic

The practice of using a face mask can be observed in five situations, namely, when (1) caring for family members with fever (2) caring for family members with respiratory infections, (3) attending clinics during peak season or a flu pandemic, (4) attending hospitals during peak season or a flu pandemic, and (5) having respiratory symptoms (Centre for Health Protection, 2020). In the first four situations, people typically wear a face mask to protect themselves. In the latter, face mask is worn to protect others.

According to a recent study (Lee et al., 2020) on the utilization of face mask, the overall participants' performance in the practice aspect was unsatisfactory. Only 114 participants (7.6%) indicated that they had always worn a face mask. Less than half of the respondents (range of 14.7–48.1%) indicated a face mask was worn under individual required situations. Males reported lower frequency in the use of face masks compared with females. Participants of different age groups reported different practices of mask use when attending clinics during the pandemic ($\chi 2= 14.46$, $p< 0.05$). Participants aged 55–64 years (mean rank = 669.18) had a relatively lower frequency of face mask use than those aged 18–24 years (mean rank = 850.11) when having respiratory symptoms ($p< 0.001$).

Similarly, the WHO promoted the use of non-pharmaceutical public health measures in the setting of severe acute respiratory syndrome (SARS) and H1N1 epidemics. The global supply of vaccines and antiviral agents was limited and not readily available. Many nations, such as the United States of America, Australia, and France, had included the use of face masks in their pandemic measures (Ho, 2012). Notwithstanding this global intervention, research conducted

to assess the practice of face mask-wearing in the outpatient department setting of primary health care in Hong Kong revealed that respondents were more likely to report wearing a face mask to protect others in public places (86.5%, 95% CI 83.1–89.9%) and at the clinic (91.8%, 95% CI 89.0–94.6%) with relatively lower use for self-protection in public places (69.2%, 95% CI 64.6–73.8%) (Ho, 2012).

2.6 Factors influencing the use of a face mask

This sub-section shows the factors that affect the use of face masks.

They include the health belief model determinants and socio-demographic characteristics.

2.6.1 Health Belief Model Determinants

This section illustrates the health belief model and how it influences the use of face masks as a health preventive behaviour.

They include perceived susceptibility, severity, benefits, barriers, and cues to action.

Researchers have explained that an individual's practice of protective behaviours is one of the most effective ways of preventing disease and promoting health (Berrigan et al, 2003). With environmental and policies support, these individual preventive habits can be transmitted to successful population-level prevention initiatives (McKinlay & Marceau, 1999). These include public education, media campaigns that, environmental manipulation and national policies. The Health Belief Model, Theory of Reasoned Action, Social Cognitive Model and the Protection Motivation Theory have been proposed to predict preventive behaviours at the personal level (Aday et al, 2014). However, the most used is the Health Belief Model which offers the required framework for this study.

2.6.2 Sociodemographic characteristics

There is literature that documents the important associations between demographic characteristics of individuals and their practice of preventive behaviours. (Berrigan et al, 2003, Boutelle et al, 2000)

Recognised health disparities and disparities in pandemic related face mask use can be partly attributed to differences in the global socio-demographics (WHO 2015). Affluent women, better-trained individuals, and those who are married, are more likely to follow proposed protective behaviours in general. There is an inverted curvilinear link between age and preventive behavioural practice (Tang & Wong 2004). Generally, the practice of preventive health behaviour tends to decrease from young children, through adolescence and adulthood but improves again among older people.

Age: Adults are more likely to believe that disease and disabilities are inevitable. This makes them more reluctant to practice suggested preventive behaviours necessary to prevent ill health (Borreani et al., 2010).

This assertion may, however, be affected in the context of COVID-19 and other respiratory pandemics as the fear of the aged being more vulnerable will make them better adhere to face mask wearing.

Marital status: In the same study by Tang et al, there was a higher degree of mask-wearing compliance reported among married persons (Tang & Wong 2004). This finding was confirmed by Taylor et al. (2009) who found that individuals who never married had lower levels of compliance. Nevertheless, the authors of that research clarified that marital status was likely a confounder as the probability of a person getting married increases with age. As such, it may not be a marital status that predicted compliance to the wearing of masks, but age itself.

Educational level: Mask-wearing behaviour has been found to be positively associated with higher education. In a survey conducted among Taiwan's shoppers and traditional market workers, participants with higher education were more likely to wear face masks (adjusted OR 6.86) (Kuo et al, 2011). This trend was echoed by the results of telephone surveys conducted in Hong Kong by Lau et al. (Lau et al, 2007) and in Australia by Taylor et al. (Taylor et al., 2009).

Gender: It has been found in many other studies that women are more likely than men to don face masks. Women were more likely to wear face masks during the SARS outbreak in Hong Kong to avoid SARS (OR 1.810, 95% CI 1.445–2.268) (Tang et al, 2004). During the H1N1 outbreak, this was similarly observed, where women were more likely to wear face masks frequently in public areas (OR 1.94, $p < 0.001$) and when they went out, with influenza-like symptoms (OR 2.44, $p < 0.001$) (Lau et al,2007).

However, that from Taiwan (Kuo et al., 2011) and Australia (Taylor et al., 2009) failed to find gender differences in the use of face masks. These findings need to be interpreted cautiously as behavioural change over time, regional cultural differences and variation in research methods could be attributable factors.

2.7 Knowledge of face mask use

Research was conducted among healthcare workers in Pakistan in April 2020 to assess their knowledge, attitude, and practices regarding face masks use during the COVID-19 pandemic. It was found that the knowledge of the technique and practice of face mask were inadequate. Of the total of 392 participants, 43.6% of participants knew how to wear the masks properly, 68.9% recognized that there are three layers, 53% said that the middle layer serves as a filter media barrier and 75.5% knew the prescribed maximum wearing period (Kumar et al, 2020).

It is obvious that if the general knowledge of face mask use among health workers who are supposed to know better is inadequate, that of the general public will undoubtedly be lower.

3.0 METHODS

3.1 Introduction

This chapter shows the methods adopted for data collection and analysis in the study.

3.2 Study design

This study was an analytical cross-sectional study using quantitative data to assess the proportion of peripartum women who wear face masks correctly, incorrectly, or not at all in the different stages of labour over one month. Effective face mask use was measured by WHO advice on the use of masks in the context of COVID-19 (WHO, 2020). In addition, a smaller sample of women answered a structured questionnaire assessing their knowledge of and reasons for correct, incorrect, or no use of face masks.

The investigator observed patients over 10 minutes in each stage of labour and postpartum in terms of face mask use (the same investigator did the observation to avoid bias and inconsistencies). This was done unobtrusively, and staff and patients were blinded to the study. A checklist was used to record face mask usage data. The type of mask worn as well as the correctness of usage was recorded. Maternal demographic and social factors such as age, educational level, marital status, household income, and employment status were recorded.

Patients were included each day from each of the different sections of the labour ward. Sampling was opportunistic based on a specified time slot each day.

