STATUS OF MEDICAL SYSTEM DURING, PRE- AND POST PANDEMIC IN RELATION TO PREPAREDNESS

by

Smriti Pandey, MSc Microbiology, PGDHM

DISSERTATION

Presented to the Swiss School of Business and Management Geneva

In Partial Fulfillment

Of the Requirements

For the Degree

DOCTOR OF BUSINESS ADMINISTRATION

SWISS SCHOOL OF BUSINESS AND MANAGEMENT GENEVA

September 2024

STATUS OF MEDICAL SYSTEM DURING PRE AND POST PANDEMIC IN RELATION TO PREPAREDNESS

by

Smriti Pandey

Supervised by

Dr. Atul Pati Tripati

APPROVED BY

dr. LJILJANA KUKEC, Ph.D.

Dissertation Chair

RECEIVED /APPROVED BY

Admissions Director

Dedication

To all those who are facing the challenges of COVID 19 pandemic, healthcare workers, staff, nurses, ward boys/girls, janitors, helpers, this work is dedicated to them. Their courage, strength, and resilience in the face of adversity have been a constant source of inspiration for the entire nation. They have shown that no matter what obstacles we may face in life, it is possible to keep going.

This doctoral degree is a personal testament to the power of perseverance and determination. I hope that it serves as a symbol of hope and motivation for those who are struggling with similar difficulties. May it encourage everyone to reclaim confidence, self-esteem, and empower them to make a difference in the world. I dedicate this work to all of the people, and to the memories of those who may have lost their fight. May their courage and spirit live on and continue to inspire future generations.

Acknowledgements

First and foremost, I want to express my sincere gratitude to my parents, who have always been my rock and support throughout my life. Their unwavering support and encouragement were invaluable in helping me become the person I am. I also want to extend a heartfelt thank you to my husband and family members for their support, and unwavering positivity.

I am grateful to my mentor Dr. Atul Pati Tripathi sir for being an excellent advisor, guide, mentor and my best critic. I would like to express my appreciation for all the faculty of SSBM who has provided excellent support, guidance, and a comfortable research environment.

Lastly, I want to extend by thanks to all the healthcare workers, support staff for helping the country in such difficult times. My condolences to who so ever has lost their lives due to this pandemic COVID 19. May their souls rest in peace.

ABSTRACT

STATUS OF MEDICAL SYSTEM DURING PRE AND POST PANDEMIC IN RELATION TO PREPAREDNESS

Smriti Pandey

2022

Dissertation Chair: <Chair's Name>

Co-Chair: <If applicable. Co-Chair's Name>

A novel coronavirus was first reported in Wuhan, China in the month of December 2019. Since then, the COVID-19 pandemic has become a global emergency, with its rapid spread and high mortality rate causing severe disruptions. The primary objective of conducting research is to understand the country's situation during the pandemic and assess whether our healthcare system can handle future pandemics. To create a "pandemic-prepared" environment, the first step is to identify and classify constraints through a structured approach. This study will review various types of constraints in the healthcare industry and develop a classification method to categorize constraint factors for identification and modeling. The constraints in the healthcare industry can be broadly classified into three categories - physical, financial, and human resource constraints. Physical constraints include the availability of infrastructure, medical equipment, and supplies. Financial constraints refer to the scarcity of funds or resources, which can limit the availability of services and treatments. Human resource constraints include the availability of skilled healthcare professionals, such as doctors, nurses, and paramedics, who can provide quality care.

In the later stage of this research, we will identify existing constraint modeling methods based on a comprehensive review of current industry practices and academic research. We will also develop a framework for total management that will help in the effective management of constraints in healthcare systems. To collect data, we will use probability sampling. We will use participant observation, structured interviews, and semi-structured interviews in the form of surveys and questionnaires. We will collect data from a hospital or clinic that was operational during the COVID period, the general public, the hospital staff, and doctors.

The sample will be given the freedom to either participate in this research or can deny the same. Proper confidentiality will be maintained of all the participants. The information collected will be strictly used for research purposes only.

The data collected will be properly analyzed. After completing the research work, we will be able to understand the shortcomings and problems that healthcare workers face during a pandemic.

We will also know how much we need to push ourselves to improve healthcare in our country. The findings of this study will help policymakers and healthcare professionals to be better prepared for future pandemic-like situations.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER I:

INTRODUCTION

1.1 Introduction

In December 2019, a novel coronavirus was reported for the first time in Wuhan, China. It was named as severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) by the World Health Organization and is responsible for coronavirus disease 2019 (COVID-19). (Zheng et al., 2020). The virus since then has disseminated rapidly to over 36 countries and territories. It started scattering at the end of 2019 and became a pandemic disease in the year 2020.

The coronavirus disease 2019 (COVID-19) outbreak is a worldwide emergency, as its rapid spread and high mortality rate has caused severe disruptions. For COVID-19 symptoms to show up it takes around 2 to 14 days after its first contact with the virus.

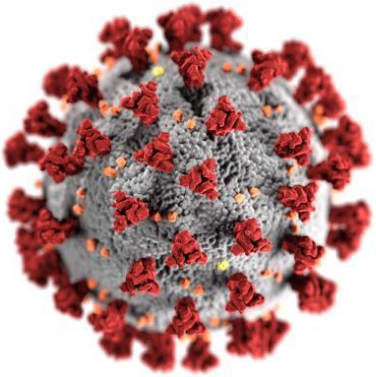


Figure 1: COVID 19 virus (Coronavirus) (Source: Google)

Symptoms of this virus can include:

• Dry cough.

• Shortness of breath.

• Loss of taste or smell.

• Extreme tiredness, called fatigue.

• Digestive symptoms such as upset stomach, vomiting, or loose stools, called diarrhea.

• Pain, such as headaches and body or muscle aches.

• Fever or chills.

• Cold-like symptoms such as congestion, runny nose, or sore throat.

Those who have no symptoms but test positive for COVID-19 are called asymptomatic. For instance, many individuals don't present with any symptoms of this virus but still test positive. Those who go on to have symptoms are considered presymptomatic. Both of these groups can still spread and escalate COVID-19 to others.

Some people may have symptoms that get worse about 7 to 14 days after symptoms initiate. The majority of people with COVID-19 have presented with mild to moderate symptoms. COVID-19 can cause serious medical complications in individuals and some of them can even lead to as

serious complications as death. Another category of people who are at a higher risk are older people and immunocompromised people.

COVID-19 disease can be of three severities i.e. mild illness, moderate illness, severe, or critical illness.

• In comprehensive terms, mild infection of COVID-19 doesn't affect the ability of the lungs to get oxygen to the body.

• In moderate COVID-19 illness, the lungs also work properly but there are signs that the infection is deep in the lungs.

• Severe COVID-19 suggests that our lungs don't work correctly, and the person needs oxygen and other medical help in the hospital.

Critical COVID-19 illness means that the lung and breathing system, called the respiratory system, has failed and there is deterioration throughout the body

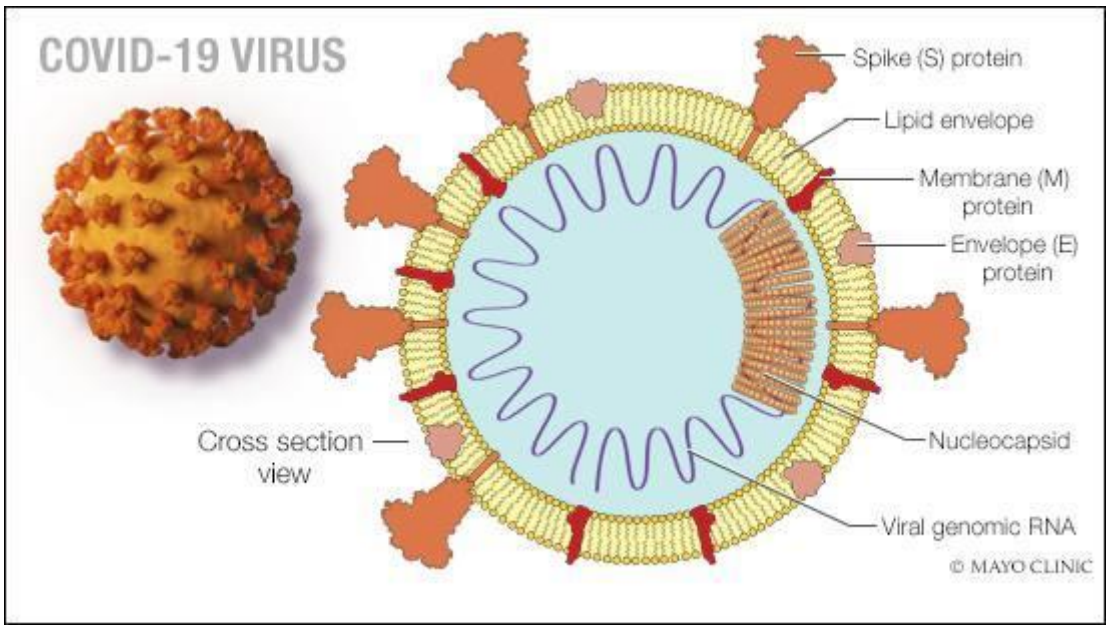


Figure 2: Cross section view of Coronavirus (Source: Google)

It is important to know that catching the coronavirus can sometimes lead to a condition called multisystem inflammatory syndrome, which causes inflammation of organs or tissues in the body. This condition is known as MIS-C in children and MIS-A in adults. It is caused by the spread of the COVID-19 virus from the mouth or nose of an infected person when they cough, sneeze, speak, sing, or breathe. The virus can be transmitted through larger respiratory droplets or smaller aerosols that can land on nearby individuals or be inhaled if people are nearby or in poorly ventilated areas. Additionally, the virus can spread by touching surfaces contaminated with respiratory droplets and later touching one's face with contaminated hands.

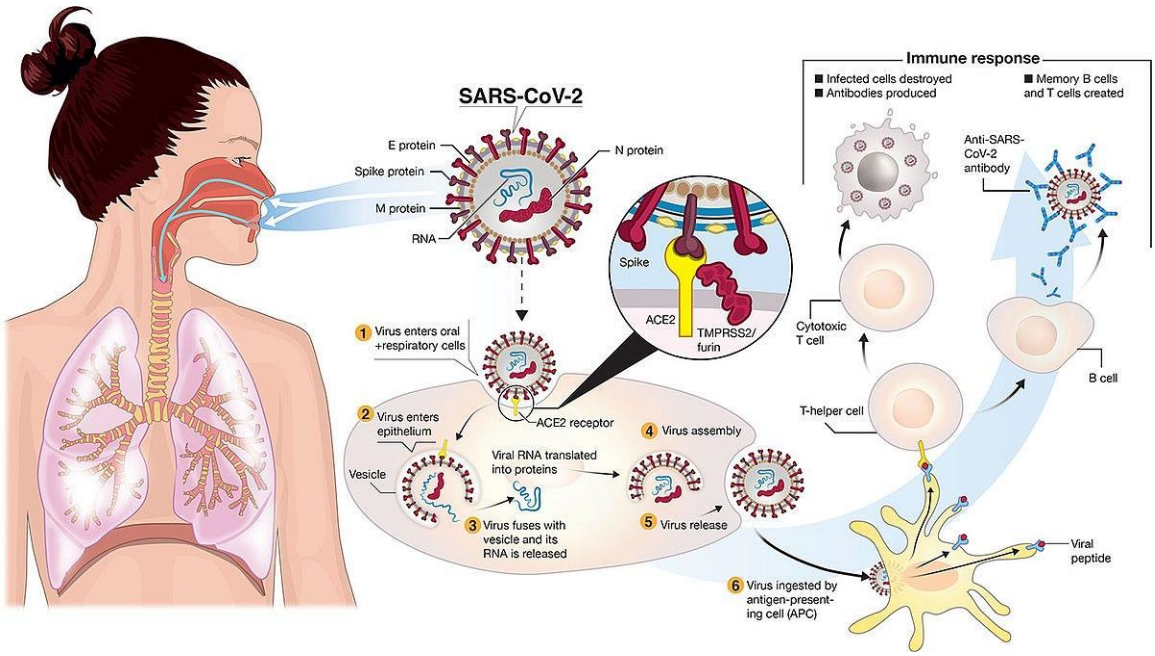


Figure 3: Coronavirus Pathogenesis in a human body (Source: Google)

It is crucial to stay well-informed about COVID-19 and understand how it spreads to prevent and slow down its transmission. One of the best ways to protect yourself and others from infection is to maintain a safe distance of at least 1 meter from others, wear a properly fitted mask, frequently wash your hands or use an alcohol-based rub, and get vaccinated.

It is important to note that people can contract COVID-19 multiple times, as the body's defense against the virus may weaken over time. As the virus infects a group of people, it replicates itself, and during this process, the genetic code can randomly change in each copy, resulting in mutations. If these mutations make previous infections or vaccination less effective at preventing infection, people can become sick again. Therefore, it is essential to take precautions and follow guidelines to minimize the risk of transmission.

By staying informed and taking necessary actions, we can all work together to slow down the spread of COVID-19 and keep ourselves and our communities safe.

COVID-19 is a highly infectious disease that spreads through respiratory droplets when an infected person coughs, sneezes, talks, or breathes. The virus can also spread by touching a surface or object contaminated with the virus and then touching your mouth, nose, or eyes. Several factors increase the risk of contracting COVID-19. These include living with someone who has COVID-19, spending time in places with poor ventilation and many people, and being in close contact with someone who has COVID-19 for more than 30 minutes. Additionally, certain activities, such as singing, exercising, or attending crowded gatherings, may increase the risk of contracting the virus. Wearing masks, practicing physical distancing, and washing hands frequently are effective measures to reduce the risk of contracting COVID-19. The risk of contracting the virus also depends on the proximity of an infected person, the duration of exposure, and the ventilation of the space. Certain groups of people are at higher risk of developing serious COVID-19 illness than others. These include people aged 65 and older, people with underlying medical conditions such as heart disease, diabetes, and lung disease, and people with weakened immune systems. Babies younger than six months are also at an increased risk of severe illness if they contract COVID-19.

In addition, other factors may increase the risk of severe illness, such as smoking, obesity, and certain blood disorders. People with sickle cell disease or thalassemia, chronic kidney or liver disease, and high blood pressure are also at higher risk of severe illness.

It is important to note that not everyone who contracts COVID-19 will experience severe symptoms, and some people may be asymptomatic. However, it is crucial to take all necessary precautions to protect yourself and others from contracting the virus

It is crucial to understand that some medical conditions can increase the risk of severe illness from COVID-19. These medical conditions include cancer or a history of cancer, type 1 or type 2 diabetes, a weakened immune system resulting from solid organ transplants or bone marrow transplants, some medications, or HIV, and pregnancy. However, it is important to note that this list is not exhaustive, as many other factors may also increase the risk of severe COVID-19 illness. For example, people who live in group homes or long-term care facilities may be at a higher risk of catching and spreading the virus. Additionally, individuals who lack access to medical care or have pre-existing health conditions, such as heart disease, lung disease, or obesity, may also be at higher risk of severe illness. Furthermore, it is worth noting that the risk of severe illness may increase with age. Older adults, particularly those 65 years and older, are at higher risk of severe illness from COVID-19. Additionally, people of all ages with underlying medical conditions, such as diabetes, obesity, and heart disease, are at higher risk of severe illness than those without these conditions. It is also essential to recognize that several infectious disease outbreaks in the past were traced to viruses originating in birds, pigs, bats, and other animals that slowly mutated to become dangerous to humans.

The virus that causes COVID-19 can spread from an infected person's mouth or nose in small liquid particles when they cough, sneeze, speak, sing, or breathe.

These particles can range from larger respiratory droplets to smaller aerosols, which can be inhaled by others and potentially lead to infection.

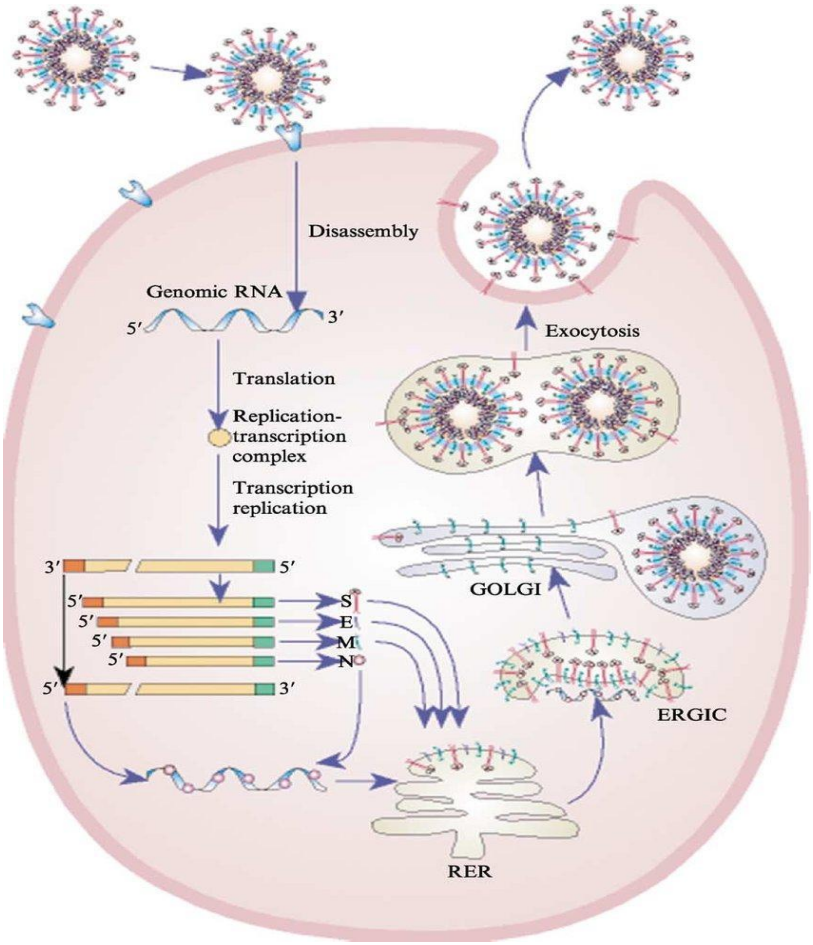


Figure 4: The life cycle of the coronavirus begins with the attachment of the virion to the receptors on the host cell through its S protein, specifically the S1 subunit. This attachment leads to the fusion of the virus envelope with a cellular membrane, marking the start of the replication cycle. (Source: Google)

Prevention

The COVID-19 pandemic has affected the entire world, and the best way to protect yourself and those around you is to get vaccinated. According to the Centre for Disease Control and Prevention (CDC), it is recommended that everyone aged 6 months and older get a COVID-19 vaccine. The COVID-19 vaccine has been proven to lower the risk of severe illness or death caused by COVID-19, and it also reduces the risk of spreading the virus to others. In the United States, there are currently three COVID-19 vaccines available, namely the Pfizer-BioNTech COVID-19 vaccine (2023-2024 version), Moderna COVID-19 vaccine (2023-2024 version), and Novavax COVID-19 vaccine (2023-2024 version). If you have a typical immune system, the number of doses required for each vaccine varies according to age. Children aged 6 months up to 4 years are considered up to date after three doses of the Pfizer-BioNTech vaccine, while people aged 5 and older are considered up to date after receiving one dose of the Pfizer-BioNTech or Moderna vaccine. Children aged 6 months up to 4 years are up to date if they've had two doses of the Moderna vaccine, and people aged 12 years and older are up to date if they've had two doses of the Novavax vaccine. If you haven't had a 2023-2024 COVID-19 vaccination, the CDC recommends getting an additional shot of that updated vaccine. In general, people aged 5 and older with typical immune systems can get any vaccine approved or authorized for their age. They usually don't need to get the same vaccine each time. However, children aged 6 months to 4 years, people aged 5 years and older with weakened immune systems, and people aged 12 and older who have had one shot of the Novavax vaccine should get all their vaccine doses from the same vaccine maker. It is essential to consult your healthcare professional if you have any questions about the vaccines for you or your child.

Your healthcare team can assist you if the vaccine you or your child received earlier is not available, or you don't know which vaccine you or your child received. Additionally, if you or your child started a vaccine series but couldn't finish it due to side effects, your healthcare professional can guide how to proceed.