Of the total of 500 patients observed over the data collection period of one month, respondents were selected using a simple random technique from each stage of labour to answer an administered questionnaire. The data were collected using a structured interviewer-administered questionnaire to elicit responses regarding patients' knowledge of face mask use and reasons for wearing or not wearing masks. A questionnaire for evaluating the knowledge of effective face mask use was adopted from published articles and contextualised to local

situations according to the WHO tool on the use of masks in the context of COVID-19. Eight items were generated to assess knowledge of effective mask use (Refer to Appendix B, under knowledge face mask use). The knowledge score was obtained by summation of responses to each question. Each question was given one mark if the answers were correct or favourable and zero if incorrect or unfavourable. Study participants were classified 1) incorrect use/ inadequate knowledge if they scored < 50% on effective use and knowledge questions and 2) correct use /adequate knowledge if they correctly answer ≥50% of questions. Effective use of face masks was also assessed by an observation checklist that had five items (Ensure the coloured side of the face mask is facing outwards, Ensure the part with metallic strip is on the upper side, Position the elastic band properly, Extend the face mask to cover mouth, nose and chin, avoid touching the face mask once it is secured).

Anyone who had all five items correct was deemed to have effectively worn their face mask.

3.3 Study site

Mowbray Maternity hospital (MMH) is a Level 2 public sector specialised maternity hospital in Cape Town, which provides maternal and neonatal care. It receives complicated obstetric and neonatal referrals from primary care midwife obstetric units (Gugulethu, Mitchell's Plain, Retreat, Hanover Park, Hout Bay, Al- Nisa private MOU, Claremont BANC, Heideveld CHC, etc.) and False Bay hospital. It is part of the teaching platform of the Department of Obstetrics and Gynaecology, and the Department of Paediatrics of the University of Cape Town.

It renders antenatal, intrapartum, postnatal, and family planning services. On average, over 950 deliveries occur every month with a 50% caesarean section rate. It has a first stage labour ward, second stage labour ward, antenatal and postnatal wards.

3.4 Study population

Peripartum women (women in labour and immediate post-partum period) at Mowbray Maternity Hospital within the study period of one month.

3.5 Inclusion criteria

Peripartum women (women in first and second stage of labour and immediate post-partum period) at MMH who are COVID negative **with** no contraindication to mask use.

3.6 Exclusion criteria

Contraindication to mask use (people with severe acute asthma, dyspnoea, and allergy)

3.7 Sample Size Determination

The sample size was calculated using the formula for estimating proportion. The formula is represented below:

n= N/ (1+N (e) 2)

Where **n**= required sample size, **N**= sample frame (population under study), **e**= margin of error in this case 5%.

The total average vaginal deliveries per month are about 500, thus N is 500. Using the above formula; n= 500/ (1+500(0.05)2) = 223. **Therefore, a sample size of 223 was used.**

Adjustment for a 10% rate of non-responses of **223** yielded a final sample size of **250.**

The estimated sample size of 250 is expected to include all stages of labour.

The population was sampled from three data collection points. Hence the sample size was trichomised using the beds/unit ratio. The beds/unit ratio for the three data collection points is 8:4:6 for the first stage, labour ward, and immediate postpartum ward, respectively.

The overall sample size divided by this ratio resulted in a sample of (8/18 *250) **111**, (4/18 *250) **56**, and (6/18*250) **83** from the first stage, second stage/ third stage, and immediate postpartum ward respectively.

The total sampling frame of 500 patients were observed using the checklist, from which 250 patients representing the sample size were selected to answer the structured questionnaire.

3.8 Sampling

Simple random sampling was employed to select study participants from each stage to obtain the calculated daily proportionate sample size to answer the structured questionnaire (thus 4 for the first stage, 2-second stage, and 3 immediate postpartum). Beds were numbered and random selection was done. For example, to select 4 patients from the estimated 8 in the first stage, 8 papers were numbered and balloted, those who chose 1 to 4 had their beds numbered and anyone who subsequently occupied those beds was recruited for answering the structured questionnaire unless they did not give consent. This was replicated over the data collection period till the desired sample size for each stage was obtained.

3.9 Study period

From the 1st of October 2020 to the 31st of October 2020.

3.10 Data collection Tool

Data collection was done using structured interviewer administered questionnaire and observation checklist (Refer to Appendix B). The questionnaire comprised closed-ended questions. The questionnaire was used for data collection because it offered a considerable advantage in its administration: questionnaires present an even stimulus potentially to large

numbers of people simultaneously and provide the investigation with an easy accumulation of data. They also give respondents the freedom to express their views or opinion.

The structured interviewer-administered questionnaire was divided into three sections. The first section involved socio-demographic characteristics. Section 2 inquired about their knowledge of the technique, practice, and benefits of face mask use. Section 3 asked questions relating to their reasons for use or non-use of face mask (thus enablers and barriers to the use of face mask).

Effective use of face mask (outcome variable) was assessed using an observation checklist. The type of mask worn as well as the correctness of usage was recorded. The checklist was designed to verify whether their knowledge of mask use was consistent with practice.

3.11 Quality Control

Quality control, according to Sansoni et al. (2010), is the process of giving the same data tool twice to the same group of participants. The questionnaire was administered to ten subjects within a week chosen for the pilot study.

Two research assistants were selected and trained to assist with data collection. There were trained on being confidential and professional with data collection. The data was password protected for security and saved on a Google Drive (cloud storage) to prevent information loss.

3.12 Training of interviewers

All interviewers attended a training session organised by the primary investigator who also accompanied them as they pretested the data collection tools. The interviewers were retrained using the feedback obtained from the pretesting.

3.13 Pretesting the instruments

The questionnaire for the study was pre-tested on patients (with comparable characteristics) who were chosen at random and weren't going to be interviewed for the main study. The questionnaire was adjusted as necessary after the pre-testing.

3.14 Data processing

The investigator, research assistants, and the data entry clerk regularly verified and validated the data, checking and resolving any discrepancies. The STATA Version 15 Software was employed in data cleaning, entry and data processing.

3.15 Data analysis

Analytical statistics was used to assess the proportion of peripartum women who effectively wore face masks. Effective face mask use was measured with the WHO tool on mask usage in the context of COVID-19. A structured interviewer-administered questionnaire was used to assess knowledge and perceived reasons for face mask use among 250 selected peripartum women. Data were analysed in STATA version 15.0. Frequencies and percentages were reported for categorical variables. Graphs and percentages were used to report the proportion of women who effectively used face masks in each of the stages of labour. The chi-square or Fisher's exact test (where necessary) were used to determine the association between effective face mask use and the factors that influenced its use. A multiple logistic regression model with a significance level set at $p<0.05$, was employed to determine the factors associated with effective face mask use.

3.16 Ethical considerations

3.16.1 Ethical clearance

The University of Cape Town's Human Research Ethics Committee (**HREC REF: 823/2020**) provided ethical approval for the research. Permission to collect data was obtained from the

relevant authorities at MMH. Appropriate consent was sought from the patients. The participants' names were anonymised (participant number: 001 to 250) and entered a spreadsheet/database.

3.16.2 Participants' consent

This was developed to either be signed or thumb printed by participants. Individual patients who agreed to be part of the study provided a written informed consent

3.16.3 Voluntary consent

Participation was optional and participants were at liberty to abstain at any point from the study when they wished to without any penalty.

3.16.4 Privacy and confidentiality

After a year, all information gathered via the hard copy of the questionnaire will be discarded and that of the soft copy will be deleted from the computer and external drive after five years.

3.17 Potential risks/benefits

Participants in the study did not experience any harm as a result of the research. There were no exposure risks in the study.

3.18 Compensation

There were neither financial benefits nor other material benefits to participants.

3.19 Protocol amendments

The ethics review committee was notified in the case that the study's title or location changed during the investigation.

3.20 Conflict of interest

There was absolutely no conflict of interest in the study. The questionnaire results were used purely for academic purposes in the study.

3.21 Funding information

The entire cost of research was self-sponsored.

CHAPTER 4

4.0 RESULTS

4.1 Socio-demographic characteristics of respondents

Table 4.1 shows the socio-demographic characteristics of respondents from the study and the stage of labour and number of women in that stage when they were recruited. The results showed that more than half of the respondents 53.6% (134/250) were in the age range of 21 to 30 years. Most of the respondents, 61.6% (154/250) had more than one child.

Out of the 250 respondents, 55.2% (138) were married.

Almost all respondents, 99.2% (248/250) had had some form of formal education with 74.8% (83/111) of those at the first stage of labour having had up to secondary school education. Eighty-two percent (46/56) and 75.9% (63/83) of respondents at the second stage of labour and postpartum respectively, also had up to secondary school education.

Most of the respondents, 61.2% (153/250) were unemployed with 97.6% indicating that they did not have any allergies.

Table 4.1 Socio-demographic characteristics of respondents (n = 250)

Variables	Total n (%)	First stage n (%)	Second stage n (%)	Post-partum stage n (%)
Age distribution				
18-20 years	19(7.6)	12(10.8)	1(1.8)	6(7.2)
21-30 years	134(53.6)	53(47.8)	36(64.2)	45(54.2)
31-40 years	86(34.4)	42(37.8)	17(30.4)	27(32.5)
Over 40 years	11(4.4)	4(3.6)	2(3.6)	5(6.0)
Parity				
Primigravid	96(38.4)	48(43.2)	20(35.7)	28(33.7)
Multigravida	154(61.6)	63(56.8)	36(64.3)	55(66.3)
Parity				
Primigravid	96(38.4)	48(43.2)	20(35.7)	28(33.7)
Multigravida	154(61.6)	63(56.8)	36(64.3)	55(66.3)
Relationship status				
Single	96(38.4)	43(38.7)	19(33.9)	34(41.0)
Married	138(55.2)	57(51.4)	35(62.5)	46(55.4)
Cohabiting	12(4.8)	7(6.3)	2(3.6)	3(3.6)
Divorced	4(1.6)	4(3.6)	0(0.0)	0(0.0)
Educational level				
None	2(0.8)	1(0.9)	1(1.8)	0(0.0)
Primary	6(2.4)	2(1.8)	2(3.6)	2(2.4)
Secondary	192(76.8)	83(74.8)	46(82.1)	63(75.9)
Tertiary	50(20.0)	25(22.5)	7(12.5)	18(21.7)
Employment status				
Employed	97(38.8)	39(35.1)	21(37.5)	37(44.6)
Unemployed	153(61.2)	72(64.9)	35(62.5)	46(55.4)
Allergies				
No	244(97.6)	109(98.2)	54(96.4)	81(97.6)
Yes	6(2.4)	2(1.8)	2(3.6)	2(2.4)

4.2 Effective face mask use among the sampling frame

Of the 500 women who came to the facility within the study period, 476 (95.2%) were observed to be wearing a face mask. Amongst those who wore the face mask to the facility, the distribution of effective face mask use is shown in the pie chart below. Nearly eighty-two percent (81.7%) of women who visited the hospital effectively wore their face mask.

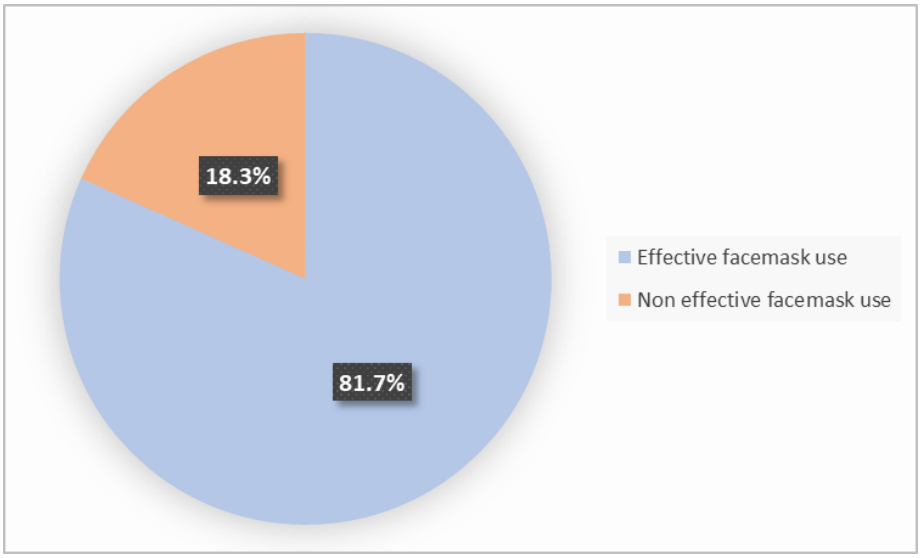

Figure 4.1 Proportion of face mask use among the sampling frame

4.2.1 Technique of face mask use among respondents

Table 4.2 below shows the techniques of using a face mask. Most of the respondents 90.8% (227/250) indicated that it was appropriate to ensure that the coloured side of the face mask was facing outwards. Nearly ninety percent (224/250) of respondents stated that it was correct to ensure that the part of the face mask with the metallic strip was on the upper side. In addition, 91.2% (228/250) of respondents indicated that it was best to position the elastic band properly.

Table 4.2 Effective facemask use

Technique of using a facemask	Correct n (%)	Incorrect n (%)
Ensure the coloured side of the facemask is facing outwards	227 (90.8)	23 (9.2)
Ensure the part with metallic strip is on the upper side	224 (89.6)	26 (10.4)
Position the elastic band properly	228 (91.2)	22 (8.8)
Extend the facemask to cover mouth, nose and chin	218 (87.2)	32 (12.8)
Avoid touching the facemask once it is secured	219 (87.6)	31 (12.4)

Effective face mask use of respondents was assessed using five items. Respondents' correct answers attracted a score of 1. The overall score was dichotomized into two levels; thus, respondents who scored all five items correctly were deemed to use face masks effectively whilst those who scored ≤ 4 were deemed not to use face masks effectively.

The proportion of respondents with effective face mask use was 78% (pr = 78.0%; 95% CI = 72.3% - 83.0%).