People with weakened immune systems

Individuals with weakened immune systems may not have the same level of protection from COVID-19 as those with healthy immune systems, which is why healthcare providers may suggest added doses of the COVID-19 vaccine. This recommendation applies to individuals with moderate to severe immunodeficiency, such as those undergoing cancer treatment or receiving organ transplants. In addition, the FDA has authorized the use of the monoclonal antibody Pemivirat (Pemgarta) to help prevent COVID-19 in some individuals with weakened immune systems. Pemgarta is a synthetic antibody that mimics the natural immune system's response to viral infections, and it can help prevent severe illness or hospitalization due to COVID-19. It is recommended that individuals with weakened immune systems speak to their healthcare provider about the best course of action to protect themselves against COVID-19.

Control the spread of infection

In addition to getting vaccinated, there are several other measures you can take to prevent the spread of the virus that causes COVID-19. If you are at a higher risk of severe illness, it is important to have a conversation with your healthcare provider about the best ways to protect yourself.

Your healthcare provider can provide you with personalized direction based on your medical history. It is also crucial to know what to do if you do become ill. This includes being aware of the symptoms and seeking medical attention as soon as possible. Getting treated as soon as possible is crucial to maximize your chances of a full recovery. Don't wait, take action now to increase your chances of a complete recovery. If you suspect you have COVID-19 or are feeling unwell, you must stay at home and avoid contact with others, including pets, if possible. By taking this simple measure, you can play a vital role in preventing the virus from spreading to others. We should do our part to keep our communities safe and healthy. Additionally, you should avoid sharing household items like dishes, towels, and personal hygiene products, as these can harbor germs and increase the risk of transmission. Remember, taking these precautions can help keep you and those around you safe.

Taking necessary precautions to protect yourself from COVID-19 is extremely important in these times. Here are some detailed guidelines that you can follow: -

Testing for COVID-19: If you experience symptoms of COVID-19 such as fever, cough, or shortness of breath, get tested for the virus as soon as possible. It's also advisable to get tested if you've been in close contact with someone who has tested positive for the virus. Wait for at least five days after exposure before getting tested.

Testing can help identify those who are infected and prevent the spread of the virus.

Social distancing: Avoid close contact with anyone who is sick or showing symptoms of COVID-19. If you can, try to maintain a distance of at least six feet from others, especially in public places where social distancing can be challenging.

Hand hygiene: Wash your hands thoroughly and frequently with soap and water for at least 20 seconds. Alternatively, use an alcohol-based hand sanitizer with at least 60% alcohol to keep your hands clean and germ-free. Be sure to wash your hands after touching any potentially contaminated surface, before eating, and after using the restroom.

Covering coughs and sneezes: Cover your mouth and nose with a tissue or your elbow when you cough or sneeze. Properly dispose of used tissues and wash your hands immediately afterwards. Cleaning and disinfecting surfaces: Clean and disinfect frequently touched objects and surfaces such as doorknobs, light switches, electronics, and counters. Use an EPA-approved disinfectant that is effective against COVID-19.

Crowded public areas: If you have a higher risk of serious illness, consider avoiding crowded public areas. If you must be in such an area, try to spread out as much as possible and wear a mask. Masks: The Centers for Disease Control and Prevention (CDC) recommends wearing a mask in indoor public spaces, especially if you are in an area with a high number of COVID-19 cases. Choose a mask that provides the most protection, fits well, and is comfortable to wear. Masks can help prevent the spread of the virus by reducing the number of respiratory droplets that are released into the air.

There are currently three types of tests authorized by the U.S. Food and Drug Administration (FDA) for testing individuals for COVID-19. These tests are:

1. Rapid antigen tests: These tests are also known as point-of-care tests. They work by detecting specific proteins from the virus that causes COVID-19 in respiratory specimens. They can produce results in as little as 15 minutes and are generally used in settings where rapid results are critical.
2. Molecular tests: These tests are also known as nucleic acid amplification, genetic, RNA, or PCR tests. They detect the virus's genetic material in respiratory specimens. Molecular tests are considered to be the most accurate diagnostic tests and are generally used in hospitals and other healthcare settings where a high level of accuracy is required.
3. Antibody tests: These tests are also known as serology tests. They detect antibodies produced by the body in response to the virus that causes COVID-19. Antibody tests are generally used to determine if an individual has been previously infected with the virus and has developed an immune response. However, they are not considered to be diagnostic tests for active COVID-19 infections. It is important to note that each test has its own strengths and weaknesses, and the choice of which test to use depends on several factors, including the individual's symptoms, exposure history, and the testing availability

Rapid Antigen Testing (Point-of Care)

How Are Rapid Antigen Tests Performed?

Rapid antigen tests are diagnostic tests that are used to detect the presence of the SARS-CoV-2 virus in patients. These tests work by detecting specific antigens that are present on the surface of the virus. To perform the test, a respiratory specimen is collected from the patient. This is typically done using a nasopharyngeal or nasal swab. The sample is then placed into an extraction buffer or reagent, which helps to release any virus particles that may be present. Once the sample has been extracted, it is then tested for the presence of SARS-CoV-2-specific antigens using an immunoassay. This is a type of test that uses antibodies to detect the presence of the virus. If the test is positive, it means that the patient has an active infection of the SARS-CoV-2 virus and should take appropriate measures to protect themselves and others from further spread.

What Does Rapid Antigen Testing Reveal?

Rapid antigen tests are diagnostic tests that help determine if a person is actively infected with the SARS-CoV-2 virus. These tests work by detecting virus-specific proteins called antigens from samples taken from the patient, such as nasal or throat swabs. As of August 18, 2020, the FDA has granted Emergency Use Authorization (EUA) for three rapid antigen tests. All of these tests detect the presence of SARS-CoV-2 nucleocapsid protein (N) antigens. These tests are designed with simplicity and speed in mind, providing results in as little as 15 minutes. One of the key advantages of rapid antigen testing is that it can be performed at or near the location where the patient is receiving care, such as a doctor's office or a clinic.

This eliminates the need for samples to be sent to a separate laboratory, which can take several days to produce results. If the viral antigen is detected in the patient's sample, it indicates that the virus is present and the patient is infected with SARS-CoV-2. However, it's important to note that rapid antigen tests are not as sensitive as other diagnostic tests such as PCR tests, which means that they may produce false negative results in some cases. Overall, rapid antigen testing is a useful tool in the fight against the COVID-19 pandemic, providing a fast and convenient way to identify infected individuals and prevent the spread of the virus.

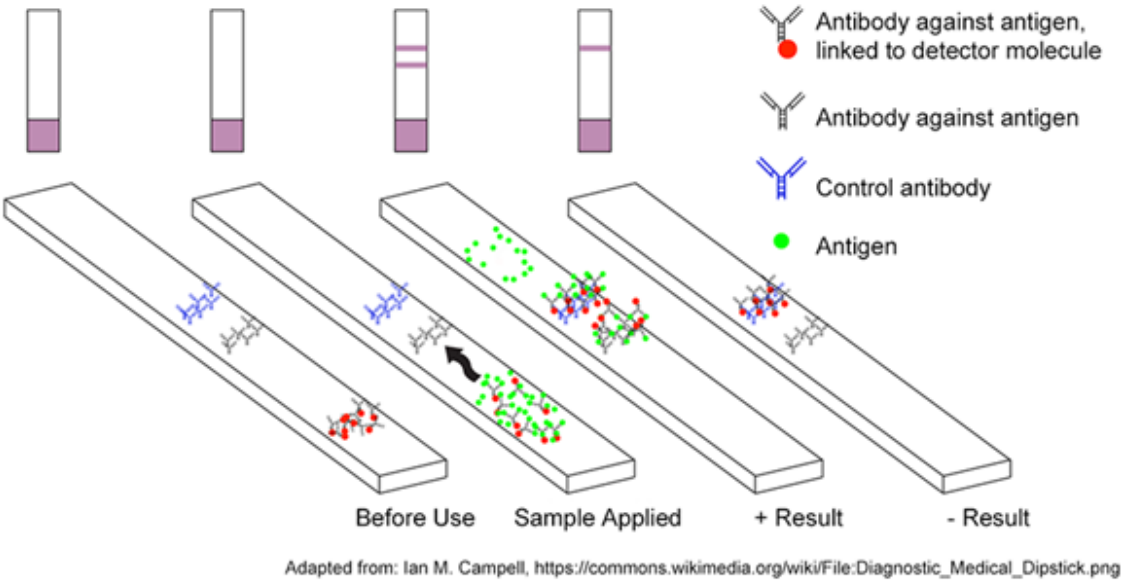


Figure 5: Diagram of a rapid antigen test. Sample is applied to the test strip and if antigen is present, it is bound by antibodies linked to detector molecules, as well as antibodies immobilized in the test line further down the strip. (Source: Google)

Molecular Testing (Nucleic Acid Amplification)

How Are Nucleic Acid Amplification Tests Performed?

Nucleic acid amplification testing (NAAT) is a diagnostic technique used to detect the presence of SARS-CoV-2; the virus responsible for COVID-19. Since SARS-CoV-2 is a respiratory virus, respiratory samples are collected from patients to perform NAAT. The most common type of sample used is nasopharyngeal swabs, which are obtained by inserting a long, thin swab through the nose to the back of the throat. However, in patients with pneumonia or lung involvement with infection, lower respiratory secretions like sputum and bronchoalveolar lavage fluid can also be used. Once the sample is collected, it is transported to a laboratory where it is processed to extract RNA from the patient specimen. RNA is a genetic material that carries the genetic information of the virus. The extracted RNA is then converted to DNA using a reverse transcriptase enzyme. This step is necessary as the NAAT technique requires amplification of DNA instead of RNA. Once the RNA is converted to DNA, it is then amplified using SARS-CoV-2-specific primers. Primers are short sequences of DNA that are complementary to the SARS-CoV-2 genome. These primers bind to the viral DNA and initiate the amplification process using polymerase chain reaction (PCR) technology. PCR is a technique used to amplify small amounts of DNA into millions of copies, making it possible to detect the presence of SARS-CoV-2 even in small amounts. Overall, NAAT is a highly sensitive technique that enables early detection of SARS-CoV-2 infection, allowing for prompt treatment and isolation of infected individuals to prevent further spread of the disease.

What Does Nucleic Acid Amplification Testing Reveal?

Nucleic acid amplification tests, also known as NAATs, are a type of diagnostic test that can provide us with a comprehensive understanding of whether a patient is currently infected with SARS-CoV-2. These tests are highly sensitive and reliable, and they work by detecting specific sequences of genetic material (RNA) of the virus in respiratory samples of patients.

NAATs have become the gold standard for detecting the presence of SARS-CoV-2 in patients. They are designed to target specific genetic sequences of the virus, and they can detect even very small amounts of the virus. The test involves extracting RNA from the patient's sample and then amplifying it using a process called polymerase chain reaction (PCR). This amplification process increases the amount of RNA in the sample, making it easier to detect if the virus is present. If viral RNA is detected in a patient's respiratory sample, it is a strong indication that the virus may be present. However, it is important to note that a positive test result does not necessarily mean that the patient is symptomatic or contagious. It is always recommended that patients who test positive for SARS-CoV-2 consult with a healthcare professional to determine the appropriate course of action.

Comparison of COVID-19 Molecular and Antibody Tests

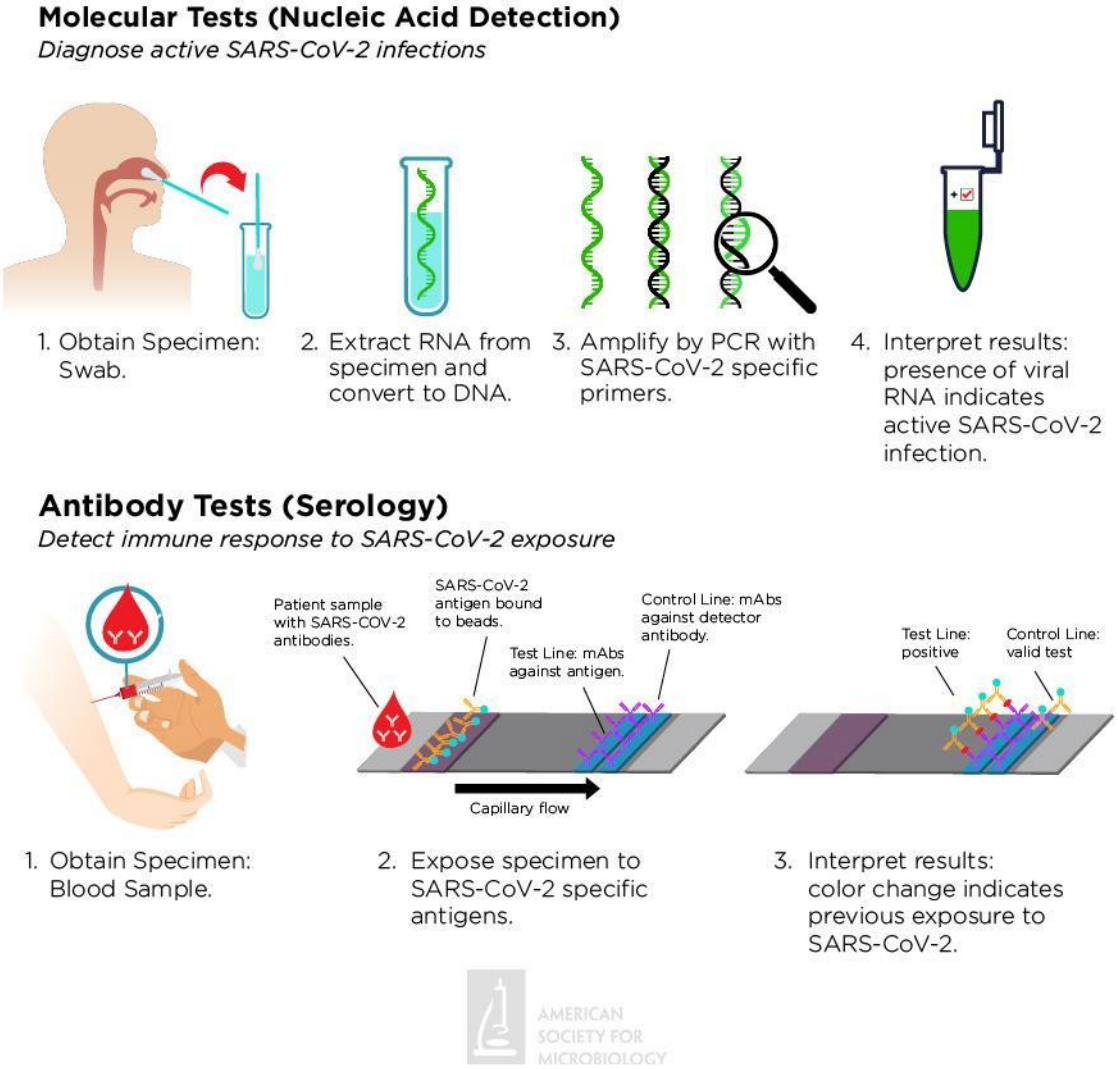


Figure 6: Comparison of SARS-CoV-2/COVID-19 test types and techniques (Source: Google)

1.2 Research Problem

The widespread COVID-19 pandemic is the foremost extraordinary combined health and financial emergency of the last century. It speaks to the foremost critical wellbeing challenge that the world has gone up against in over 70 a long time of WHO's presence. There's subsequently an exceptional level of both investigation and opportunity for alter in connection to worldwide wellbeing, as mindfulness of the results of an unused widespread illness and its repercussions over all zones of life are at the bleeding edge of this wellbeing crisis.

COVID 19 has completely collapsed our Indian Healthcare system. India has 1154686 registered doctors in the specialty of modern medicine. At present single Government Allopathic Doctor cater to the need of 10926 persons. Currently, 60% of the total of India's population lives in rural India. To provide healthcare facilities to the people living in rural India, the government has established 25743 Primary Health Centers, 158417 Sub Centers, and 5624 Community Health Centers. Currently, 713986 beds are available in government hospitals in India which amounts to 0.55 beds per 1000 population.

Some states like Jharkhand, Assam, Haryana, Bihar, Gujrat, Odisha, Madhya Pradesh, Maharashtra and Manipur which is home to more than 70% of the total Indian population has the population to bed ratio even lower than the national average but some states like Kerala, Sikkim, and Tamil Nadu have the better population to bed ratio. (Singh et al., 2020)

The current situation indicates that there is a high probability of an imbalance between the demand and availability of hospital beds, ICU beds, ventilators, Personal Protective Equipment (PPE), and trained medical personnel throughout the country. This is a result of the increasing number of COVID-19 cases in the country. If we consider a scenario where only 0.1% of the total population becomes infected in the next two months, and only 5% of these cases require ICU beds, we would need 65000 ICU beds to accommodate them. This is a significant number, and it highlights the importance of increasing the capacity of our healthcare system to meet the demands of the pandemic.

Additionally, if one patient requires a ventilator for 15 days, it would create a demand for 975000 ventilator days. This is a crucial aspect to consider since the availability of ventilators is crucial in treating severe cases of COVID-19. It is essential to understand that the calculations are based on the assumption that the infection rate remains at 0.1%.

However, if the infection rate rises, the demand for medical resources will also increase, making it extremely challenging for the healthcare system to cope with the surge of patients. Therefore, we must take proactive measures to ensure that our healthcare system is adequately equipped to handle the challenges of the pandemic. It is crucial to have a sufficient number of hospital beds, ICU beds, ventilators, PPE, and trained medical personnel to provide quality care to patients in need.

1.3 Purpose of Research

The purpose of research is to improve society by increasing knowledge through the development of scientific theories, concepts, and ideas. Research goals are achieved by forming hypotheses, collecting data, analyzing results, drawing conclusions, applying results to real-world applications, and formulating new research questions. From weather forecasting to the discovery of antibiotics, researchers are constantly trying to find new ways to understand the world and how it works – with the ultimate goal of improving our lives. The goal of research is therefore to discover what is known, what is unknown, and what we can develop further. This allows scientists to develop new theories, ideas, and products that shape society and our everyday lives.

Although research can take many forms, it has three main purposes:

Exploratory: Exploratory research is the first research conducted around a problem that is not yet clearly defined. Therefore, exploratory research aims to better understand the exact nature of the problem and does not provide a conclusive answer to the problem itself. This allows us to conduct more in-depth research later.

Descriptive: Descriptive research expands knowledge about a research problem or phenomenon by describing it based on its characteristics and overall. Descriptive research focuses on the “how” and “what” rather than the “why.”

Explanatory: Explanatory research, also known as informal research, is conducted to determine how variables interact, that is, to determine cause and effect relationships. Explanatory research addresses the “why” of research questions and is therefore often based on experiments.

One of the primary purposes of conducting research is to evaluate the current state of our country's healthcare system during the COVID19 pandemic and determine if it is adequately equipped to handle any potential future pandemic. To achieve this aim, the current study targets to provide a comprehensive review of existing literature and hospital practices, and to analyze and outline a framework for improving the healthcare system's preparedness for such situations. The ongoing COVID-19 pandemic has had a significant impact on developmental activities worldwide, with global, political, financial, and technical resources being mobilized to contain the spread of the virus. This virus has wrecked a havoc on the world. The pandemic has also highlighted the importance of preparedness and the need to improve healthcare systems at all levels. The long-term effects of the COVID-19 pandemic are expected to be far-reaching, with its impact likely to influence all spheres of human life and slow down developmental activities. Given its scale and severity, combating COVID-19 remains a top priority on the global agenda at present. Despite the many efforts to contain the pandemic, its duration and outcome remain uncertain. Therefore, it is important to continue conducting research and developing strategies to improve the healthcare system's preparedness for future pandemics and other health crisis. (Bhatia, 2020)

1.4 Significance of the Study

The aim of conducting this study is to provide a detailed review and an in-depth overview of the current status of our healthcare system. Research is important because it enriches knowledge, leads to innovation and success, improves the quality of education and life, helps find the truth and enables continuous improvement. This study can help identify the strengths and weaknesses of the healthcare system, which can ultimately help generate innovative ideas to establish a stable healthcare future for our country, especially in the event of another pandemic. This study also aims to help us understand how our healthcare system was impacted when we were hit by the pandemic for the first time in many years. It focuses on the experiences of healthcare workers and the general public during the pandemic, providing an overview of the pandemic and its ordeals from their perspective. The number of COVID-19 cases has been consistently increasing in several countries, and the epidemic curve is refusing to flatten. This indicates that the transmissibility of SARS-CoV-2 and inadequate effective response have made it challenging to control the spread of the virus. As a result, a larger number of cases and deaths are likely to occur in the future. The pandemic has put a significant strain on the health systems, which have been grossly overwhelmed. Healthcare workers have been working tirelessly to manage the situation, but the shortage of essential supplies, such as personal protective equipment (PPE), has made their job even more challenging. By conducting this study, we hope to gain a better understanding of the impact of the pandemic on our healthcare system and the challenges faced by healthcare workers and the general public. This insight can help inform policy decisions and shape the future of healthcare in our country.