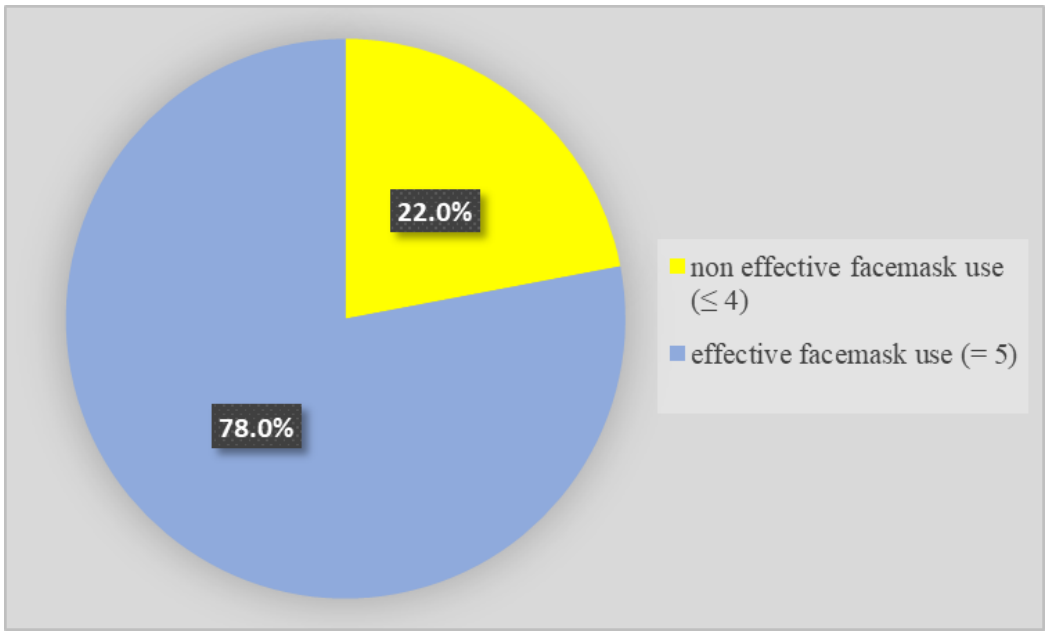

Figure 4.2 Proportion of effective face mask use among respondents

4.2.2 Effective face mask by labour stage

Effective face mask use was highest at the postpartum stage (83.1%). The second stage of labour recorded the lowest prevalence (64.3%) of effective face mask use as compared to the first stage of labour (81.1%) and the postpartum stage (See figure 4.3)

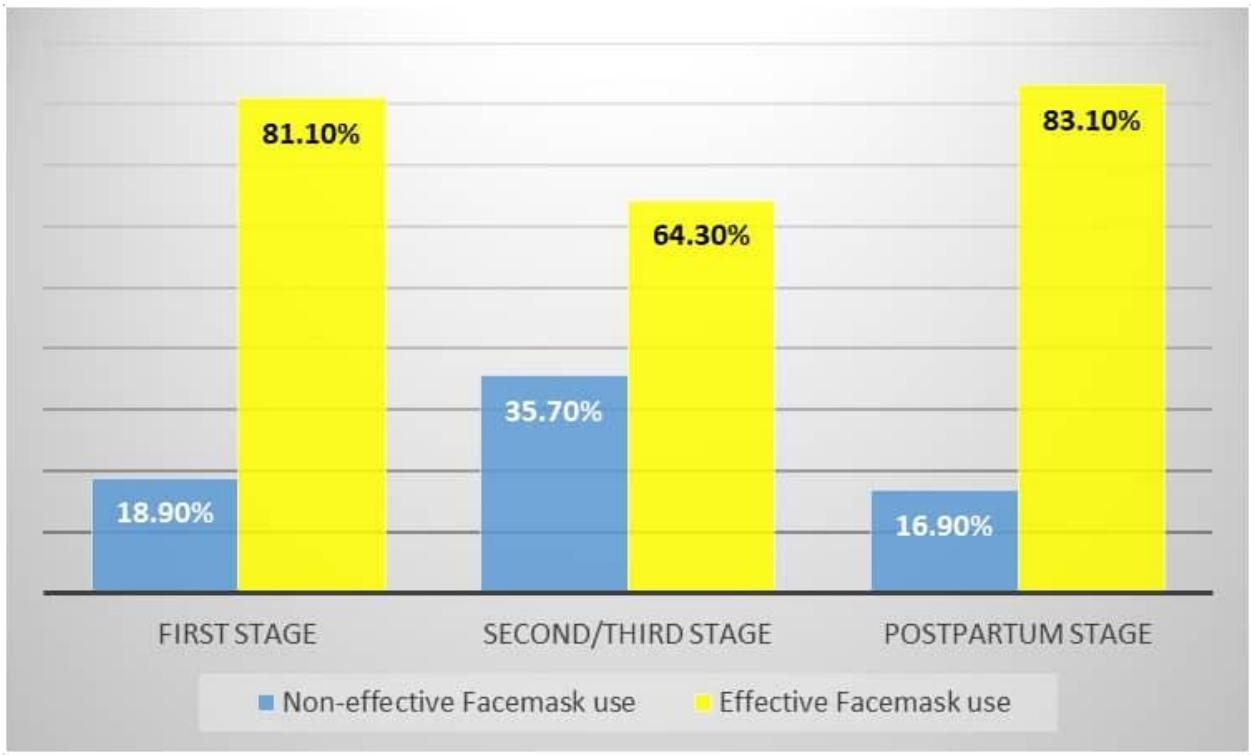

Figure 4.3 Proportion of effective face mask use by labour stage

4.2.3 Association between labour stage and effective face mask use

Table 4.3 displays the results of the chi-square test of association between labour stage and effective face mask use among respondents. The result was found to be statistically significant (p = 0.018).

Table 4.3 **Association between labour stage and effective facemask use**

Variable	Effective facemask use Yes (n = 195)	No (n = 55)	p-value
Labour stage			**0.018***
First stage	90(81.1)	21(18.9)	
Second/Third stage	36(64.3)	20(35.7)	
Postpartum stage	69(83.1)	14(16.9)	

+ (fisher's exact) *(statistically significant, p≤0.05)

4.3 Knowledge of face mask use

Table 4.4 documents knowledge of face mask use among the 250 respondents.

Table 4.4 **Knowledge of face mask use**

Variables	True n (%)	False n (%)	Don't know n (%)
When wearing a facemask at the clinic, there is no need to cover the mouth when sneezing or coughing	89(35.6)	160(64.0)	1(0.4)
A cloth mask is effective as a regular surgical face mask	151(60.4)	76(30.4)	23(9.2)
The used facemask can be stored in a bag for later use when one is not sick	57(22.8)	187(74.8)	6(2.4)
A facemask helps to prevent HIV	13(5.2)	232(92.8)	5(2.0)
Perform hand hygiene before mask wearing	232(92.8)	13(5.2)	5(2.0)
Choose the appropriate size of facemask	209(83.6)	35(14.0)	6(2.4)
Dispose of the used facemask in a lidded rubbish bin	233(93.2)	13(5.2)	4(1.6)
Touch only the elastic band when taking off the mask	222(88.8)	16(6.4)	12(4.8)

4.3.1 Overall knowledge of effective face mask use among respondents

Out of the 250 respondents, 90.0% had adequate knowledge on effective face mask use.