It is very important to study new health problems or diseases that affect specific communities. Research can:

1. Help doctors and scientists determine whether a test or treatment is safe for a specific person
2. Show whether ways to prevent COVID-19 (including vaccines) are effective and safe to use
3. Show whether new tests are effective or ineffective and whether treatments for COVID-19 are effective and safe to use
4. The 2019 coronavirus disease (Covid-19) pandemic has swept across the globe, killing hundreds of thousands of people, crippling economies, closing borders and causing devastation on an unprecedented scale.

It has strained health services and staff in many regions and will undoubtedly have a profound impact on medical research in the short and long term. Prior to the COVID pandemic, virology (including influenza) accounted for less than 2% of all biomedical research. However, the number of laboratories and researchers focused on answering Covid-related research questions is staggering, likely accounting for 10-20% of current biomedical research, demonstrating the incredible adaptability of the scientific community. International research efforts on COVID-19 have been rapidly supported with billions of euros. Sharing research and data has never been faster or more efficient. The crisis has also brought illness, health and healthcare back to the forefront of social issues and will have a lasting impact on public spending. Additionally, just as COVID-19 has exposed social, racial, and economic disparities in health, the pandemic also appears to be highlighting existing gender inequalities in research.

Indeed, initial analyses suggest that female academics publish less and launch fewer research projects than their male counterparts.

This may be a consequence of confinement and the fact that more women than men are taking on household and child care responsibilities while “working” from home.

Travel, social, and financial restrictions will also have serious consequences for scientific research around the world. Research staff and resources have been deliberately and deliberately prioritized for COVID-19-related activities. Distance and transmission issues have led to the suspension of most non-COVID clinical research, leading to reduced recruitment of study subjects and delays in data entry into clinical trial databases.

Research recruitment has been halted due to travel restrictions, and young researchers may soon find themselves out of work if their topic is not the pandemic. Indeed, while government-funded medical research organizations around the world say they are committed to maintaining the continuity and scale of biomedical research, it remains to be seen how the economic crisis will affect public spending. In addition, research funding that relies on public fundraising is expected to decline significantly and many researchers will see their funding opportunities significantly reduced. The overall impact of the crisis on the economy suggests that future research funding will not be significantly affected.

1.5 Research Purpose and Questions

Research is intended to provide information and is based on data that is collected and analyzed. This exploration is done in a systematic way, where it is examined or studied to enrich knowledge. Research is intended to support a goal and occurs in many fields such as psychology (mind and behavior), science (chemical reactions), education (human development), medicine (drugs and drug testing), zoology (animal behavior), humanism (society), and technology (software/security). Regardless of the method or goal, research usually contains the same key elements. There will always be a problem or research question, which can be a statement or request for information about a problem or area of interest that describes why the research should be conducted. This research problem or question should be examined or explored and should not be too general or vague. This issue will help develop research objectives. It describes what the research aims to discover or achieve. Research objectives basically determine the research direction. From these goals, the researcher constructs a hypothesis. The hypothesis is the assumption or prediction that is being tested by the research. The rest of the research is conducted to confirm or disprove the hypothesis. Another major element of research involves research techniques. This is how information is collected based on the research method (qualitative or quantitative) and includes experiments, surveys, observations, series. These will be explained in more detail in the discussion of research methods. Functional health systems play a crucial role in ensuring the well-being of individuals, communities, societies, and countries. They provide preventive, curative, rehabilitative, restorative, and health-promoting services, which are vital for the physical and mental health of people.

In addition, a well-functioning healthcare system contributes to the increased overall economic productivity and human development of a nation. Access to quality healthcare services is critical, and the need for quality and operational health systems is continuous. Any disruption in access to these services can have detrimental effects on human health, resulting in a loss of life and substantial economic losses. Therefore, it is essential to evaluate the effectiveness of our healthcare system and identify areas where improvements can be made. The COVID-19 pandemic has highlighted the importance of having a robust healthcare system that can respond effectively to public health emergencies. We need to find ways to address the difficulties we faced during the pandemic and ensure that our healthcare system is equipped to deal with any future pandemic-like situations. We must evaluate the challenges faced by various hospital departments, especially the ICU, pathology, radiology, OPD, and related departments, to identify areas that require improvement. During the pandemic, we witnessed a scarcity of resources such as masks, PPE kits, hospital beds, oxygen, medicines, injectables, and testing kits. It is crucial to ensure that our healthcare system has adequate resources to respond to public health emergencies effectively. The peak waves of COVID-19 put a tremendous strain on our healthcare system, and our doctors, medical staff, and healthcare staff faced numerous challenges. They were working long hours, dealing with high patient loads, and facing an increased risk of infection. Finally, we need to determine what changes we can make to bring significant improvements to our healthcare system in the future. Do we need to implement more schemes in hospitals to tackle similar situations? We need to evaluate our healthcare system's strengths and weaknesses and identify areas for improvement, which will help us ensure that we are better prepared to respond to any future public health emergencies.

CHAPTER II:

REVIEW OF LITERATURE

It was discussed that prevention has to be adopted essentially as a possible option, especially fitting in the form of screening programs or of administration of drugs and, most important for public health, vaccines: revealingly, all interventions involving social, behavioral, and environmental factors, key disease determinants, are defined via a negative as "nonpharmaceutical interventions. He has said that nature provides a powerful warning and a unique occasion for analyzing and rethinking the structure and functions of an advanced health system in society, repositioning at the core of its prevention in its three dimensions: health promotion, preparedness to confront novel health problems as soon as they emerge, and actual application of specific preventive measures. (From and Wave, 2020).

Suneela G claimed that India needs to make some major changes in order to survive a pandemic like situation in near future. They suggested drafting of a National Health Security Action Plan and making various amendments in the Ayushman Bharat scheme. Technology like telemedicine, e learning, applications, digital solutions is encouraged. Schemes like: Health and Wellness Centers and National Health Protection Scheme were also discussed. India's expenditure on healthcare as a percentage of GDP is mentioned to be around 1.5% which is one of the lowest in the world. They mentioned that 6 building blocks of healthcare needs to be strengthened. (Garg et al., 2020)

WHO has discussed that Hospitals and other healthcare facilities play a critical role in national and local responses to emergencies, such as communicable disease epidemic. They suggested to Establish mechanisms for facilitating mutual support and coordination between hospitals and local healthcare providers to prevent or mitigate hospital overload (WHO, n.d.)

Sonu H. Subba mentioned PHCIs (Primary health care institutions) are going to play an indispensable role in the fight against COVID-19. However, the current gaps in readiness will severely hamper the capacity of PHCIs to respond toward the pandemic over an extended period. As the current pandemic has again reinstituted the importance of six building block approach toward health system strengthening, it is imperative to adapt this at primary care level to bridge these gaps as soon as possible. They recommend that a '6 × 5' approach toward empowering PHCIs from health system perspective can facilitate the preparedness and response against current COVID-19 pandemic as well as future health system shocks (Subba et al., 2021).

Vijayaprasad Gopichandran article analyzed the COVID-19 pandemic in the south Indian state of Tamil Nadu and the state's response to this pandemic. Further, it applied the Trust-Confidence-Cooperation framework of risk management to analyses the influence of public trust and confidence on the Tamil Nadu health system in the context of the preventive strategies adopted by the state. The article proposed a six-pronged strategy to build trust and confidence in health system functions to improve cooperation to pandemic containment measures. (Gopichandran, 2020)

Patralekha Chetterje discussed that The Indian government's expenditure on health as a percentage of GDP still hovers around 1·5%, one of the lowest in the world. For around 52% of households in urban areas, and 44% of households in rural areas, the private sector is the main source of health care when they are sick, according to government data. (Chetterje, 2020)

POC (point of care) diagnostic devices currently used in clinical setups along with constraints in their use. The devices and technologies that are in the research and development phase across the country that has tremendous potential to elevate the clinical diagnostics scenario along with the diagnosis of ongoing COVID-19 pandemic are emphasized. The implications of using POC diagnostic devices and the future objectives for technological advancements that may eventually uplift the status of healthcare and related sectors in India are also discussed by Aditya Narayan Konwar, Vivek Borse. (Konwar and Borse, 2020)

The coronavirus pandemic has resulted in multiple challenges for developed countries and these challenges are going to be even more for developing countries like India if there is an increase in infected cases says Singh A, Deedwania P, Vinay K, Chowdhury AR, Khanna P. (Singh et al., 2020)

The Director-General of WHO declared that the outbreak of 2019-nCoV constitutes a PHEIC (***Public Health Emergency of International Concern)*** and accepted the Committee's advice and issued this advice as Temporary Recommendations under the IHR (International Health Regulations**). (**WHO., 2020)

(Gold J., 2020) discussed that in the current situation indicates that there is going to be an imbalance between demand and availability of hospital beds, ICU beds, ventilators, PPE, and trained medical personals throughout the country. If we consider that only 0.1% of the total population gets infected in the next 2 months and only 5% among them need ICU beds, then we will be needing 65000 ICU beds. Now if one patient remains on the ventilator for 15 days, then it creates a demand for 975000 ventilator days. This is the simple calculation when we have considered the rate of infection at 0.1 percent. We can imagine the demand created by this pandemic if we consider the rate to be 1%. We can still buy the ventilator, but the major limiting factor will be the availability of healthcare professionals and support staff to run the ventilator safely as they are already getting infected and being sent for quarantine.

Smith claimed that in the absence of vaccines and specific treatment, the only available public health tools to control person-to-person transmittable diseases are isolation and quarantine, social distancing, and community containment measures. Even if traditional public health measures are not able to fully contain the outbreak of COVID-19, they will still be effective in reducing peak incidence and global deaths. Exportations to other countries need not result in rapid large-scale outbreaks, if countries have the political will to rapidly implement countermeasures. (Wilder-smith et al., 2020)

Zoe discussed that as the number of COVID-19 cases continues to grow in the U.S., health care facilities nationwide are contending with an increasing crush of patients, and growing more and more desperate for the tools they need to protect themselves from catching and spreading the

virus that causes it. A portrait of a desperately ill-equipped medical workforce is emerging from an online survey with 978 respondents, built by a grassroots organization started by doctors trying to get personal protective equipment, commonly called PPE, to facilities where it is needed most. (Zoe. S., 2020)

Emanuel discussed that in the United States, perhaps the earliest example was the near-immediate recognition that there were not enough high filtration N-95 masks for health care workers, prompting contingency guidance on how to reuse masks designed for single use. Physicians in Italy have proposed directing crucial resources such as intensive care beds and ventilators to patients who can benefit most from treatment. Daegu, South Korea - home to most of that country's COVID-19 cases - faced a hospital bed shortage, with some patients dying at home while awaiting admission. In the United Kingdom, protective gear requirements for health workers have been downgraded, causing condemnation among providers. The rapidly growing imbalance between supply and demand for medical resources in many countries presents an inherently normative question. (Thome et al., 2020)

Abdelrahman discussed about a genome phylogenetic analysis and suggested that genomic sequence of SARS-CoV-2 is almost 80% similar to that of SARS-CoV, further both these viruses bind to same host cell receptor ACE-2. Hence it is expected that, previously available literature data about coronavirus vaccine designing may play crucial role in development of rapid vaccine against COVID-19. Which will be help in dealing with future pandemic like situations also. (Abdelrahman et al., 2020)

Sonalini Khetrapal (2020) reported that as on May 12, 2020, a total of 4,098,018 confirmed cases with 283,271 deaths were reported. In one day alone (May 12, 2020), 82,591 cases and 4,261 deaths were reported to the World Health Organization (WHO). The number of cases has been consistently increasing in several countries where the epidemic curve is refusing to flatten. It also indicates that because of the transmissibility of SARS-CoV-2 and inadequate effective response, larger number of cases and deaths are likely to take place in times to come. (Bhatia, 2020)

2.1 Theoretical Framework

The theoretical framework is a crucial element in a research study as it provides a structure to support the theory. In this literature review, we will delve into multiple perspectives directed towards the ongoing pandemic that has affected the world since 2019. We will collect and analyze views from several authoritative sources, including authors, researchers, academicians, and scholars, to provide comprehensive insights on various parameters related to COVID-19. These parameters may include the impact of the pandemic on public health, economics, social life, and other related aspects. The literature review will particularly focus on published information about the status of medical systems during the pandemic. We will examine the effectiveness of the current medical systems in dealing with the pandemic, including the availability of medical facilities, equipment, and personnel. We will also evaluate the level of preparedness of the medical systems in various countries to handle the pandemic, including the challenges faced and the strategies implemented to mitigate them. In organizing the literature review, we will present a well-structured summary of the various sources, while also synthesizing the information to provide a clearer picture of the ongoing pandemic. This approach will help readers to understand the complex issues surrounding the pandemic and the impact it has had on various aspects of human life.

2.2 Theory of Reasoned Action

The Theory of Reasoned Action (TRA) is a social psychology framework that aims to explain the relationship between attitudes and behaviors within human action. The theory proposes that an individual's behavior is influenced by both their attitudes and subjective norms. Attitudes refer to an individual's positive or negative evaluation of a particular behavior, whereas subjective norms refer to perceived social pressure to perform or not perform a particular behavior. In the context of the healthcare system of our country, the TRA can be used to analyze if we are equipped to handle another pandemic-like situation in the near future. We need to understand the parameters that affect our healthcare system during a pandemic. These parameters include oxygen availability, hospital beds, medical supplies, medications, COVID Care centers, quarantine hospitals, doctors, nurses, and supplies like hand sanitizers, masks, and PPE Kit, among others. The TRA framework posits that the external variables that influence an individual's behavior include hospitals, clinics, nursing homes, nurses, and doctors. Thus, it is important to assess the state of our healthcare infrastructure and identify areas that need improvement. We need to evaluate if our healthcare system can handle the surge in demand during a pandemic and if there are enough resources to cater to the needs of patients. To bring significant changes to our healthcare system in the future, we need to identify what changes we can make. There is a need to implement policies and schemes that can strengthen our healthcare infrastructure. We need to invest in research and development to develop new vaccines, medications, and medical equipment. We need to train our healthcare professionals to handle emergencies and equip them with the necessary resources to do so.

CHAPTER III

METHODOLOGY

3.1 Overview of the Research Problem

The COVID-19 pandemic has wreaked havoc on the healthcare system in India, causing a severe imbalance between the demand for and availability of essential healthcare resources. The world was not at all prepared to face such scenario.

The current situation is alarming, as it suggests that there will be a significant shortage of hospital beds, ICU beds, ventilators, PPE, and trained medical personnel throughout the country. To give an idea of the scale of the problem, let's consider a hypothetical scenario. If only 0.1% of the population gets infected in the next two months, and only 5% of them require ICU beds, we will need 65000 ICU beds. If each patient remains on the ventilator for 15 days, this will create a demand for 975000 ventilator days. This is a simple calculation based on an infection rate of 0.1%, and the actual demand could be much higher if the infection rate increases.

The impact of the COVID-19 pandemic is not limited to the healthcare system alone. Public health activities, which are equally important in protecting the health of communities and promoting healthy and productive lives, have been severely impacted as well. Any sudden disruption in the delivery of health services can severely affect essential services, and the COVID-19 pandemic has disrupted ongoing health programs.

If we consider the rate of infection to be 1%, the demand for essential healthcare resources will be even higher, and meeting this demand will be a major challenge.

The availability of healthcare professionals and support staff to run ventilators safely is already a major concern, as they are getting infected and being sent for quarantine.

The COVID-19 pandemic has shifted the priorities of the healthcare system, which is overwhelmed and has limited capacity to provide services to communities. Logistics and supplies, especially of essential drugs and personal protective equipment, have been disrupted, adversely affecting services. Hospitals and health facilities overwhelmed with COVID-19 patients are also making it difficult for patients with acute or chronic ailments to access standard care. In conclusion, the national authorities have to plan for and address challenges related to the health of the population while simultaneously combating the COVID-19 pandemic. The situation demands urgent action to ensure that essential healthcare resources are available to those who need them the most.

3.2 Operationalization of Theoretical Constructs

This study aims to identify and classify constraints in the healthcare industry for the purpose of creating a "pandemic prepared" environment. As part of the research for this study, the primary method being employed is a comprehensive literature review and the development of a conceptual model. The study will begin by reviewing various types of constraints in the healthcare industry and their characteristics. This comprehensive analysis will allow the identification of the most common constraints that are likely to impact healthcare systems during a pandemic. To achieve this, a structured approach will be used to classify constraint factors. This will involve developing a classification method that categorizes constraint factors based on their characteristics. This process will allow for the identification and modeling of constraints that are most likely to impact the healthcare industry during a pandemic.

During the second stage of this study, our team will undertake an exhaustive review of current industry practices and academic research with the aim of identifying existing constraint modeling methods. We will conduct a comprehensive analysis of all relevant sources to ensure that we capture the most up-to-date information and insights in this area.

Comprehensive research refers to an in-depth and detailed investigation or study of a particular topic, question, or subject. This involves examining all relevant aspects, collecting a wide range of information, analyzing data, and drawing conclusions based on the results.

Comprehensive research typically involves a systematic approach to collecting and analyzing information from a variety of sources such as academic journals, books, databases, surveys, interviews, experiments, and other relevant documents. The goal of in-depth research is to gain a deep understanding of the topic or question being studied and to provide a comprehensive overview of the topic. This type of research typically involves a detailed literature review, collecting and analyzing data, interpreting results, and drawing conclusions and recommendations based on the results. Extensive research is often conducted in academic and scientific fields to advance knowledge, solve problems, or inform decision making. Researchers often use a variety of research methods and techniques to ensure that their research is thorough, rigorous, and comprehensive.

Our objective is to establish a robust framework that draws on best practices and empirical evidence, allowing us to develop effective constraint modeling methods that can be applied in a range of contexts. We are committed to delivering insights that are clear, concise, and evidence-based, and that will provide valuable guidance to practitioners, researchers, and other stakeholders in this field.

This analysis will explore the various methods used to model constraints and identify the most effective techniques for modeling constraints in healthcare systems during a pandemic.

Upon identification of the techniques for constraint classification and modeling, a comprehensive framework for total constraint management will be delineated. This framework will provide a comprehensive approach to managing constraints within the healthcare industry during a pandemic. This will help to ensure that healthcare systems are prepared to handle the challenges presented by a pandemic

3.3 Research Purpose and Questions

The COVID-19 pandemic has had a catastrophic impact on our lives globally. It has become increasingly important to conduct research to understand if our country's healthcare system is equipped to handle another pandemic-like situation in the future. The objective of the current study is to provide a comprehensive review of literature and hospital practices to analyze and outline a framework for dealing with such a situation. The study aims to identify ways to overcome the difficulties that we faced during our first encounter with the pandemic and assess how well the healthcare system of our country is equipped to deal with a similar situation in the near future. It will examine the challenges faced by various hospital departments, including ICU, pathology, radiology, OPD, and other related departments. The research will take into account the shortage of resources such as masks, PPE kits, hospital beds, oxygen, medicines, injectables, and testing kits. Furthermore, the study will provide an in-depth analysis of the ordeal faced by doctors, medical staff, and healthcare staff during the peak waves of COVID-19. It will examine the risks they faced while providing essential medical services and the measures taken to safeguard their health and protect them from the virus. Finally, the research will suggest changes that can bring about significant improvements in our healthcare system. It will consider whether we need to implement new schemes in hospitals to address a similar situation in the future and how we can make our healthcare system more efficient and robust. The study will provide a comprehensive framework for dealing with pandemics that can help us be better prepared to tackle similar situations in the future.

3.4 Research Design

A research design is a strategy for answering your research question using empirical data. Creating a research design means making decisions about:

Your overall research objectives and approach	Whether you'll rely on primary research or secondary research	Your data collection methods
Your sampling methods or criteria for selecting subjects	The procedures you'll follow to collect data	Your data analysis methods

Table 1: Research design

A well-planned research design is essential to ensure that your methods align with your research objectives and that you use the appropriate analysis for your data. In this research, the first step is to select a sampling frame, which is the staff of the hospital. Later, a sample size of 50 doctors, 100 general public, 20 non-clinical staff, and administration staff will be selected. The sampling technique that will be used is random sampling which involves randomly selecting a small group of people (a sample) from a larger population and predicting the likelihood that their responses will match those of the overall population.

In this sampling method, each member of the population has an equal chance of being selected. This method is the simplest probability sampling method because it involves only a single random selection and requires little prior knowledge of the population. Since a random method is used, any research conducted on this sample should have high internal and external validity and be at lower risk of research bias such as sampling bias and selection bias.

Two essential requirements for probability sampling are that everyone in the population must have an equal, non-zero chance of being selected and that the specific chance of being selected for each person is known.

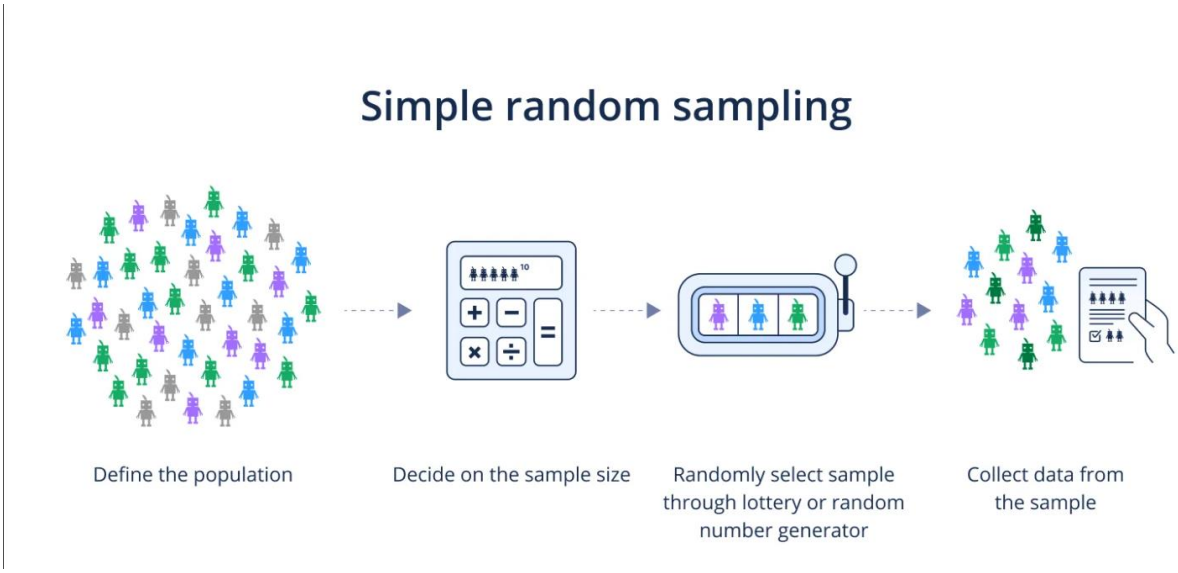


Figure 7: Simple random sampling (Source: Google)

To collect data, participant observation, structured interviews, and semi-structured interviews in the form of surveys and questionnaires will be used. The data collection process will require access to a hospital or clinic that was functional during the COVID period. A survey is a tool that helps to examine a process or question a selected sample of individuals to obtain data about a service, product, or process.

Data collection surveys are commonly employed to gather valuable information on the opinions, behaviors, or knowledge of a targeted group of individuals. Such surveys aim to collect accurate and relevant data and are instrumental in making informed decisions. Some of the common types of surveys include written questionnaires, face-to-face or telephone interviews, focus groups, and electronic surveys via email or website. With the advent of probability sampling techniques in the 1930s, surveys have emerged as a comprehensive and widely accepted tool for empirical research across social sciences, marketing, and official statistics. The application of probability sampling has enabled researchers to draw accurate statistical inferences from a small yet representative sample of a population, leading to an unparalleled level of insight and understanding of different phenomena. Today, surveys are an indispensable aspect of research in various fields, including social sciences, healthcare, finance, and government. The results obtained through surveys help businesses and policymakers to make informed decisions, identify market trends, and understand consumer behavior. Moreover, surveys provide an efficient and cost-effective means of data collection, enabling researchers to gather large-scale data sets in a relatively short period.

As such, the significance of surveys in empirical research cannot be overstated, and they continue to remain a valuable tool for researchers seeking to explore various aspects of human behavior and society. The methods involved in survey data collection are any of the number of ways in which data can be collected for a statistical survey. The data collected through these methods will help in predicting the likelihood of the responses of the overall population, which will be used to analyze and draw conclusions about the research objectives.

Qualitative and quantitative data are broad categories that encompass a variety of research methods and approaches. While both have the primary goal of gathering knowledge, quantitative research is numerical and objective, seeking to answer questions such as when or where. Qualitative research, on the other hand, focuses on subjective phenomena that cannot be measured numerically, such as how different people experience grief.

We have used a mixed of qualitative as well as quantitative analysis for this research. In our research survey we have put some open-ended questions as well because we wanted to understand the feedback from the sample population as well.

Quantitative analysis: Quantitative research approaches questions from a different perspective than qualitative research. Instead of trying to understand subjective meaning by asking exploratory questions like “how?” and “why?”, quantitative research provides precise causal explanations that can be measured and communicated mathematically.

While qualitative researchers may visit subjects in their homes or in the field, quantitative research is typically conducted in a controlled environment. Instead of gaining insight or understanding about a subjective, contextual issue, as is the case with qualitative research, the goal is to gather objective information, such as determining the best time to undergo a particular medical intervention.

Qualitative research: Qualitative research differs from quantitative research in its goals, techniques, and design. It aims to collect information about phenomena, groups, or experiences that cannot be objectively measured or quantified mathematically. Qualitative research is more exploratory, relying on data sources such as photographs, diaries, video footage, and interviews.

3.5 Population and Sample

During the early 19th century, researchers endeavored to conduct exhaustive surveys of entire populations, a task that was onerous and often resulted in suboptimal research outcomes. In contrast, contemporary researchers and academicians rely on smaller population subsets, known as samples, from which they make inferences about the broader population from which the sample was drawn. A population is the entire group from which you want to draw conclusions. A sample is the specific group from which you will collect data. The sample size is always smaller than the total population size. In research, a population does not always refer to people. It can mean a group that contains elements of whatever you want to study, such as objects, events, organizations, countries, species, organisms, etc. Population is important in a research study because it forms the basis for selecting participants and determining sample size. Population refers to the set of cases that will form the subject of sample selection. By defining the population, researchers can specify the criteria that participants must meet, such as inclusion and exclusion criteria. The selection of the population and sample size is crucial to achieving the research objectives. Careful selection of a representative sample of the population ensures the appropriateness of the comparisons made in the study.

In general, understanding and defining the population is fundamental to research because it provides the framework for selecting participants, determining sample size, and doing the analysis.

In this study, the sample population comprises individuals who are residents of India. The research team will be selecting diverse subsets of this population, including 50 medical professionals, 100 members of the general public, and 20 non-clinical staff and administrative personnel.

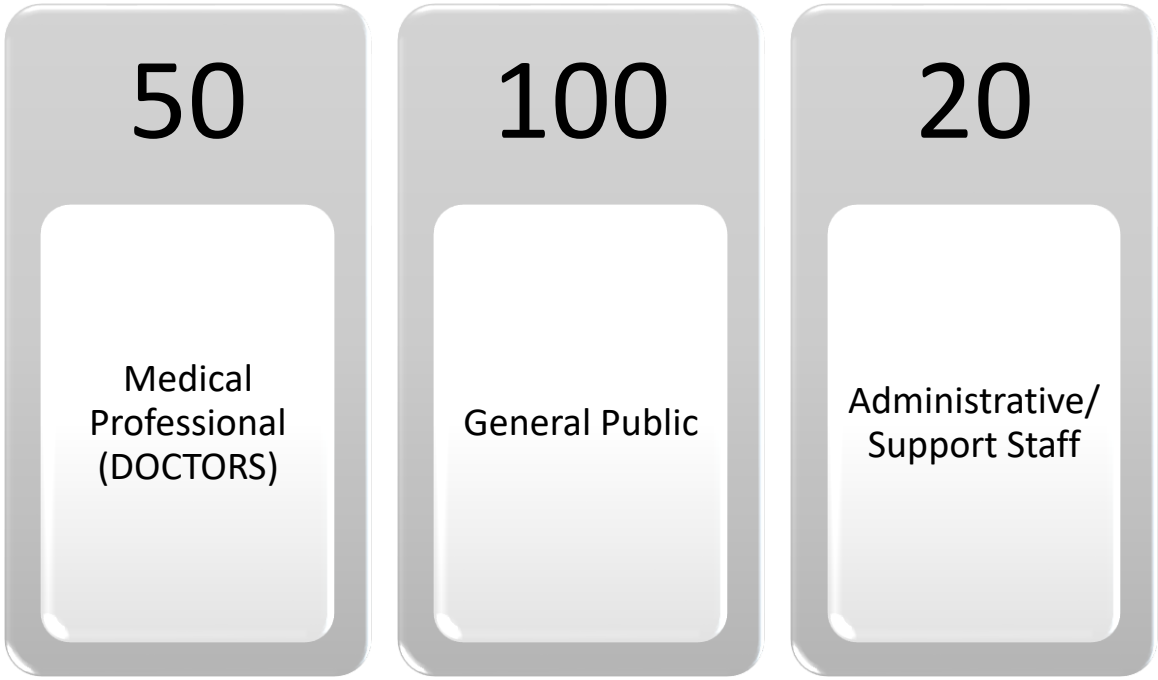


Figure 8: Sample selected for the research

3.6 Participant Selection

The following criteria will be utilized to determine eligible participants for the study:

1. Medical Professionals: Medical professionals who have worked in a hospital or clinic during the COVID-19 pandemic shall be selected.
2. Non-Clinical and Administrative Staff: Individuals who have provided services in non-clinical or administrative roles at a hospital or clinic during the COVID-19 pandemic are eligible to participate.
3. General Public: Any member of society who lived through the COVID-19 pandemic in India will be considered for participation.

3.7 Instrumentation

Data instrumentation is a crucial process in research that encompasses the selection, design, and implementation of data collection methods. The accuracy and reliability of research data heavily rely on the quality of the instrument used in the data collection process. Therefore, the selection of the appropriate data collection method and its design play a pivotal role in ensuring the validity of the data collected. It is, therefore, imperative to exercise due diligence in the process of data instrumentation to ensure that the data collected is dependable and trustworthy. Research instruments commonly employed in data instrumentation include interviews, surveys, observations, focus groups, and secondary data. Interviews may be structured, semi-structured, or unstructured, and are typically conducted in-person or in group settings. Surveys gather data from a wide demographic and can be distributed via various formats, such as paper, email, or phone.

Observations gather data regarding the behaviors of participants in their natural environment, while focus groups gather data from groups of individuals who share similar experiences or characteristics. Secondary data is data that has already been collected and analyzed by another party. The quality of research is highly dependent on the quality of the research instrument. The efficiency of a research instrument is directly proportional to the authenticity and reliability of the research. In our research, we utilized a combination of interviews, surveys, and questionnaires, with unique survey forms tailored to the profiles of doctors, administrative and non-clinical staff, and the general public. This approach ensured that we obtained pertinent and germane data from each demographic. In conclusion, data instrumentation is a multidisciplinary approach that requires meticulous attention to detail and expertise in research methodologies. The selection of a research instrument is central to the accuracy and reliability of research data. Consequently, researchers should prioritize the use of high-quality research instruments to obtain dependable and genuine data are used to gather data on the behavior of participants in a natural setting. The focus group methodology is a research technique employed to collect data from individuals who share similar characteristics or experiences. This approach is particularly useful for obtaining insights and feedback on products, services, or other topics of interest. Its structured format and interactive nature provide a valuable means of gathering rich, nuanced data that can inform decision-making and drive positive outcomes. Secondary data is data that has already been collected and analyzed by someone else. The quality of research largely depends on the quality of the research instrument used. An efficient research instrument ensures the authenticity and reliability of the research. In our research, we used a combination of interviews, surveys, and questionnaires. We created

different survey forms for doctors, administrative and non-clinical staff, and the general public to ensure that we received appropriate and relevant data from each group.

3.8 Data Collection Procedures

Collecting data is a fundamental process in research that entails the gathering of information on a particular subject or phenomenon. Researchers can use various techniques to collect data, such as observation, interviews, questionnaires, schedules, and surveys. One noteworthy data collection technique that has gained considerable attention in recent times is the randomized response (RR) technique. This technique, which Warner developed in 1965, allows researchers to obtain sensitive information while guaranteeing privacy for respondents. Encouraging greater cooperation among respondents can effectively reduce the probability of false attitude reporting. This approach ensures a more accurate representation of the attitudes being reported and helps to maintain the integrity of the results. This technique has proven to be useful in situations where respondents may be reluctant to answer honestly due to the sensitive nature of the questions asked. Understanding the specifics of how technology is used, or might be used, often requires a detailed examination of activities conducted in context. Case studies are a useful technique that involves the thorough investigation of individuals and groups facing specific challenges to understand the real and potential impacts of computing technology. This particular methodology is grounded in a thorough and contextual examination of a limited number of cases. It employs a range of data sources that are analyzed using rigorous qualitative methods, which culminate in nuanced descriptions that effectively capture the intricacies and complexities of the

environments under scrutiny. Case studies can be used to explore design opportunities, explain activities in context, describe systems, contexts, or processes, and demonstrate the successful use of novel tools.

Questionnaires are another popular data collection technique that involves stand-alone instruments administered to sample subjects either through mail, phone, or online. The questionnaires provide an opportunity to structure data collection plans with precision. Participants can take their time to think about the questions and answer accordingly. This technique is widely used due to its convenience and ability to reach a large number of participants. It is also cost-effective and can be used to collect both quantitative and qualitative data. In conclusion, data collection techniques are crucial in research as they help researchers gather the necessary information for the study. By choosing the most appropriate technique based on the research objectives, the nature of the research, and the available resources, researchers can gather accurate and reliable data.

3.9 Data Analysis

Data analysis is a systematic process that involves the application of statistical and/or logical techniques to describe, summarize, and evaluate data. It encompasses various methods, such as examining, filtering, adapting, and modeling data, aimed at solving problems and making informed decisions. Non-statistical analysis as a tool for the analysis has been pursued here. The auditor or researcher selects items that they believe are representative of the population, based on their professional judgment and experience. This method of sampling is particularly useful when the sample size is limited, and the researcher's knowledge and expertise play a crucial role in selecting the sample. There are several types of non-statistical sampling methods, including Haphazard Sampling, Judgment Sampling, and Block Sampling. Haphazard sampling involves selecting items without any specific plan or method, whereas Judgment Sampling involves the use of professional judgment to select samples most likely to contain misstatements or errors. Block Sampling, on the other hand, entails selecting a block or sequence of items from the population, assuming that the selected block is representative of the entire population. In our study, we used Judgmental Sampling, also known as purposive sampling or authoritative sampling, to select the sample for our research. This technique relies on the researcher's knowledge and judgment to choose sample members. It is most useful when there are only a limited number of people in a population who possess the qualities that the researcher is looking for. Researchers often choose judgmental sampling when other sampling techniques would be too time-consuming or when they have confidence in their knowledge to select a sample for conducting research. This method is highly accurate, with minimal errors, as it is based on the researcher's expertise and knowledge.

3.10 Research Design Limitations

Every research has its limitations, and these limitations arise due to restrictions in methodology or research design. In our research, we faced a major limitation, which was that not many doctors and healthcare workers were willing to give us their consent to record their views. This was mainly due to the confidentiality agreement they had to adhere to, as they were not allowed to divulge much information. To overcome this limitation, we had to do a lot of follow-ups with the doctors and support staff to get their responses, as they were extremely busy and didn't have enough time to provide us with detailed answers. This resulted in a delay in collecting and analyzing the data, which was a significant challenge.

Another major limitation of our research was the lack of previous studies in the research area. As it was the first time in many years that our nation was hit with a pandemic, there was very little research available to discuss in-depth, as it was a new viral strain. We had originally planned to increase the sample size and take personal interviews of every individual. However, due to the shortage of time and resources, we were only able to interview a few respondents.

We also observed that surveys focused on collecting quantitative data, which may limit the depth of understanding. Surveys may not capture nuanced or contextual information about organizational dynamics, culture, or interpersonal relationships. We had to face this challenge as we were collecting data through surveys, and we had to ensure that we were getting a comprehensive and accurate understanding of the respondents' perspectives. Finally, some of the data on general populations, such as a particular ethnic group, may be too unreliable to be useful.

Therefore, we had to be cautious while interpreting the data and ensure that we were not making any biased or inaccurate conclusions. In a nutshell, our research faced several limitations, but we were able to overcome most of them by being diligent and meticulous in our approach.

Few gaps that we observed were as follows:

1. Knowledge gap: These are gaps in knowledge or understanding about a topic that require additional research to fill. For example, there may be a lack of understanding of the mechanisms behind a particular disease or how a particular technology works.in our research the knowledge about the virus is limited.
2. New mutant strain: COVID 19 is a new strain of the virus which makes it even more complicated to research in depth.
3. Rush Hours: Since the doctors are busy throughout the day, it became very difficult to reach them and have an in-detail discussion about the pandemic. There were some of the doctors who refused to even entertain the forms which cost us a lot of time.
4. Classic literature gap: This type of research gap occurs when a new concept or phenomenon has not been studied much, if at all. For example, in current research, the virus is a new mutant strain and there is very little research done on it. This is why the world is struggling to fight the pandemic.

3.11 Conclusion

The objective of the research was to comprehensively evaluate the impact of the COVID-19 pandemic on patients with acute coronary syndromes, cancer care, immunosuppressive therapy, tumor resection, and inpatient treatment. The study obtained data through a series of interviews and surveys conducted with healthcare workers, the general public, and administrative staff. The study found that patients with these conditions have been disproportionately affected by the pandemic. The protocols that previously required in-person visits to healthcare facilities have been altered, leading to a significant disruption in the healthcare system. The healthcare providers and patients are now grappling with new challenges in delivering and receiving healthcare services. The study further notes that patients with terminal cancer require compassionate and aggressive treatment. However, the pandemic has led to the denial of potentially life-saving treatment to these patients, which has given rise to ethical dilemmas. Furthermore, the fear of contracting SARS-CoV-2 has made patients hesitant to seek healthcare in healthcare facilities. This situation calls for careful consideration and attention to ensure that patient care is not compromised. The study recommends that innovative solutions need to be implemented to address these challenges. It is essential to assess the impact of changes in healthcare protocols on the health of affected patients. The healthcare providers need to ensure that the patients receive the care they need while maintaining their safety during these unprecedented times.

CHAPTER IV:

RESULTS

FOR GENERAL PUBLIC –

SAMPLE SIZE 100

4.1 Name

Everyone who filled the form has given their names in this question

4.2 Age

The age bracket of the sample ranged from 23 till 57.