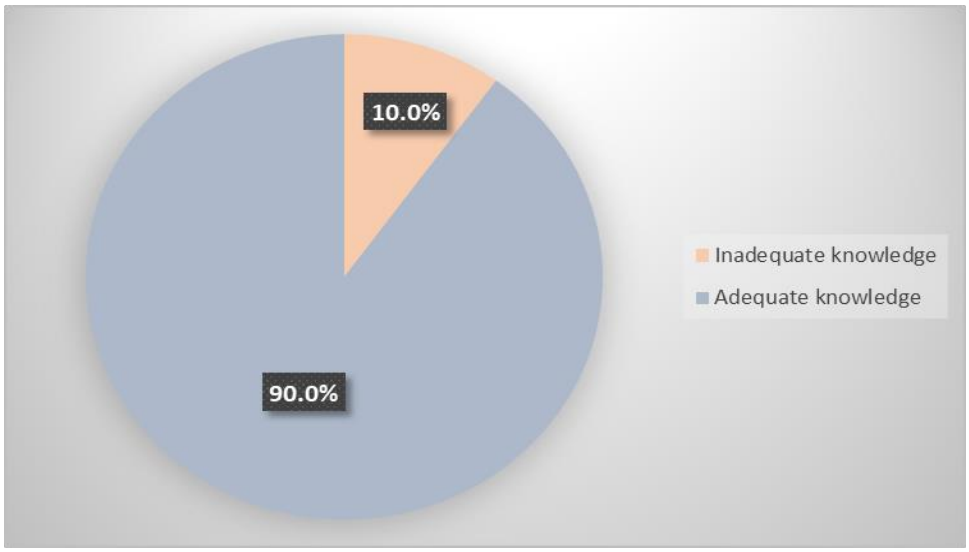

Figure 4.4 Proportion of respondents with adequate knowledge of effective face mask use

4.4 Reasons for use/non-use of face masks

Table 4.5 below shows respondents' reasons for using face masks. A good number of the respondents, 133 (53.2%) agreed that they used face masks because they "felt susceptible to getting COVID-19 in the hospital". Most of the respondents, 227 (90.8%) agreed that "having COVID-19 will be troublesome as it may spread to loved ones". Ninety-six percent (240/250) of the respondents agreed that they used face masks due to the belief that putting on a face mask is an appropriate way of protecting an individual and others from COVID in the hospital. More than half of respondents, 135 (54.0%) disagreed that "wearing a face mask is troublesome because it distorts communication" while 138 (55.2%) agreed that they "sometimes forgot to put on their face mask". Fifty-six percent (140/250) of the respondents agreed that their reason for using a face mask was only if the doctor/nurse said so.

Table 4.5 **Reasons for use of face masks**

Statement	Agree n (%)	Uncertain n (%)	Disagree n (%)
Perceived susceptibility to COVID-19			
Feeling susceptible to getting COVID in the hospital	133(53.2)	40(16.0)	77(30.8)
Belief there is a high chance of having COVID transmitted whilst at the hospital	129(51.6)	37(14.8)	84(33.6)
Feeling that since COVID crisis is over, there is no worry about getting COVID-19	62(24.8)	28(11.2)	160(64.0)
Perceived severity of COVID-19			
Belief that getting COVID-19 is serious	223(89.2)	10(4.0)	17(6.8)
Having COVID-19 will be troublesome as it may spread to loved ones	227(90.8)	17(6.8)	6(2.4)
Having COVID-19 will be troublesome as it may lead to taking time off work	206(82.4)	18(7.2)	26(10.4)
Perceived benefits of wearing a face mask			
Belief that wearing a face mask is a good way to protect oneself and others against COVID in the hospital	240(96.0)	6(2.4)	4(1.6)
Wearing a face mask in the hospital cannot prevent transmission of COVID-19	144(57.6)	21(8.4)	85(34.0)
Perceived barriers to wearing a face mask			
Will only wear a face mask in the hospital if it is free	52(20.8)	13(5.2)	185(74.0)
Wearing a face mask is troublesome because it distorts communication	93(37.2)	22(8.8)	135(54.0)
Wearing a face mask is troublesome because it makes breathing difficult when put on	111(44.4)	19(7.6)	120(48.0)
Sometimes forget to put on the mask	138(55.2)	62(24.8)	50(20.0)
Will feel shame as the only person wearing a face mask in the hospital	67(26.8)	80(32.0)	103(41.2)
Cues to action			
Will wear a face mask if there were more posters serving as a reminder	103(41.2)	67(26.8)	80(32.0)
Will wear a face mask if the doctor/nurse say so	140(56.0)	58(23.2)	52(20.8)
Pressure from employers at work force one to put on mask	112(44.8)	63(25.2)	75(30.0)
Pressure from mass media and government reminds one of need to put on face mask	125(50.0)	57(22.8)	68(27.2)

4.4.1 Association between effective use of face mask and reasons for use/non-use of face mask

The factors associated with effective face mask use are shown below in table 4.6

Table 4.6 **Association between effective use of face mask and reasons for use/non-use of face mask**

Variables	Effective face mask use		p-value
	Yes (n = 195)	No (n = 55)	
Feeling susceptible to getting COVID in the hospital			0.785
Agree	105(78.9)	28(21.1)	
Uncertain	32(80.0)	8(20.0)	
Disagree	58(75.3)	19(24.7)	
Belief there is a high chance of having COVID transmitted whilst at the hospital			0.481
Agree	97(75.2)	32(24.8)	
Uncertain	31(83.8)	6(16.2)	
Disagree	67(79.8)	17(20.2)	
Feeling that since COVID crisis is over, there is no worry about getting COVID-19			0.523
Agree	49(79.0)	13(21.0)	
Uncertain	24(85.7)	4(14.3)	
Disagree	122(76.3)	38(23.7)	
Belief that getting COVID-19 is serious			$^{+}$0.107
Agree	176(78.9)	47(21.1)	
Uncertain	5(50.0)	5(50.0)	
Disagree	14(82.4)	3(17.7)	
Having COVID-19 will be troublesome as it may spread to loved ones			$^{+}$0.760
Agree	177(78.0)	50(22.0)	
Uncertain	14(82.4)	3(17.6)	
Disagree	4(66.7)	2(33.3)	
Having COVID-19 will be troublesome as it may lead to taking time off work			**$^{+}$0.010***
Agree	163(79.1)	43(20.9)	
Uncertain	9(50.0)	9(50.0)	
Disagree	23(88.5)	3(11.5)	
Belief that wearing a face mask is a good way to protect oneself and others against COVID in the hospital			$^{+}$0.482
Agree	186(77.5)	54(22.5)	
Uncertain	6(100.0)	0(0.0)	