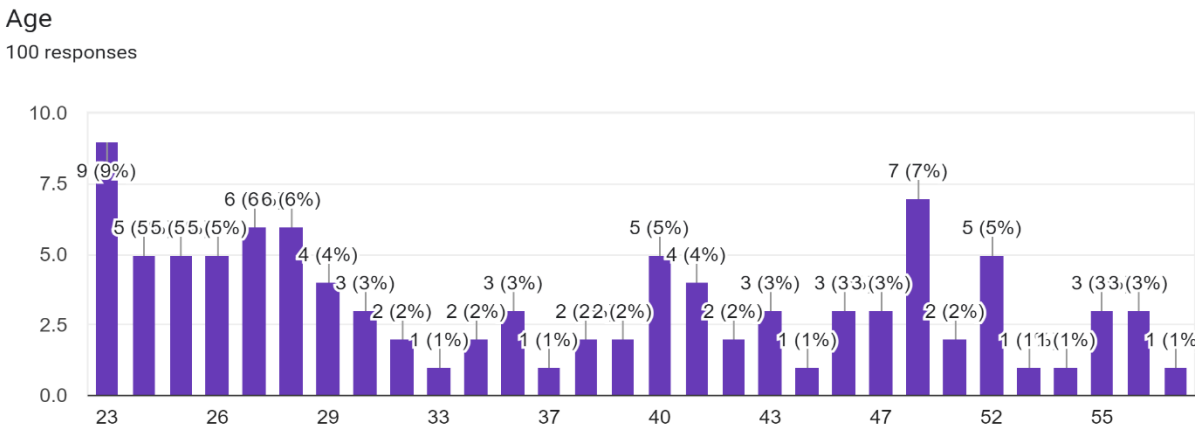


Figure 1.1: Age of the participants for general public

4.3 Gender

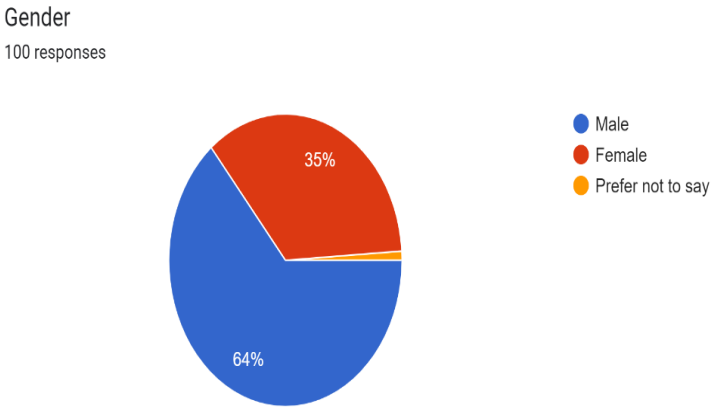


Figure 1.2: Gender of the participants for general public

4.4 City/Locality

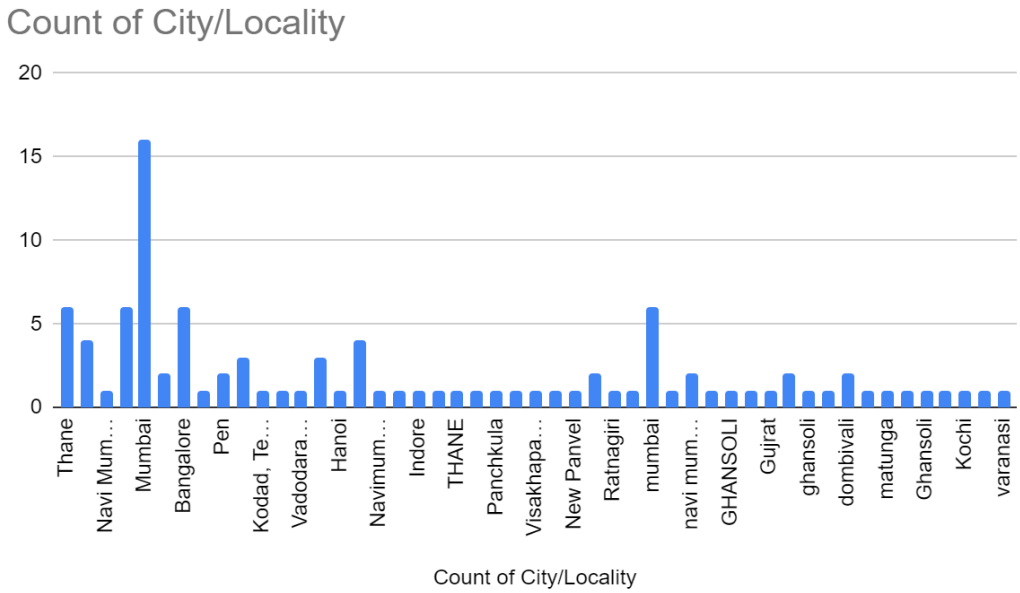


Figure 1.3: Locality of the participants for general public

4.5 Have you ever been infected with COVID 19?

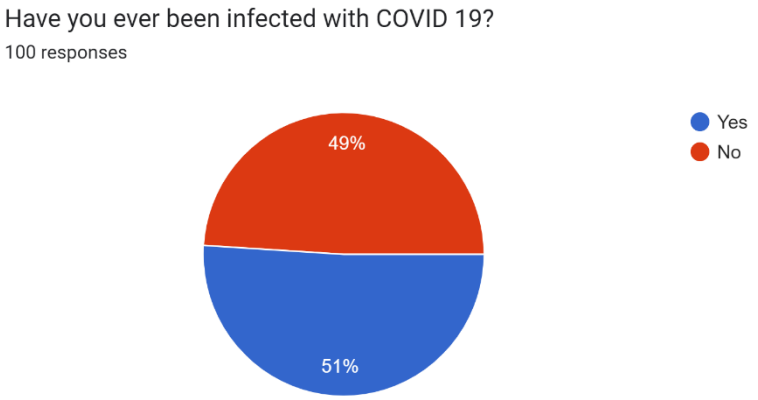


Figure 1.4: Percentage of participants who did/didn't suffer from COVID 19

4.6 How were you exposed to COVID 19?

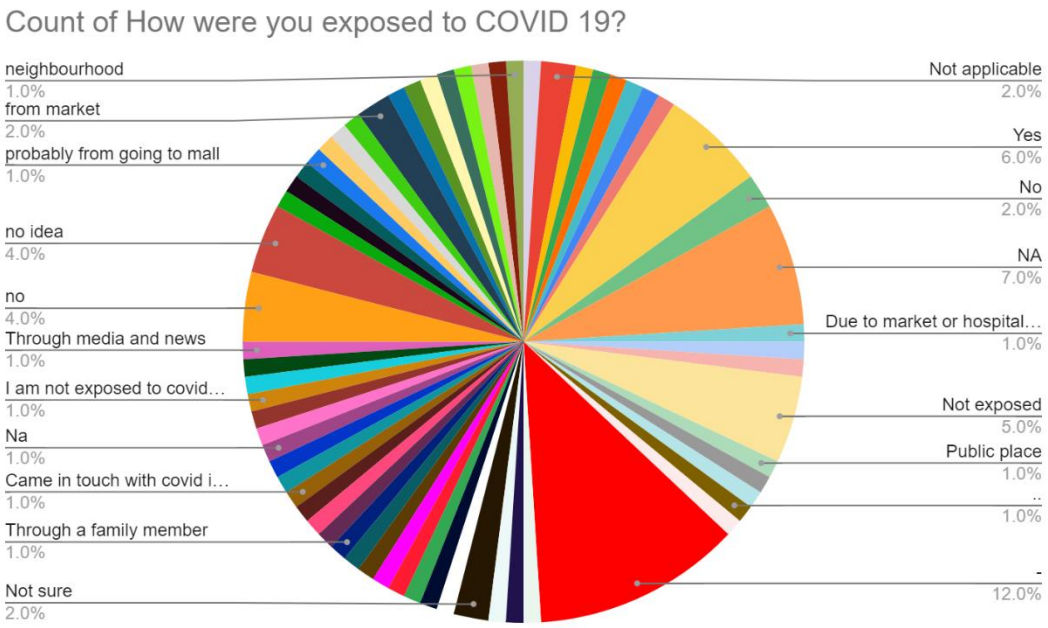


Figure 1.5: Exposure source of participants of COVID 19

4.6 Where did you isolate yourself during the infection?

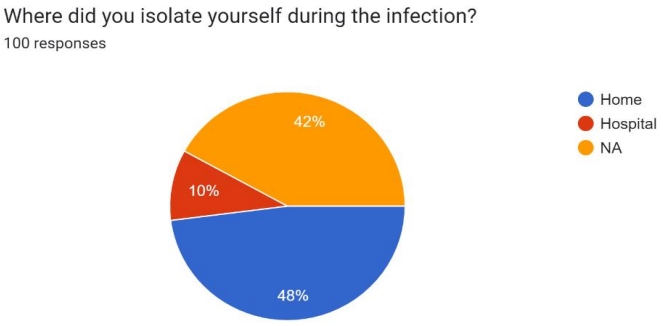


Figure 1.6: Percentage of participants who isolated at home and those who were isolated in a hospital

4.7 Did the local authorities help you to tackle with issues during your COVID 19 journey?

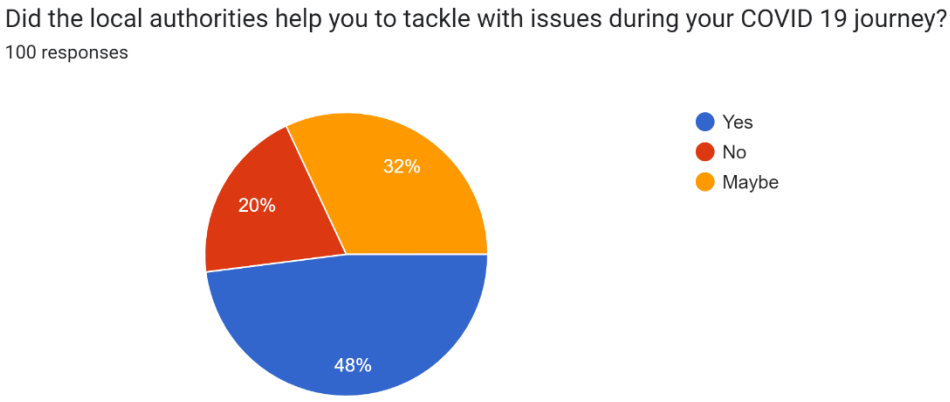


Figure 1.7: Percentage of participants reviewing help received or not from local authorities

4.8 Did the local authorities help you to tackle with issues during your COVID 19 journey?

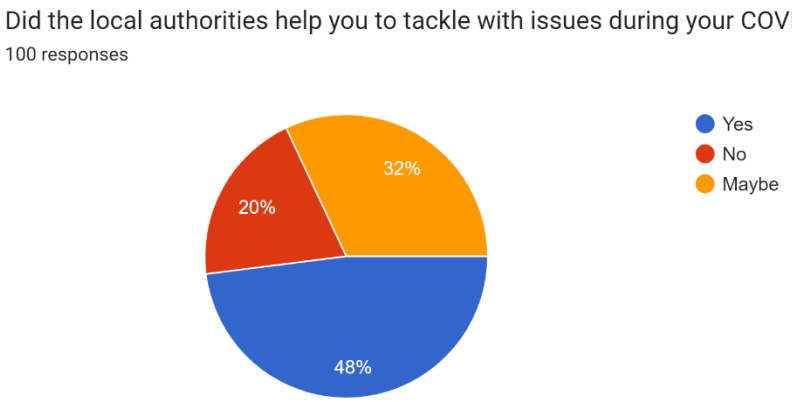


Figure 1.8: Percentage of participants reviewing help received or not from local authorities

4.9 During the pandemic how easily were you able to get supplies like masks, sanitizers, medication etc.?

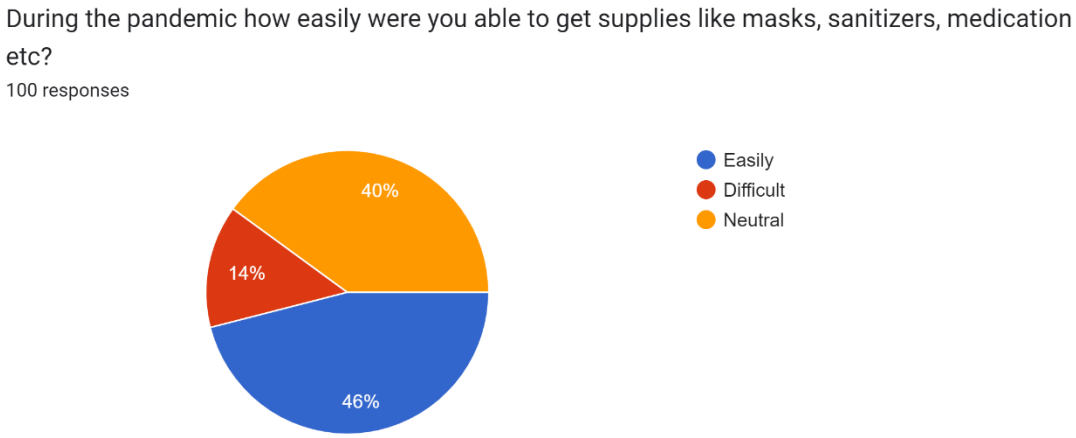


Figure 1.9: Percentage of participants reviewing supplies availability

4.10 Did you take health as a serious factor in your life before getting COVID 19?

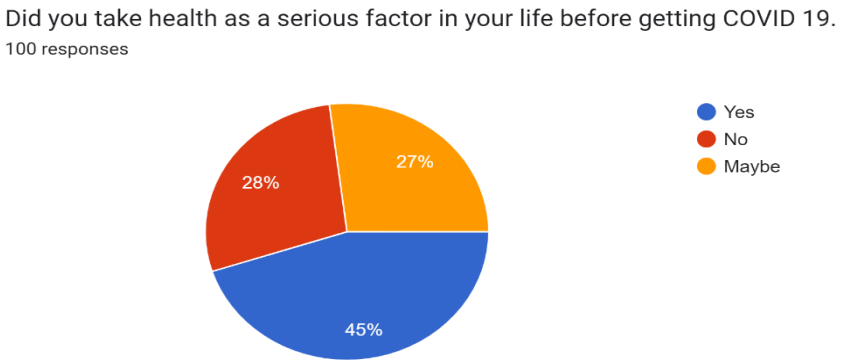


Figure 1.10: Percentage of participants reviewing of they took health seriously before COVID 19

4.11 Did COVID19 impact you mentally, physically and emotionally?

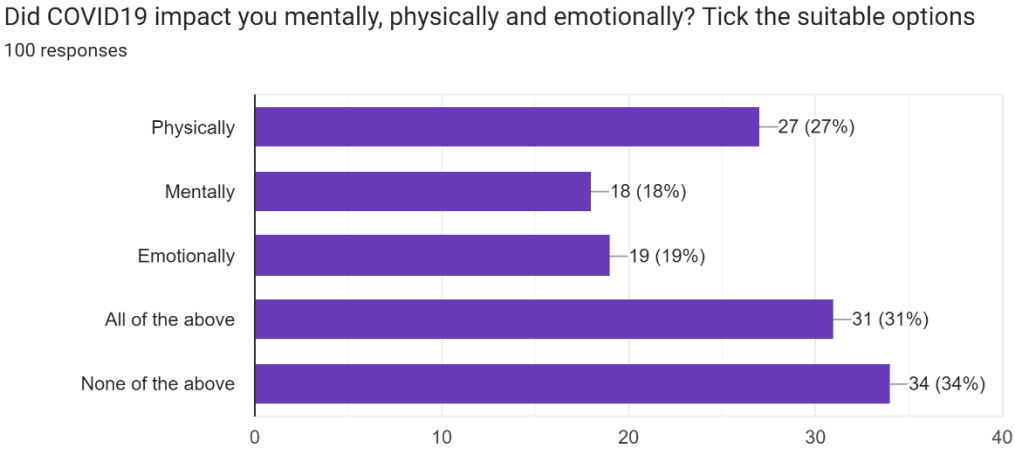


Figure 1.11: Percentage of participants reviewing mental, physical and emotional wellbeing during COVID 19 pandemic.

4.12 Did you try to call the govt given toll free number?

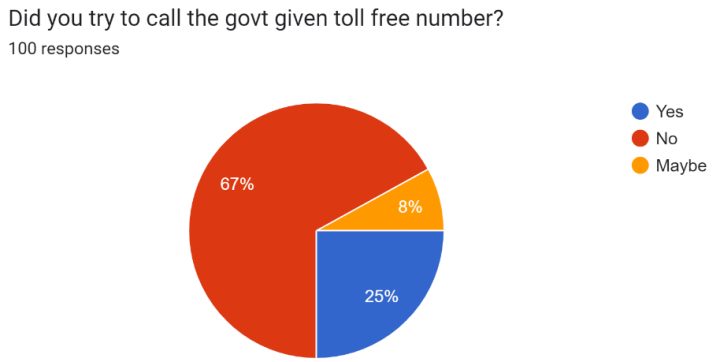


Figure 1.12: Percentage of participants reviewing if they had contacted COVID 19 India helpline number

4.13 Did you use Aarogya Setu application?

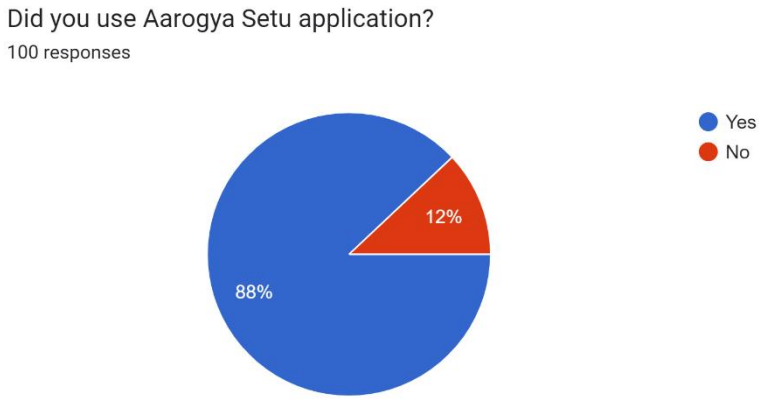
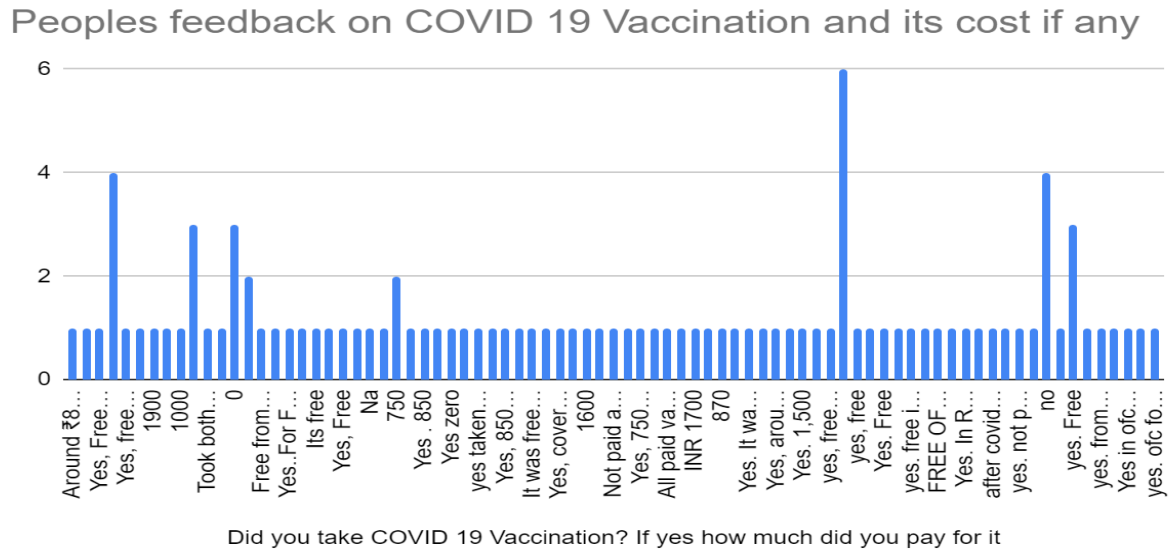


Figure 1.13: Percentage of participants reviewing if they had used Aarogya Setu application

4.14 Did you take COVID 19 Vaccination? If yes how much did you pay for it



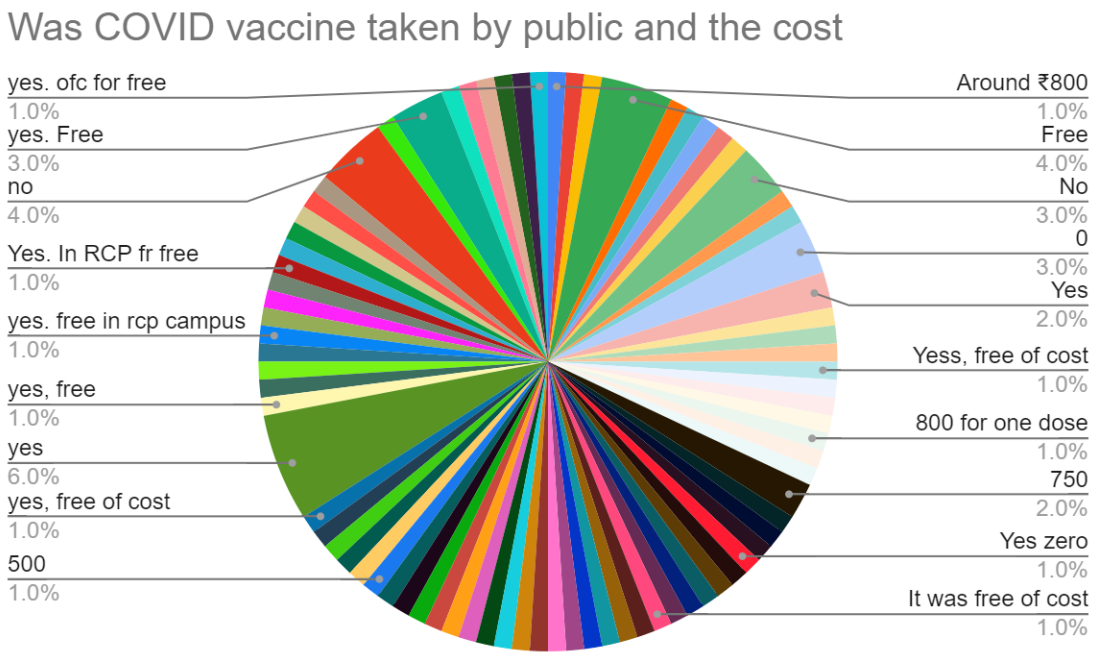
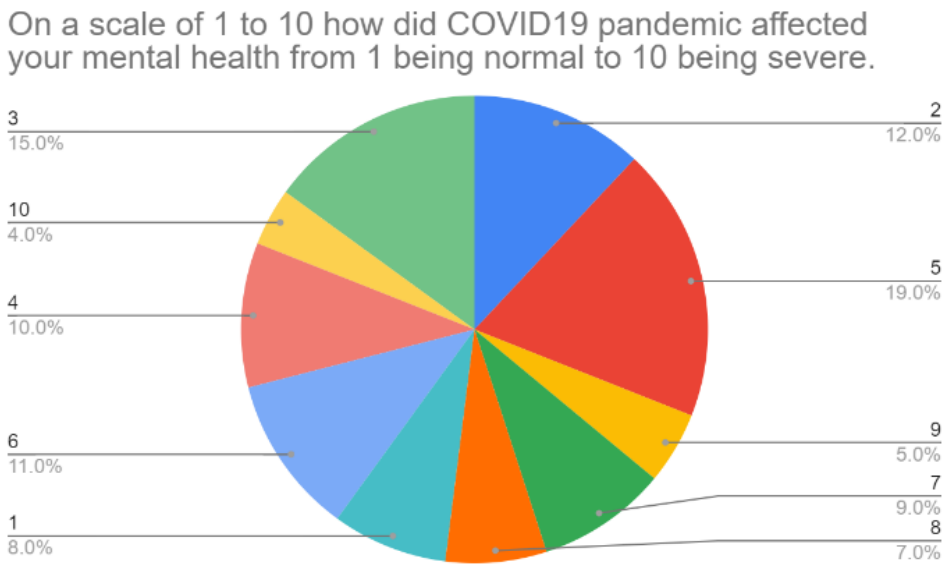


Figure 1.14: Peoples view about taking vaccine and its cost

4.15 On a scale of 1 to 10 how did COVID19 pandemic affected your mental health from 1 being normal to 10 being severe.



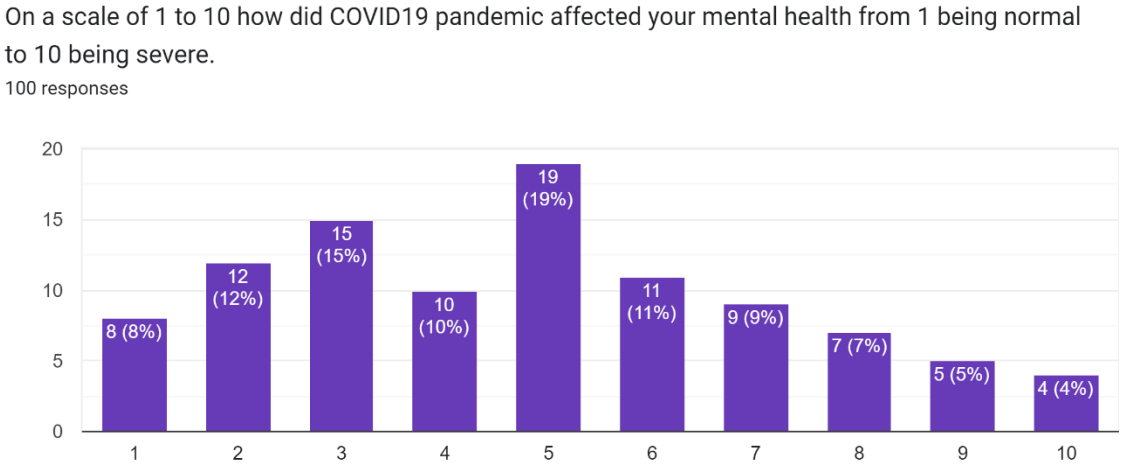


Figure 1.15: How COVID19 pandemic affected mental health of sample

4.16 Suggest, how as a country we can be prepared in future if we face another pandemic like situation

Since the sample size is 100, we shall be discussing the most common suggestions that were given by the public to tackle another pandemic if any in future

- more hospital, awareness
- Taking proper precautions, and spreading public awareness.
- Keep the medical services handy for economically backward people
- Take safety measures and get proper vaccination
- Proper planning and execution of situation and spread of awareness and Mental Health Support.
- There is a lacking of hospitals where there is all the equipment available to tackle such situations. To improve health infrastructure like United States and other western countries.
- Take Vaccination on time. We should start opening new hospital with sufficient staff and doctors
- Make use of party halls for accommodation of beds, proper supply of medicines
- Be prepared for every and anything
- Be prepared with oxygen cylinder and rapid built hospitals, keep a data of all warehouse that could be transformed in to hospitals...
- As we are a highly populated country in the world... There should be proper planning before imposing any force majeure law. The pandemic has affected the people belonging in the lower part of the human pyramid due to improper awareness and lack of communication.

- Need to have good physical health
- Keep different provision as contingency for the next upcoming pandemics
- Awareness. Strong and resilient health systems, hospital capacity should be increased, have well-functioning supply chain.
- Better to wear a mask always when we go out even after covid was gone
- I think as a country we should be united and be co-operative towards the decision of the government, also follow the necessary Guidelines given by them.
- It would be good if hospitals all over India are well prepared and equipped with all the facilities that would be required as in some area's facilities are not present and why the time patient reaches the hospital it's too late
- COVID had a major impact on people who were not financially equipped poor people for example maids so some provisions could be made for them which are easily accessible for them.
- Giving more focus on the mental health of the population. Better implementation of policies and discipline
- Vaccination should be done to all age people Awareness of COVID Hospital and isolation center should be given to people public places should be sanitize on regular basis.
- By managing to get the vaccinations availability at the faster rate.
- At least put 25% share of government in private hospitals while giving license so that in every private hospital there should be department monitoring the private hospitals.
- Always wear a mask. More free vaccination drives. Stop corrupt shopkeepers who were selling supplies on double rates

- Increasing the number of medical equipment and training all medical staff efficiently
- I believe we did well
- To increase people immunity by increasing parks for jogging and playground for physical training
- Start taking precautions in advance when you know the neighboring countries are facing issues.
- Practice hygiene factors like hand hygiene, cough etiquette consistently Invest in healthcare Improve the conditions of hospitals Improve the remuneration of healthcare workers, especially of nurses, who risk themselves to care for, to be with the sick all the time. Encourage more people to embrace nursing, and medicine.
- Better hospital facilities
- At least districts level infrastructure development to handle these types of issues
- Improve our medical infrastructure
- Spread more awareness and knowledge to general public; avoid spread of falsified information and half-truths.
- Make govt operations and planning on healthcare more transparent to public. Allow more budget to empower healthcare system to address such situation in the future. Conduct frequent audit on healthcare institutions and take strict action on anyone misuse or corrupts the system for financial or personal gains.
- Fastrack diagnosis, Robust track and trace technology, Ease of availability of medication
- Lots of health education, strengthening the capacity of the health structures, planning in advance for emergencies, having a contingency plan, and strengthening supply chain management.

- Better precautions to contain the spread of the pandemic. Though the precautions were taken during 1st wave, it was largely ignored in the 2nd wave, which turned out to be more fatal.
- Such situations cannot warrant preparedness however India as a country has performed significantly well in comparison with other nations of the world with appropriate due diligence, rules around movement during pandemic, education, vaccination development and availability of critical medicines.
- If we know the portal of entry of virus or organism then we can plan accordingly. Government support with full integrity also required to control the pandemic. During pandemic bed management must be done appropriately in the hospitals. Triage the patient as per the criticality. Close monitoring and adequate staff are required. Ensure Support the hospital staffs all medical and non-medical. Ensure adequate availability of medications. Ensure mental, physical and emotional support. We should not mentally torture the patients.
- We need to understand the symptoms and decide a full proof plan for how to vaccinate the country like India (densely populated).
- Create proper awareness so people do not panic, ensure basic facilities are provided for everyone.
- Public awareness is the key. Advance preparation will go a long way in control in earlier stages itself.
- We need to be organized; we need planned medical equipment and facilities to counter such pandemic situations in future.
- Medical infrastructure should be improved, health to be made as free and accessible for all.

- We need to have sufficient hospitals and medical staff members to cater any contingency like situation in future. Awareness among the general public about proper hygiene and sanitation.
- By taking proper precautions, being financially independent
- By following all the mandatory rules of the government to face such type of pandemic
- No suggestions.
- By stop spreading rumors. Focusing more on improving immunity. Giving moral support and not sympathy. Taking good care of mental health as it matters the most during such pandemics. It's all about mindset and positive attitude, with that we can fight back such bug all together.
- Making people aware and We need action plan.
- Keeping adequate supplies of all the prerequisites.
- Showing faith in public and increasing the ways to provide resources to the people as lack of resources had affected the minds of people during pandemic.
- Increasing the no. of hospitals and doctors in the country. Even if students who are unable to clear their medical studies should be given some opportunities to work in hospitals.
- By maintaining hygiene and cleanliness of our surroundings and community. Strong campaign should be there for not littering and spitting in public.
- Keeping emergency supplies of oxygen cylinders, masks, sanitizers, or other necessities ready.
- Prevention and 200% of hospitals being equipped to handle the mass illness
- more hospital facility
- More hospitals, healthcare centers and doctors
- Be more organized and disciplined
- put good money in hospitals and by following rules and regulations

- By making people know about pandemic and following govts rules
- More hygiene. Stop non veg food consumption.
- people should follow govt instructions. proper healthcare system needed like in foreign. eat good food
- lower the cut-off for medical entrance so that we can get more doctors. Open more hospital open more small clinics tell public about these infections as a routine in colleges, ofc etc.
- understand what went wrong this time and improve
- Make makeshift hospitals before hand
- get good development in rural areas
- we are a developing country and should focus on infrastructure to tackle this

FOR ADMINISTRATIVE / SUPPORT STAFF

SAMPLE SIZE: 20

4.11 Name

Everyone who filled the form has given their names in this question.

4.12 Age

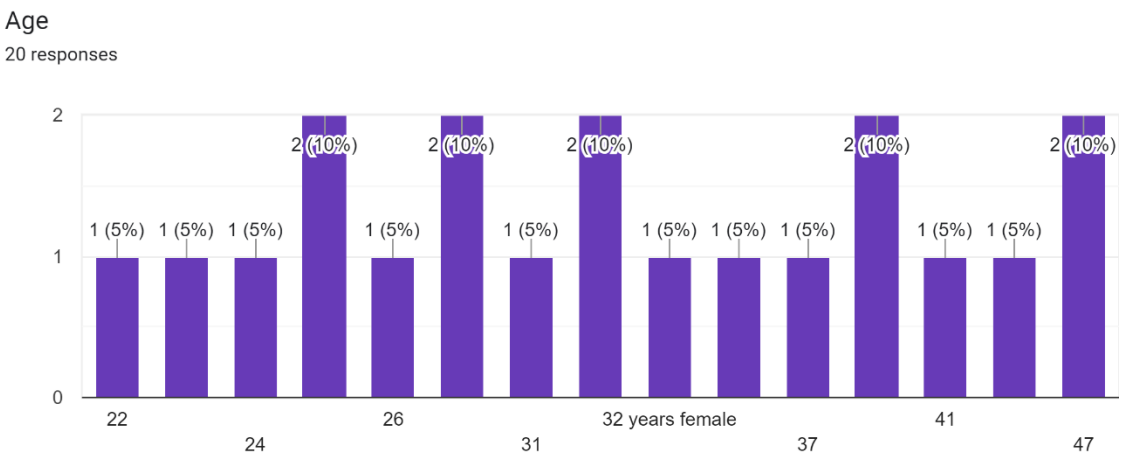


Figure 1.16: Age of the participants who took part in the survey

The sample size ranges from the age of 22 till the age of 47.

Gender: Male and female

4.13 Hospital/Clinic Name

Various hospitals participated and helped in completion of the survey.

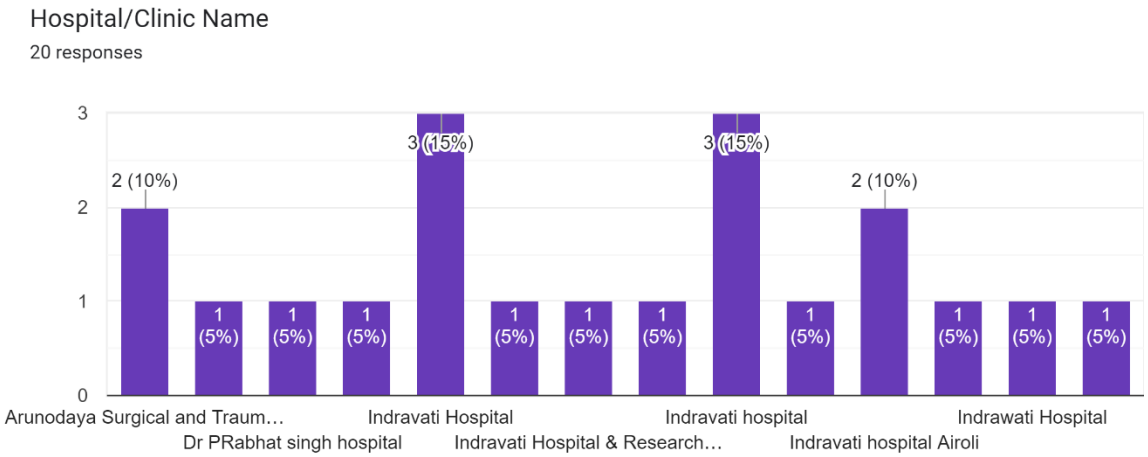


Figure 1.17: Hospitals that participated in the survey in and around the country

4.14 Qualification and Designation

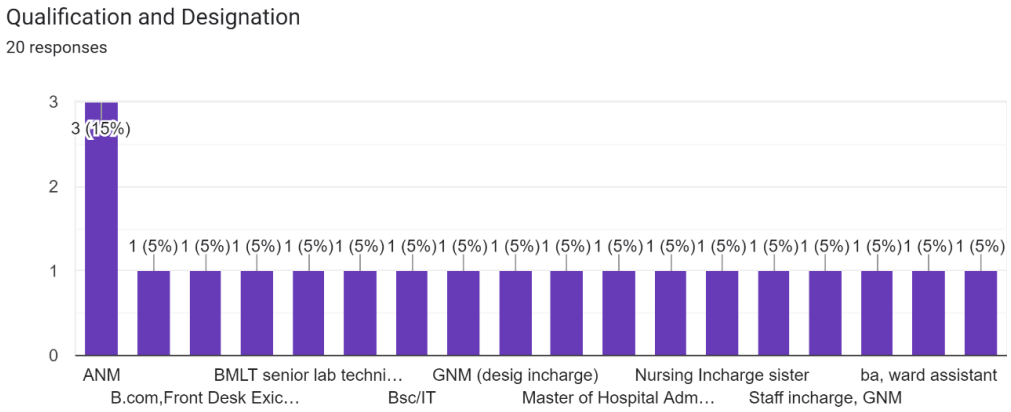


Figure 1.18: Qualifications of the participants

4.15 Did your hospital/ clinic face a shortage of staff during COVID-19?

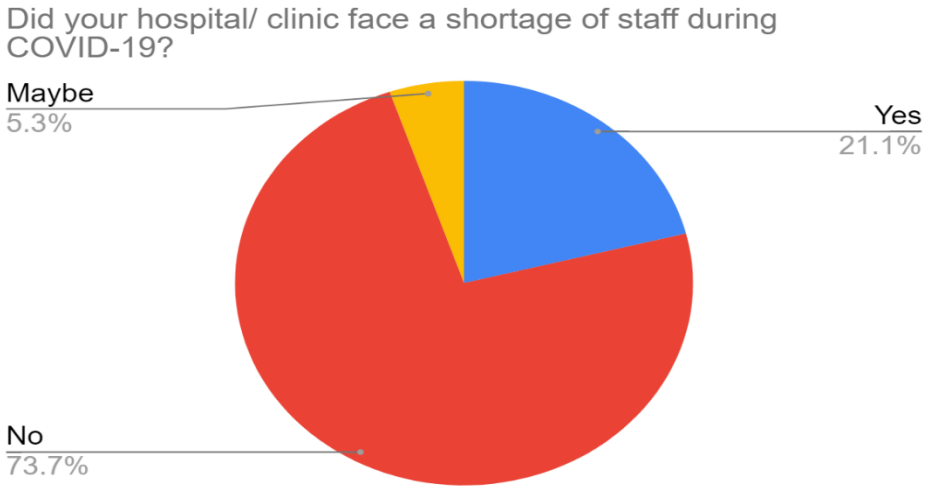


Figure 1.19: Depiction of staff shortage during COVID 19.

4.16 List the resources that were facing a shortage in a covid ward.

Some of the things that were facing shortage in a COVID ward as per the sample were as following:

- Beds
- Remdesivir injection
- Nursing Staff

The above three were selected by the sample as the things that were facing a lot of shortage during COVID 19 pandemic.

4.17 Have you had an extremely stressful, disturbing, or traumatic experience due to COVID-19?

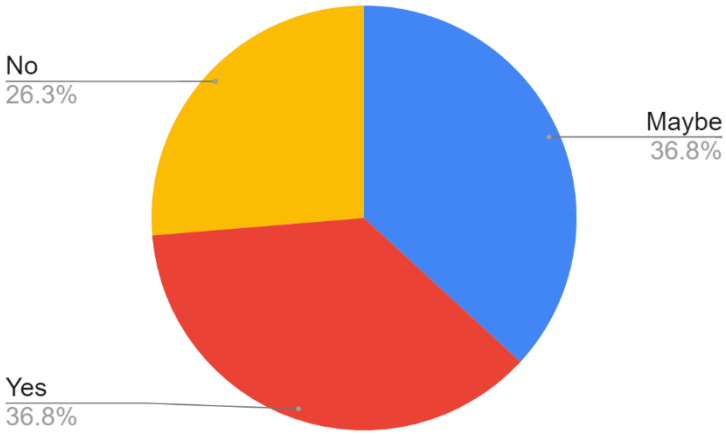


Figure 1.20: Depiction of sample's view if they had any stressful experience during COVID 19.