Disagree	3(75.0)	1(25.0)	
Wearing a face mask in the hospital cannot prevent transmission of COVID-19			[+]0.946
Agree	113(78.5)	31(21.5)	
Uncertain	16(76.2)	5(23.8)	
Disagree	66(77.7)	19(22.4)	
Will only wear a face mask in the hospital if it is free			[+]0.146
Agree	36(69.2)	16(30.8)	
Uncertain	9(69.2)	4(30.8)	
Disagree	150(81.1)	35(18.9)	
Wearing a face mask is troublesome because distorts communication			[+]0.331
Agree	69(74.2)	24(25.8)	
Uncertain	16(72.7)	6(27.3)	
Disagree	110(81.5)	25(18.5)	
Wearing a face mask is troublesome because it makes breathing difficult when put on			[+]0.311
Agree	84(75.7)	27(24.3)	
Uncertain	13(68.4)	6(31.6)	
Disagree	98(81.7)	22(18.3)	
Sometimes forget to put on the mask			0.439
Agree	104(75.4)	34(24.6)	
Uncertain	49(79.0)	13(21.0)	
Disagree	42(84.0)	8(16.0)	
Will feel shame as the only person wearing a face mask in the hospital			0.331
Agree	51(76.1)	16(23.9)	
Uncertain	59(73.8)	21(26.2)	
Disagree	85(82.5)	18(17.5)	
Will wear a face mask if there were more posters serving as a reminder			0.100
Agree	74(71.8)	29(28.2)	
Uncertain	53(79.1)	14(20.9)	
Disagree	68(85.0)	12(15.0)	
Will wear a face mask if the doctor/nurse say so			0.425
Agree	105(75.0)	35(25.0)	
Uncertain	47(81.0)	11(19.0)	
Disagree	43(82.7)	9(17.3)	

Pressure from employers at work force one to put on mask			0.506
Agree	84(75.0)	28(25.0)	
Uncertain	52(82.5)	11(17.5)	
Disagree	59(78.7)	16(21.3)	
Pressure from mass media and government reminds one of need to put on face mask			**0.005***
Agree	87(69.6)	38(30.4)	
Uncertain	48(84.2)	9(15.8)	
Disagree	60(88.2)	8(11.8)	

+(fisher's exact) *(statistically significant, p≤0.05)

4.5 Association between socio-demographic characteristics and effective face mask use

The results of the bivariate analysis i.e., Chi squared/Fischer's exact test (age distribution, parity, relationship status, educational level, employment status, and allergies) is shown below in table 4.7. The socio-demographic factor which showed significant association with effective face mask use was the educational level **(p = 0.015)** of respondents.

Table 4.7 **Association between socio-demographic characteristics and effective facemask use**

Variables	Effective facemask use		p-value
	Yes (n = 195)	No (n = 55)	
Age distribution			+0.090
18-20 years	15(78.9)	4(21.1)	
21-30 years	111(82.8)	23(17.2)	
31-40 years	63(73.3)	23(26.7)	
Over 40 years	6(54.5)	5(45.5)	
Parity			0.506
Primigravid	77(80.2)	19(19.8)	
Multigravida	118(76.6)	36(23.4)	
Relationship status			+0.308
Single	77(80.2)	19(19.8)	
Married	108(78.3)	30(21.7)	
Cohabiting	8(66.7)	4(33.3)	
Divorced	2(50.0)	2(50.0)	
Educational level			**+0.015***
None	1(50.0)	1(50.0)	
Primary	5(83.3)	1(16.7)	
Secondary	143(74.5)	49(25.5)	
Tertiary	46(92.0)	4(8.0)	
Employment status			0.094
Employed	81(83.5)	16(16.5)	
Unemployed	114(74.5)	39(25.5)	
Allergies			+0.601
No	189(79.7)	48(20.3)	
Yes	6(100.0)	0(0.0)	

+ (fisher's exact) *(statistically significant, p≤0.05

4.6 Factors associated with effective face mask use

The results from a multiple logistic regression of factors associated with effective face mask use are shown in the table below. Respondents in the second/third stage of labour were found to have a 67% significant reduction in their odds of using face masks effectively as compared

to those who were in the first stage of labour (cOR = 0.33; 95% CI = 0.16 – 0.68; p = 0.003). However, after adjusting for all other factors, effective face mask use was significantly reduced by 62% among respondents in the second/third stage of labour compared to those who were in the first stage of labour (aOR = 0.38; 95% CI = 0.17 – 0.83; p = 0.016).

The odds of effective face mask use were significantly reduced by 75% among respondents who had had up to secondary school education as compared to those who had had up to tertiary education (cOR = 0.25; 95% CI = 0.09 – 0.74; p = 0.012). Adjusting for other factors (labour stage, pressure from mass media, knowledge of mask use) the odds of effective face mask use was significantly reduced by 75% among respondents who had had up to secondary school education as compared to those who had had up to tertiary education (aOR = 0.25; 95% CI = 0.08 – 0.77; p = 0.016).

Respondents who were uncertain whether "having COVID-19 will be troublesome as it may lead to taking time off work" had a 74% significant reduction in their odds of using face masks effectively as compared to those who agreed that "having COVID-19 will be troublesome as it may lead to taking time off work (cOR = 0.26; 95% CI = 0.09 – 0.71; p = 0.008). Adjusting for other factors, this association was no longer statistically significant".

Effective face mask use was significantly increased by 2.33 and 3.28 times respectively among uncertain respondents (cOR = 2.33; 95% CI = 1.04 – 5.22; p = 0.040) and those who disagreed (cOR = 3.36; 95% CI = 1.41 – 8.01; p = 0.005) whether "pressure from mass media and government reminded them of the need to put on face mask" as compared to those who agreed. After adjusting for all other factors, effective face mask use was significantly increased by 2.66 and 3.58 times respectively among uncertain respondents (aOR = 2.66; 95% CI = 1.08 – 6.51; p = 0.033) and those who disagreed (aOR = 3.58; 95% CI = 1.44 – 8.93; p = 0.006) whether

"pressure from mass media and government reminded them of the need to put on face mask" as compared to those who agreed.

Furthermore, having adequate knowledge of face mask use significantly increased the odds of effective face mask use by 2.67 times compared to having inadequate knowledge of face mask use (cOR = 2.67; 95% CI = 1.12 – 6.33; p = 0.026). After adjusting for all other factors, the odds of using face masks effectively were significantly increased by 4.10 times among respondents with adequate compared to those with inadequate knowledge of face mask use (aOR = 4.10; 95% CI = 1.49 – 11.28; p = 0.006).

Table 4.8 **Factors associated with effective face mask use**

Variables	cOR (95% CI)	p-value	aOR (95% CI)	p-value
Labour stage				
First stage				
Final stage	**0.33(0.16 – 0.68)**	**0.003***	**0.38(0.17 – 0.83)**	**0.016***
Postpartum stage	1.53(0.69 – 3.37)	0.295	1.74(0.70 – 4.30)	0.233
Educational level				
Tertiary	1.00		1.00	
None	0.09(0.005 - 1.67)	0.105	0.05(0.002 – 1.20)	0.065
Primary	0.43(0.04 - 4.69)	0.492	0.33(0.03 – 4.18)	0.393
Secondary	**0.25(0.09 - 0.74)**	**0.012***	**0.25(0.08 – 0.77)**	**0.016***
Having COVID-19 will be troublesome as it may lead to taking time off work				
Agree	1.00		1.00	
Uncertain	**0.26(0.09 - 0.71)**	**0.008***	0.34(0.12 – 1.02)	0.054
Disagree	2.02(0.58 - 7.05)	0.269	2.34(0.60 – 9.08)	0.221
Pressure from mass media and government reminds one of need to put on face mask				
Agree	1.00		1.00	
Uncertain	**2.33(1.04 - 5.22)**	**0.040***	**2.66(1.08 - 6.51)**	**0.033***
Disagree	**3.28(1.43 - 7.52)**	**0.005***	**3.58(1.44 - 8.93)**	**0.006***
Overall knowledge				
Inadequate knowledge	1.00		1.00	
Adequate knowledge	**2.67(1.12 - 6.33)**	**0.026***	**4.10(1.49 – 11.28)**	**0.006***

(Statistically significant, p≤0.05)

CHAPTER FIVE

5.0 DISCUSSION

SUMMARY OF STUDY FINDINGS:

Proportion of effective face mask use among respondents was generally high 78%, but lowest in the second and third stage of labour. The odds of face mask use were higher among respondents who disagreed that pressure from mass media and government reminded them to put it on. Conversely those who had up to secondary level education had a significantly lower odd of face mask use. Majority (90%) of respondents had adequate knowledge on face mask use.

The proportion of effective face mask use was found to be 78% among peripartum women at Mowbray Maternity Hospital. This finding is comparable to research conducted to assess the practice of face mask-wearing in the OPD setting of a primary health care in Hong Kong during the SARS pandemic. From the Hong Kong study, 91.8% of respondents reported wearing face masks to protect others at the clinic (Ho, 2012). Although both are high, the settings were different; that of MMH was in a peripartum setting where pain in labour ward was a limitation to mask wearing, hence the face mask efficacy was slightly lower.

In contrast, a cross-sectional descriptive study by Lee et al. (2020) to assess practice and technique of using face mask amongst adults in the community showed that, the overall participants' performance in the practice aspect was unsatisfactory and low. Only 114 participants (7.6%) indicated that they had always worn a face mask. This was done during a non-epidemic period in Hong Kong. The disparity in findings could result from the fact that our study in MMH was conducted in the hospital at a time when there was widespread information about the need to wear face masks, coupled with the hospital's internal enforcement

for individuals to adhere to COVID-19 protocols. Conversely, that of Hong Kong could be partly explained by the development of fatigue after previous repeated pandemics.

Our study found that 90.0% of respondents had adequate knowledge of effective face mask use and Knowledge was a significant predictor of mask usage (p-value 0.006). This finding is like that of a questionnaire-based cross-sectional study conducted in a primary health care facility in South Africa by Hoque et al., 2021, assessing knowledge, attitude and practices among pregnant women during the COVID-19 pandemic. It revealed that, women with adequate knowledge were 7 times more likely to implement positive measures in curbing the spread of COVID-19 (p=0.019). Research conducted among healthcare workers in Pakistan in April 2020 to assess their knowledge, attitude, and practices of face mask use during the COVID-19 pandemic revealed otherwise. The overall knowledge of the technique and practice of mask usage was inadequate.

However, our study was conducted among peripartum women and perhaps knowing how vulnerable they were to COVID-19, they paid attention to available educational materials and that may have improved their knowledge. Health education on COVID-19 was made available during antenatal visits, sensitising women on the need for COVID prevention and mask wearing. This intervention could have accounted for the relatively high knowledge among them. This finding was evident in their reasons cited for using a face mask. More than half of the respondents, 133 (53.2%), agreed that they used face masks because they "felt susceptible to getting COVID-19 in the hospital". Most of the respondents, 227 (90.8%), agreed that "having COVID-19 was troublesome as it may spread to loved ones".

Effective face mask use was significantly higher among respondents who disagreed that "pressure from mass media and government reminded them of the need to put on face mask"

as compared to those who agreed. This finding further reiterates the point that respondents had adequate knowledge and hence did not feel that pressure from mass media and government was what made them put on a face mask.

Effective face mask use was highest at the postpartum stage (83.1%) and lowest in the second/third stage of labour (64.3%). The relatively low prevalence in the second stage of labour could be a result of the pain and emotion that characterizes this stage of labour and the potential discomfort that the face mask use may pose. Wearing of face mask can also hamper patients pushing and breathing heavily at the same time. This finding is significant because of the potential for the spread of COVID-19 at this stage of labour.

However, in MMH, women in the second stage of labour are in single rooms offering some protection to other patients but not attendant health care workers who are at risk. Health care workers are therefore encouraged to wear appropriate PPE when in a pandemic setting.

Another finding is that the odds of effective face mask use were significantly lower among respondents who had had up to secondary school education as compared to those who had had up to tertiary education. As reviewed in the literature (evident by the Taiwan survey and Lau et al,2007) mask-wearing behaviour was positively associated with higher education.

It is therefore not surprising to find in this study that, compared to tertiary educated peripartum women, respondents with secondary education had lower odds of effective face mask use. Perhaps the education on COVID-19 is not simplified enough for persons with up to secondary level education to understand. There is a need to make educational materials on effective face mask use and COVID-19 simple through public education and outreach programs to target this subgroup of the population, thereby increasing their odds. Accessibility can also be increased through radio, media, etc.

To avoid potential asymptomatic or pre-symptomatic transmission, during future pandemics, pregnant women like all other individuals should be encouraged, among other prevention strategies, to use face masks effectively.

The pandemic has taught us many things. Findings from this study could be used for public health campaigns or policy decisions in the future.

5.1 Limitations of the study

The findings of this study can only be generalized within the confines of Mowbray Maternity Hospital, as it was facility-based research.

Based on the cross-sectional study design, associations found cannot be temporal or causal.

The observation of effective face mask use can be prone to observer bias. However, the robust statistical methods used in the conduct of the study make the findings empirically sound and can be compared to findings from similar contexts.

CHAPTER SIX

6.0 CONCLUSIONS AND RECOMMENDATIONS

6.1 Conclusion

Generally, effective face mask use was high amongst respondents but was lowest at the second/third stage of labour.

Knowledge of effective face mask use was also high.

Perceived susceptibility to getting COVID-19 in the hospital and the potential to spread to families at home were why most respondents wore face masks effectively.

The second/third stage and secondary education were negatively associated with face mask use in that those in the second/third stage of labour had the lowest proportion of effective face mask use compared to the first and postpartum stages. Similarly, those with secondary as compared to tertiary education had a significantly lower proportion of effective face mask use.

Adequate knowledge and disagreement with the perception that pressure from mass media and government reminded them of the need to put on face masks were beneficial factors.

6.2 Recommendations

Even though the use of face masks is of historical value now, it is worth noting these essential factors associated with mask use to ensure compliance during future respiratory pandemics like COVID-19.