4.18 Were you paid enough salary remuneration for your work in COVID ward?

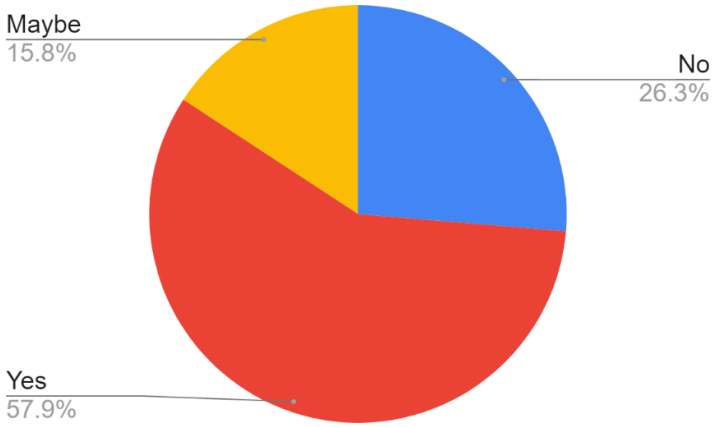


Figure 1.21: Depiction of sample's view about their salary renumeration

4.19 Did you suffer from COVID-19 while treating or managing a patient?

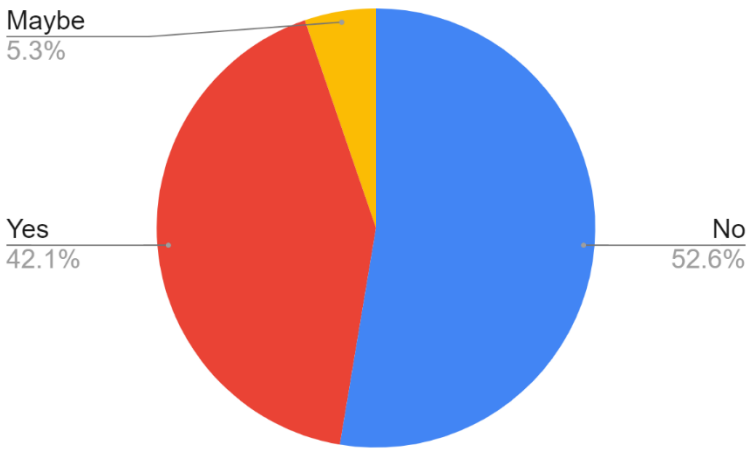


Figure 1.22: Percentage of sample who suffered and who didn't suffer from COVID 19

4.20 How often are you required to work beyond your shift to finish existing work or provide adequate care to patients?

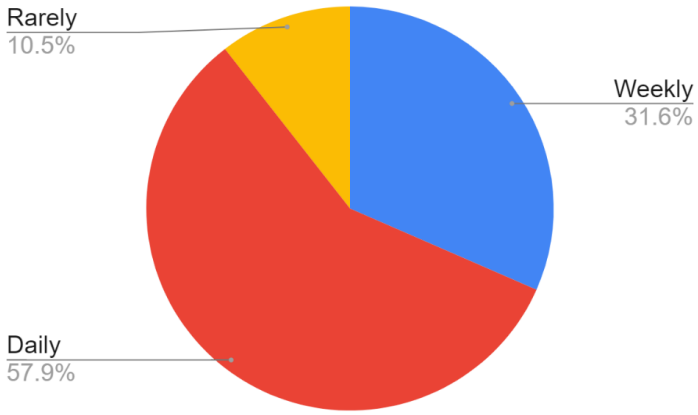


Figure 1.23: Percentage of sample who were required to work beyond their shift to finish existing work or provide adequate care to patients

4.21 As a support staff, what suggestion would you like to give to tackle a pandemic like situation in the near future?

We shall be discussing the most common suggestions that were given by the administrative/support staff to tackle another pandemic if any in future

- Don't panic and done be afraid of the situation.
- Take care of others with yourself also in panic situation. And be strong in any situation
- The government should give us some help to always maintain the spirit of working in the field
- Proper guidance to public. No fake news and rumors, fear about the pandemic.
- If anyone creates pandemic situation in future so I am ready to help any time.
- All staff are warriors so if again this situation come then all nursing staff again come together and fight with Covid and safe our patients.
- Never backing down. This is our nation so save and safe the people. Jay Hind
- More Nurses needed
- No suggestions to give

FOR HEALTHCARE PROVIDERS/ DOCTORS

SAMPLE SIZE: 20

4.30 Name

Everyone who filled the form has given their names in this question

4.31 Age

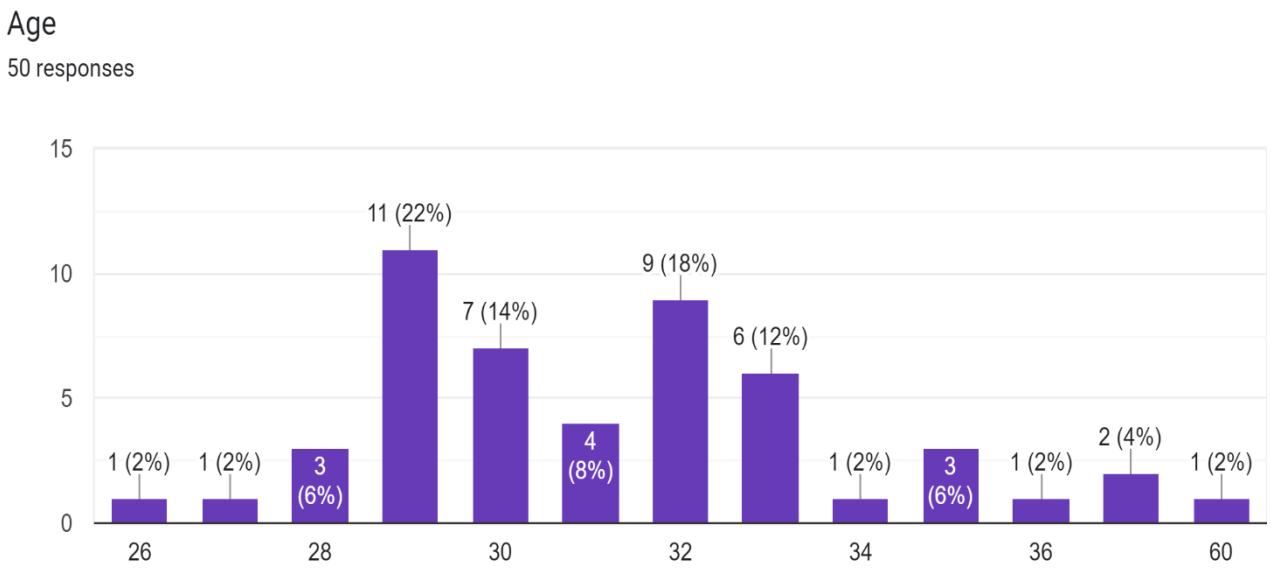


Figure 1.24: Age range of the sample who participated in this survey.

4.32 Qualification and Designation

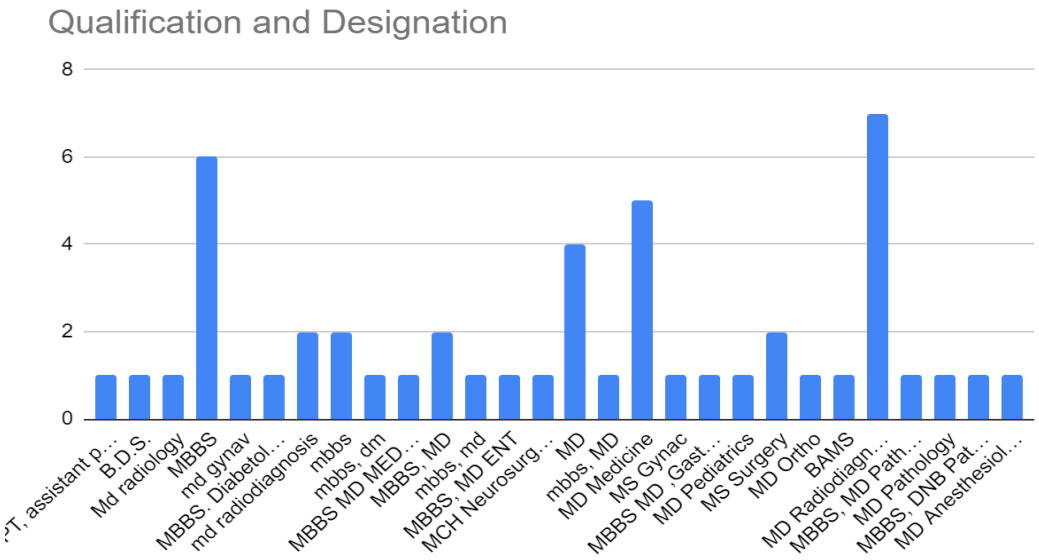


Figure 1.25: Qualification and designation of the sample who participated in this survey.

4.33 Hospital/Clinic Name

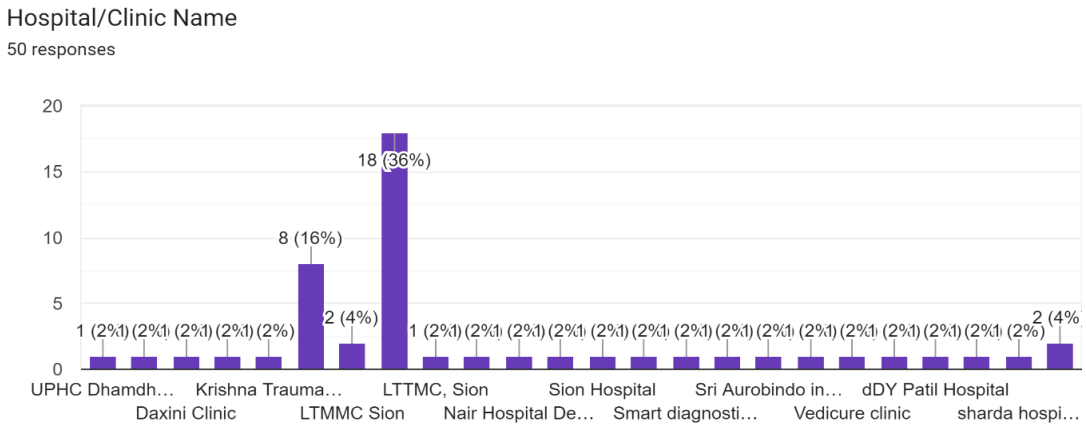


Figure 1.26: Hospital/clinic name of the sample who participated in this survey.

4.34 Do you work in a service/department/clinic dedicated to/or where patients with COVID-19 were hospitalized?

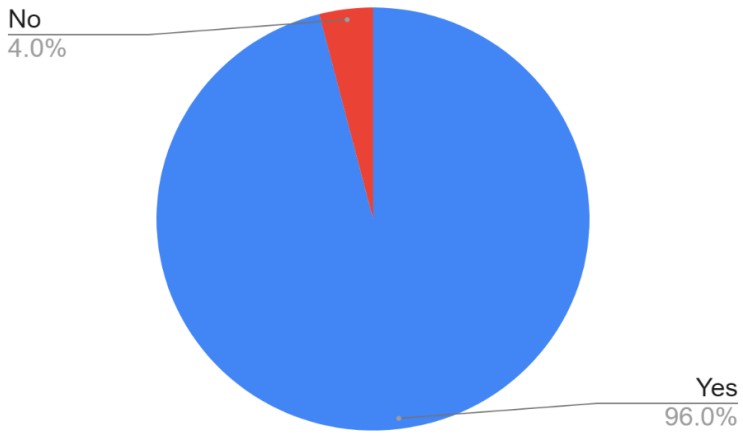


Figure 1.27: Percentage that has worked in a service/department/clinic dedicated to/or where patients with COVID-19 were hospitalized

4.35 Did you contract COVID 19 while treating your patients?

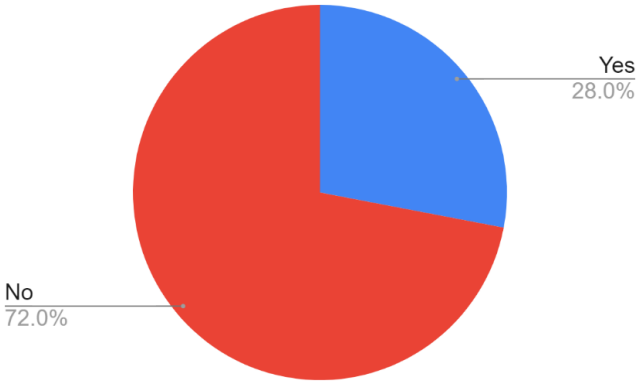


Figure 1.28: Percentage of sample that has contracted COVID 19 while treating their patients

4.36 Do you believe equipment given to you were enough to protect you from COVID 19?

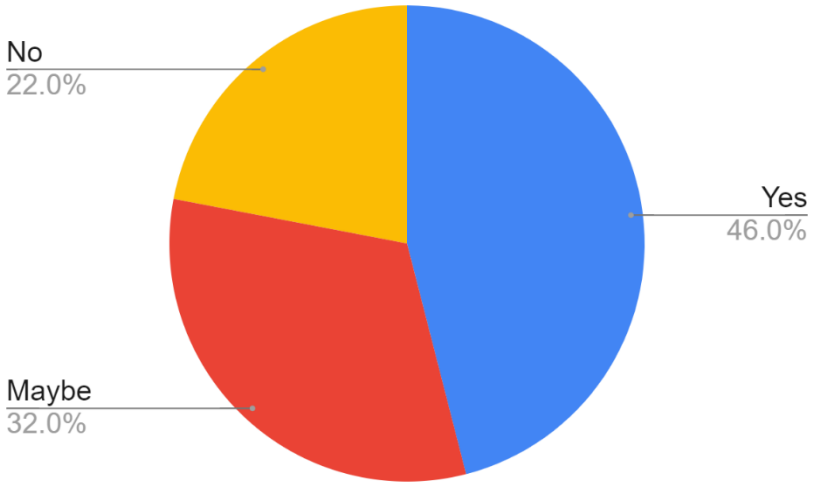


Figure 1.29: Percentage of sample explaining if the equipment given to them were enough to protect you from COVID 19 while treating their patients or not

4.37 Working hours at a stretch?

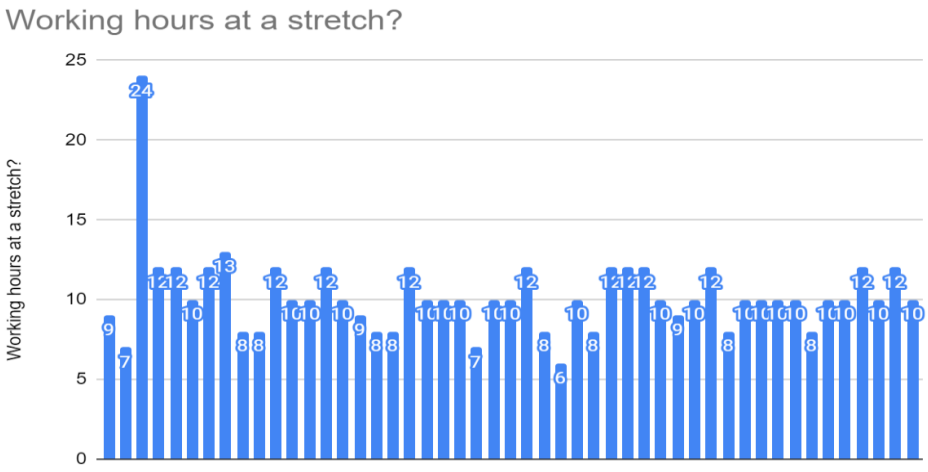


Figure 1.30: Working hours of the sample population during COVID 19 duty

4.38 Were the things like sanitizers, gloves, PPE kits readily and easily available?

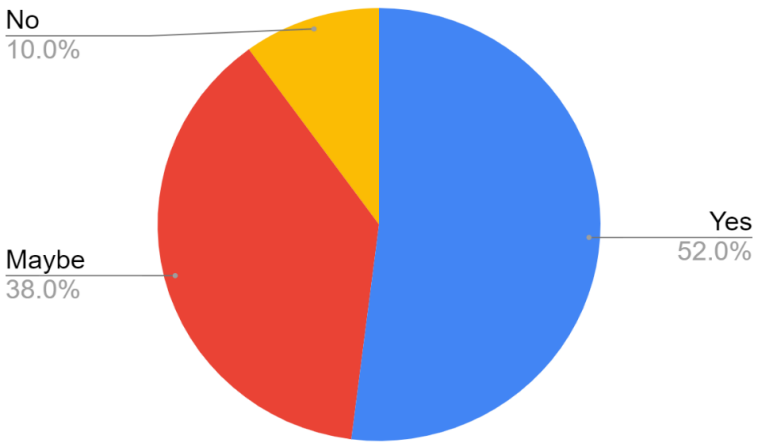


Figure 1.31: Percentage of availability of sanitizers, gloves, PPE kits during duty at COVID ward