1. There is a need for health professionals at the hospitals to educate peripartum women with secondary education about the dangers of COVID-19 and the risk of spread, especially in the hospital.

2. Health professionals working in the labour ward should enforce adherence to COVID protocols at the second/third stage of labour.

3. There is a need for community education through structured outreach programs by doctors and nurses to sensitise people to wear face masks during future pandemics, as some respondents said, “They will only wear a face mask if doctors/nurses told them to do so.”

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APPENDICES

APPENDIX A: Consent Form

Participant no:

The Department of Obstetrics and Gynaecology, College of Health Sciences, University of Cape Town is undertaking research on face mask use in women during the labour period or after delivery at Mowbray Maternity Hospital. Labour refers to the period just before childbirth.

Why is this study being done?

With the current pandemic which has taken away lots of human lives, rendered people incapacitated, others jobless and affected the global economy, it has become necessary to try and avoid being infected. The World Health Organization has recommended several approaches to help curb the spread. Chief amongst them is face mask wearing: a relatively inexpensive method of dealing with the spread of the Coronavirus.

The study seeks to assess how women in labour or just after delivery use face masks during the current Covid-19 pandemic at Mowbray Maternity Hospital. We would like to ask you a few questions about your knowledge about face mask use as well as reasons why you would or would not use a mask.

How many people will take part in the study?

Five hundred and forty people (540)

How long will the study last?

The study will last for one month

What do we do to decide if you are eligible to take part?

Any woman over 18 years who is in labour or immediate post-delivery at Mowbray Maternity Hospital, who is not diagnosed of or has no symptoms of Covid-19, or no allergy to face mask use, and able to give consent (no learning difficulty or psychiatric illness)

What will happen if you decide to take part in the study?

By participating, you are providing information to us that may be helpful for the future

What are the risks and discomforts of this study?

There are no risks involved and the study will not affect your care or treatment to be received in the facility

Are there any benefits to you for being in the study?

Knowledge obtained from you will better inform decision makers, so that policies will be developed and directed at increasing face mask use. This will help curb the spread of respiratory diseases such as the current pandemic among pregnant women and their birth attendants

What will happen when the study is over and will the results of the research be shared with you?

Information obtained will be disseminated by publishing this study in a peer-reviewed journal, use of conferences, workshops and seminars.

Who will see the information which is collected about you during the study (Privacy and Confidentiality)?

If you agree to participate, all information will be confidential. This means that your name will not be revealed or used. You will be given a study number which will be placed on the questionnaire to ensure your privacy

Data storage

All information collected will be kept private and stored for a period of five years. The information collected will not affect your care, but it may help us to understand face mask use better. This information can be used to help women in the future.

Voluntary Agreement

Agreeing to this study is not binding and compulsory. You can decide to withdraw or leave the study at any point. You are also welcome to ask any questions before agreeing to be a part of the research.

Will you receive any reward (money or food vouchers) for taking part in this study?
There will be no money received for being a part of the study

Who do I speak to (or contact) if I have any question about the study?
Please feel free to contact any of the following people if you have any concerns about the study Principal investigator: Dr Chantal Stewart
Email: Chantal.stewart@westemcape.gov.za
Obstetrics and Gynaecological consultant: Dr Saadiqa Allie EmaiI: Saadiqa.al Iie@westerncape.gov.za

University of Cape Human Research Ethics Committee(HREC): Prof Marc Blockman EmaiI: marc.blockman@uct.ac.za

Participant's Consent

I have been given the information in the aforementioned document explaining the advantages, concerns, and protocols for the study headed "Assessment of face mask use among peripartum women at Mowbray Maternity Hospital during the current Covid-19 pandemic." I have read the information above, or I have had someone else read it to me, I have asked questions and received appropriate responses regarding participation in the study, and thus willing to part of the study.

_____ _____

Date Name and Signature/Thumbprint of patient

Statement by Person taking consent

I confirm that the content and reason for the research has been explained to the above participant

_____ _____

Date Witness if thumbprint taken

APPENDIX B: Questionnaire

Date:

Participant no:

Area recruited from:

1st stage	
2nd Stage	
Postpartum ward	
other	

If other, please specify

……

A. **Socio-demographic info**

1. Age ……

18-20 years	
21-30 years	
31-40 years	
Over 40 years	

2. Parity

primigravid	
mutigravid	

3. Relationship status

single	
married	
Co-habiting	
Divorced	
other	

If other, please specify

…….

4. Education

none	
Primary	
secondary	
tertiary	

5. Employment status

employed	
unemployed	
other	

If other, specify…….

6. Co-morbidities

asthma	
epilepsy	
IGT/diabetes	
Hypertension	
other	

If other, specify……

7. Allergies

No	
Yes	

If yes, please specify…….

B. Knowledge of face mask use

Statement	True	False	Don't know
1. When wearing a facemask at the clinic, there is no need to cover your mouth when sneezing or coughing			
2. A cloth facemask is effective as a regular surgical face mask			
31f I am not sick; the used facemask can be stored in a bag for later use			
4. A facemask helps to prevent HIV			
5.Correct procedure:			
• Perform hand hygiene before mask wearing • Choose the appropriate size of facemask • Dispose of the used facemask in a lidded rubbish bin • Touch only the elastic bands when taking *off* the mask			

• Perform hand hygiene before mask wearing • Choose the appropriate size of facemask • Dispose of the used facemask in a lidded rubbish bin • Touch only the elastic bands when taking *off* the mask			

C. Reasons for use/non-use of face masks (health belief model determinants)

Category	Statement	Agree	Uncertain	Disagree
Perceived susceptibility to Covid-19	• I feel that I am susceptible to getting Covid in the hospital • There is a high chance of having COVID transmitted to me while I am at the hospital • I feel that since Covid crisis is over, I no longer have to worry about getting Covid-19			
Perceived severity of Covid-19	• I believe that getting Covid-19 is serious • Having Covid will be troublesome for me as I may spread it to loved ones • Having Covid will be troublesome for me as I have to take time *off* work			
Perceived benefits of wearing a facemask	• I believe that wearing a face mask is a good way to protect myself and others against Covid in the hospital • In the hospital, wearing a facemask cannot prevent the transmission of Covid-19			
Perceived barriers to wearing a facemask • I will only wear a facemask in the hospital if it is free • Wearing a facemask is troublesome because, I cannot communicate properly (discomfort) • Wearing a facemask is troublesome because, I have difficulty breathing when I put on mask • I sometimes forget to put on the mask • I would feel ashamed if I was the only person wearing a facemask in the hospital (inconvenience)				

D. Observation checklist: Assessment of wearing of a face mask

Technique of using facemask	**Wearing of mask at all Yes/ No**	**Correct**	**Incorrect**
Wearing a facemask			
1.Ensure the colored side of the facemask is facing outwards			
2.Ensure the part with metallic strip is on the upper side			
3.Position the elastic band properly			
4.Extend the facemask to cover mouth, nose and chin			
5.Avoid touching the facemask once it is secured			