4.39 How many patients on an average you have treated during COVID 19?

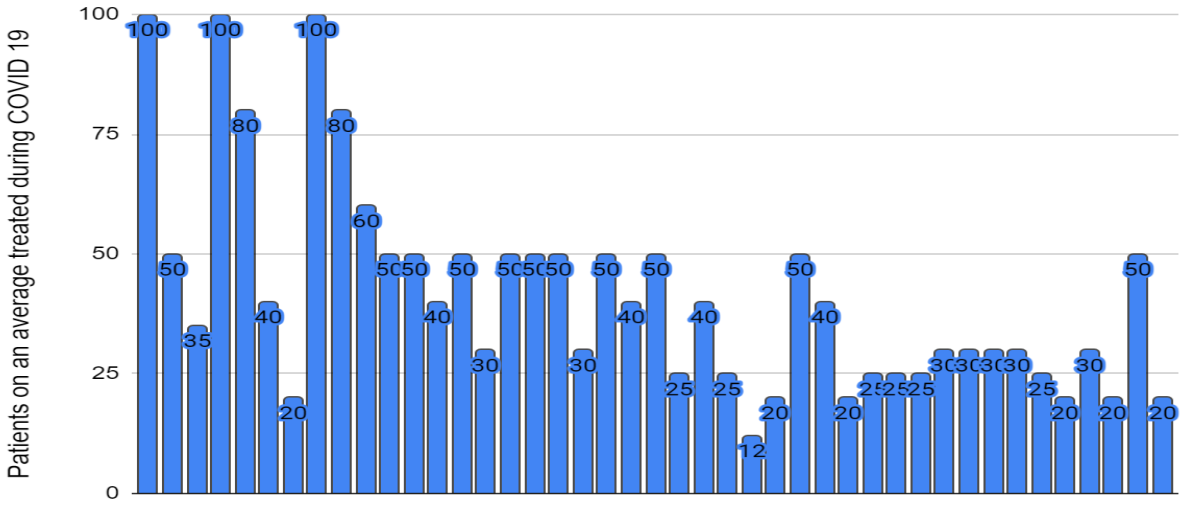


Figure 1.32: Patients on an average treated during COVID 19 by the participants

4.40 How has your clinic or hospital fared in terms of business?

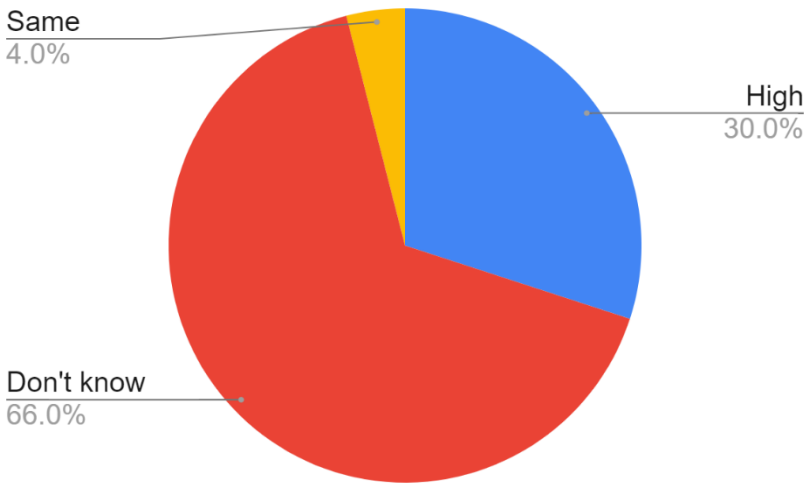


Figure 1.33: Business of hospital/clinic during COVID 19 as per the participants

4.41 How has COVID 19 affected your mental health? List the symptoms?

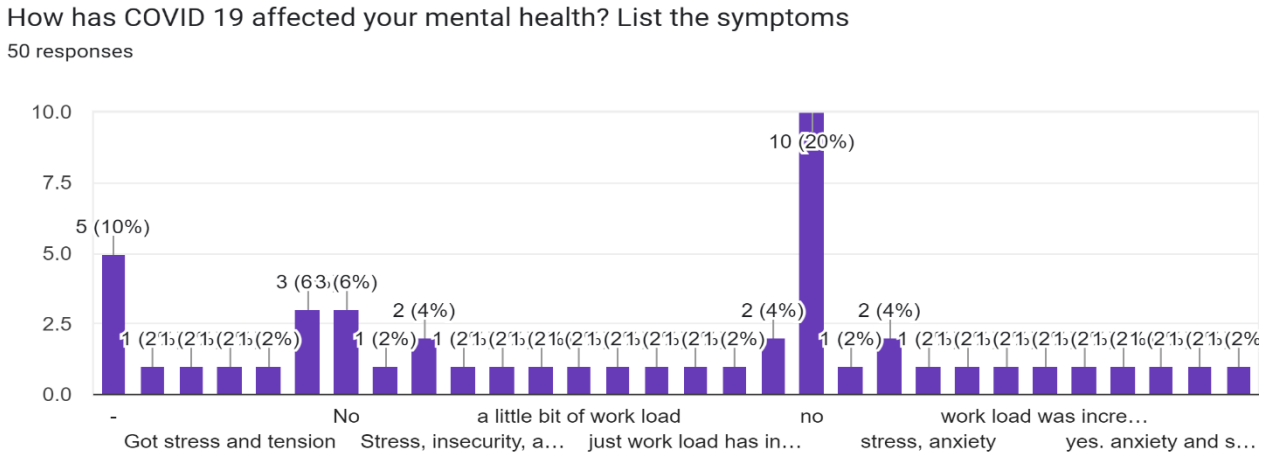


Figure 1.34: COVID 19 and its implications on mental health of the participants

4.42 Have you done or experienced any of the following as a result of COVID 19?

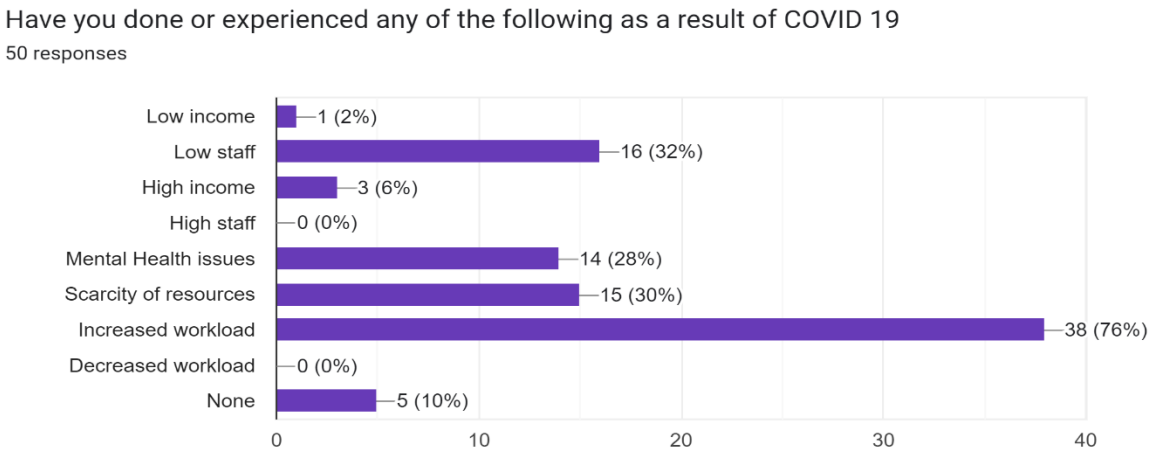


Figure 1.35: Participants sharing if they got affected by external factor during COVID 19

4.43 Imaging method used to diagnose COVID 19

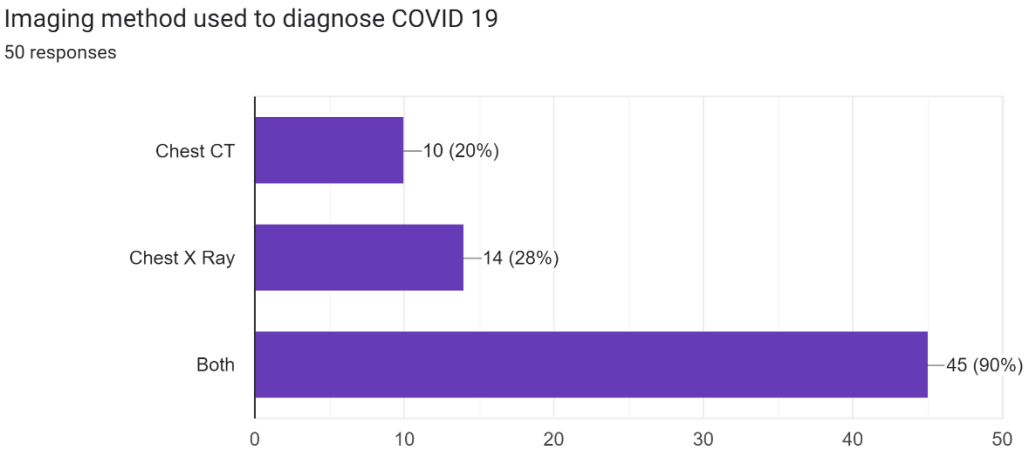


Figure 1.36: Participants sharing which diagnostic tool did they use during COVID 19

4.44 List of equipment/resources that was amiss during your whole tenure of COVID 19

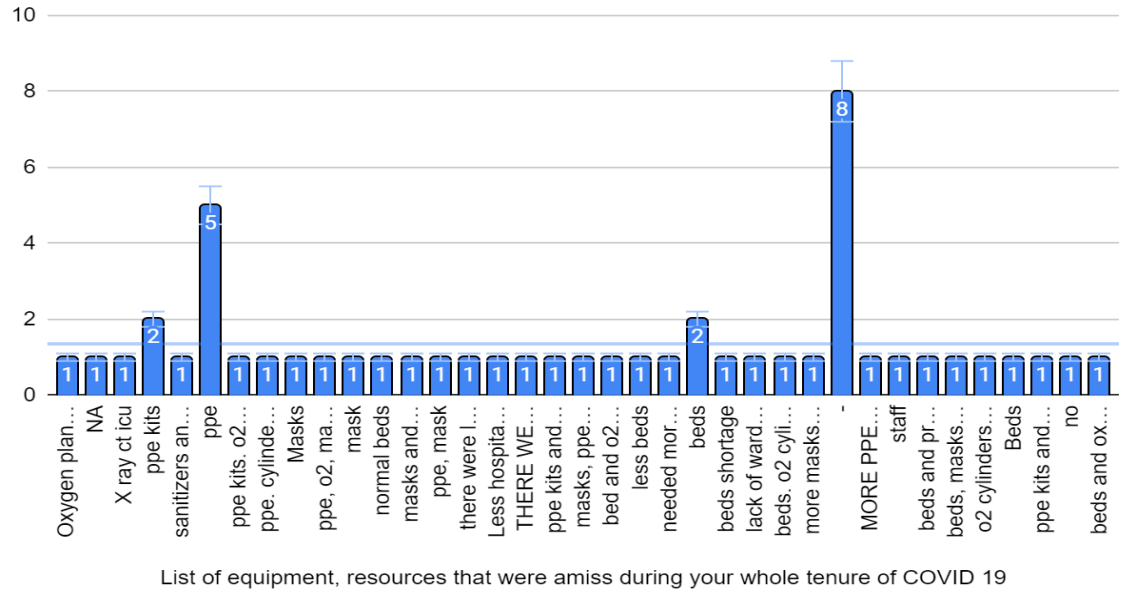


Figure 1.37: Participants sharing list of resources that were amiss during COVID 19

4.45 Were you understaffed in COVID 19?

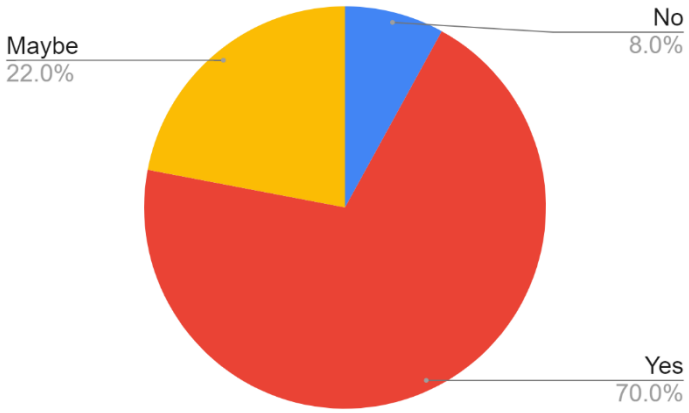


Figure 1.38: Participants sharing if they were understaffed or not during COVID 19

4.46 Did the govt help you during COVID-19 duty? If yes specify?

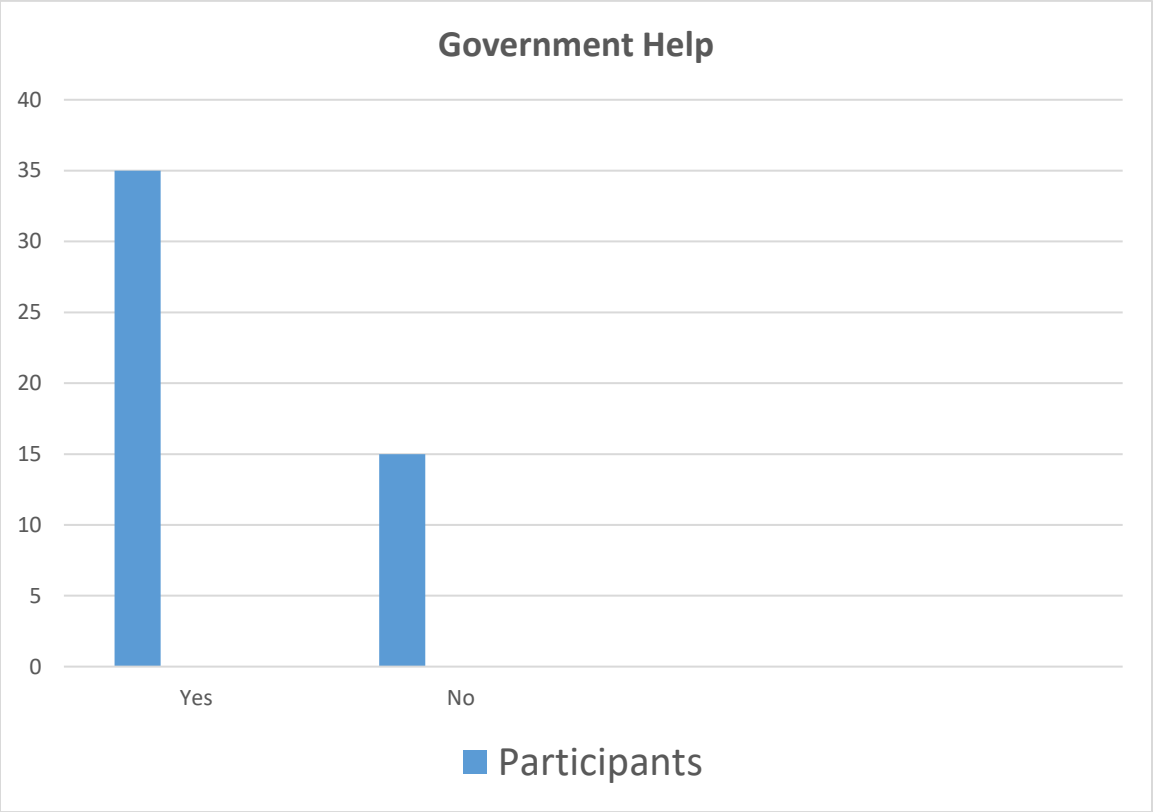


Figure 1.39: Participants sharing if they got government help or not during COVID 19

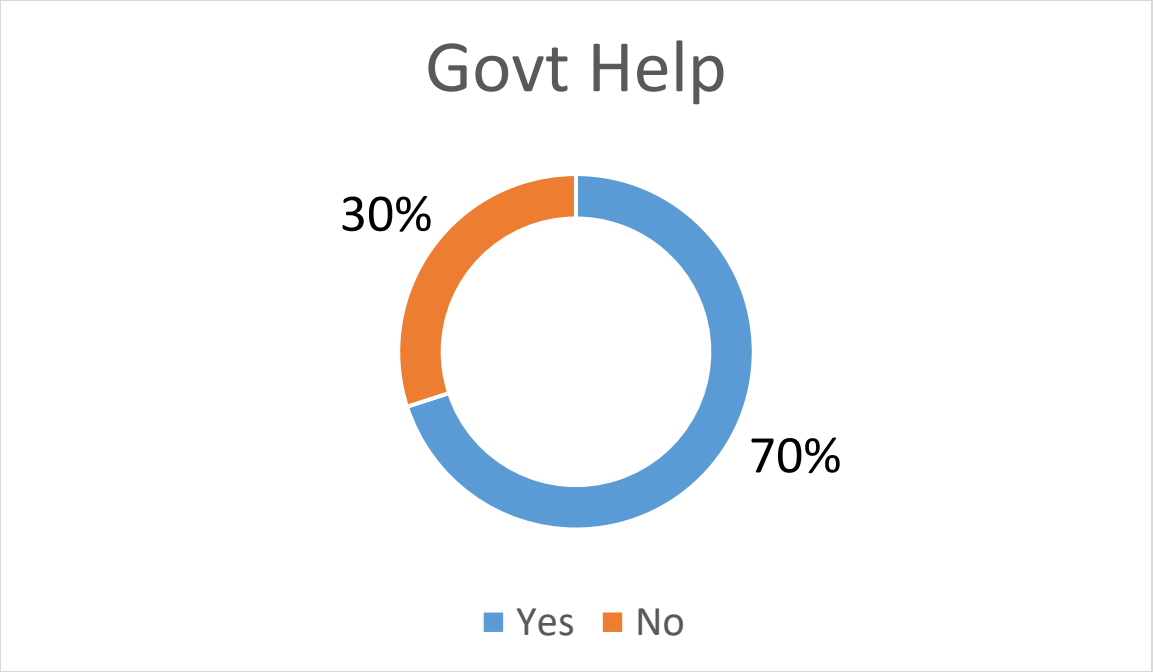


Figure 1.40: Participants sharing if they got government help or not during COVID 19

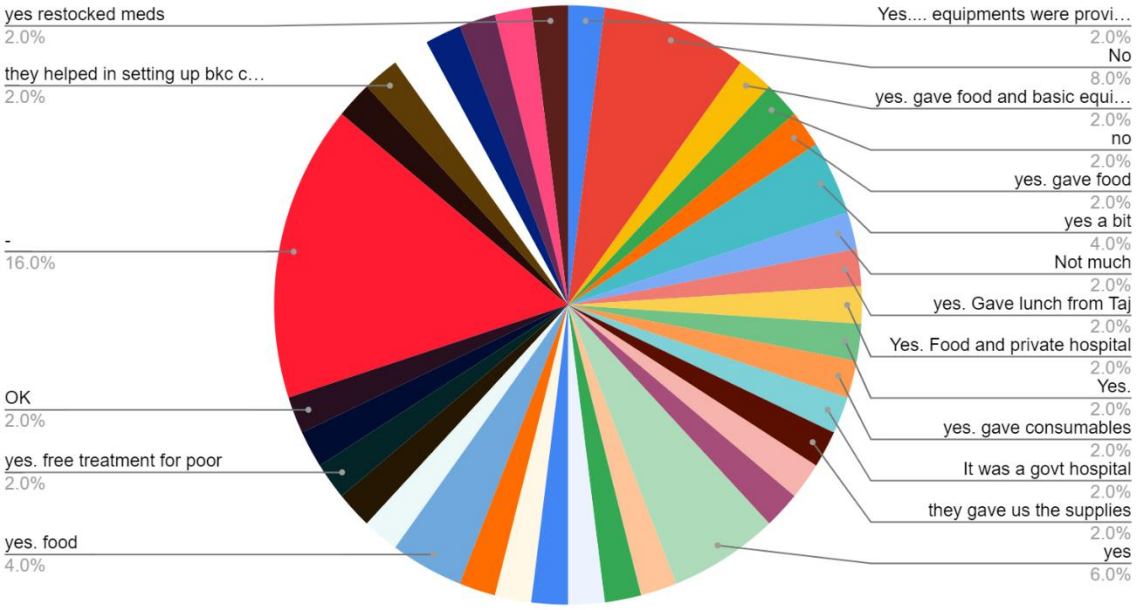


Figure 1.41: Participants sharing if they got government help or not during COVID 19

4.47 What were your expectations from your hospital or our government in terms of treatment and well-being during COVID-19?

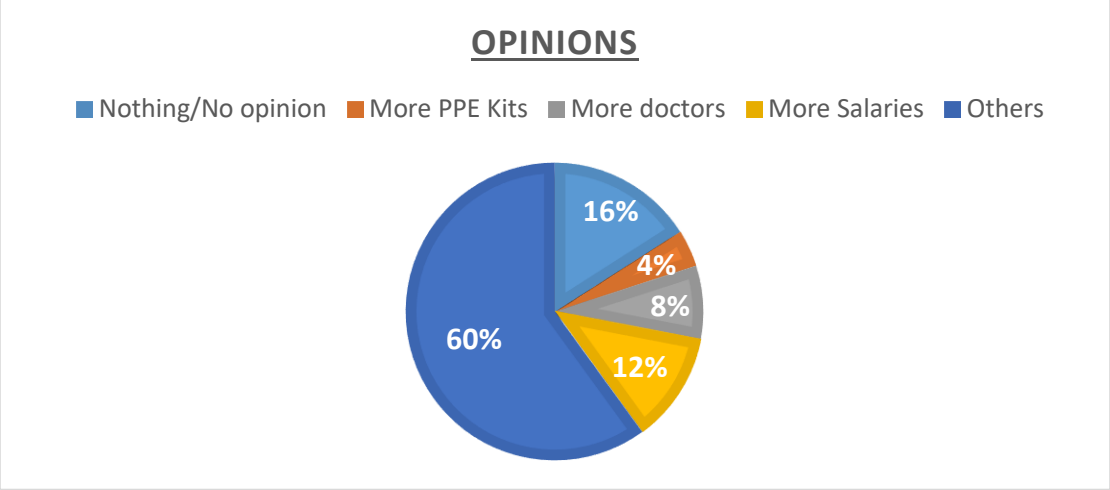


Figure 1.42: Participants sharing their opinions during COVID 19

- Easily available oxygen, extra income for all health workers
- To follow protocol and ensure safety of the staff
- To increase staff and provide good salary
- More support for the doctors
- To increase the staff
- More staff and more financial support
- Them to give us more supplies
- They will help us when we got covid. But they called us within 2 days
- Free treatment

- Drs will be well paid
- Patient load to doctor ratio
- To give salary on time
- More hospitals needed
- More help we would have wanted
- We would have wanted the work load to reduce a bit and would have wanted more recovery time if we had covid as we had to return to work within a week after having covid
- They gave us almost everything
- All good
- More staff employment, more doctors and help needed
- More help to doctors in terms of mental health
- We wanted more employees i.e. doctors so that our work load was reduced
- More beds and staff
- Satisfactory
- Give us proper on time breaks and salary

4.48 As a doctor what is your suggestion to tackle another pandemic like situation in near future

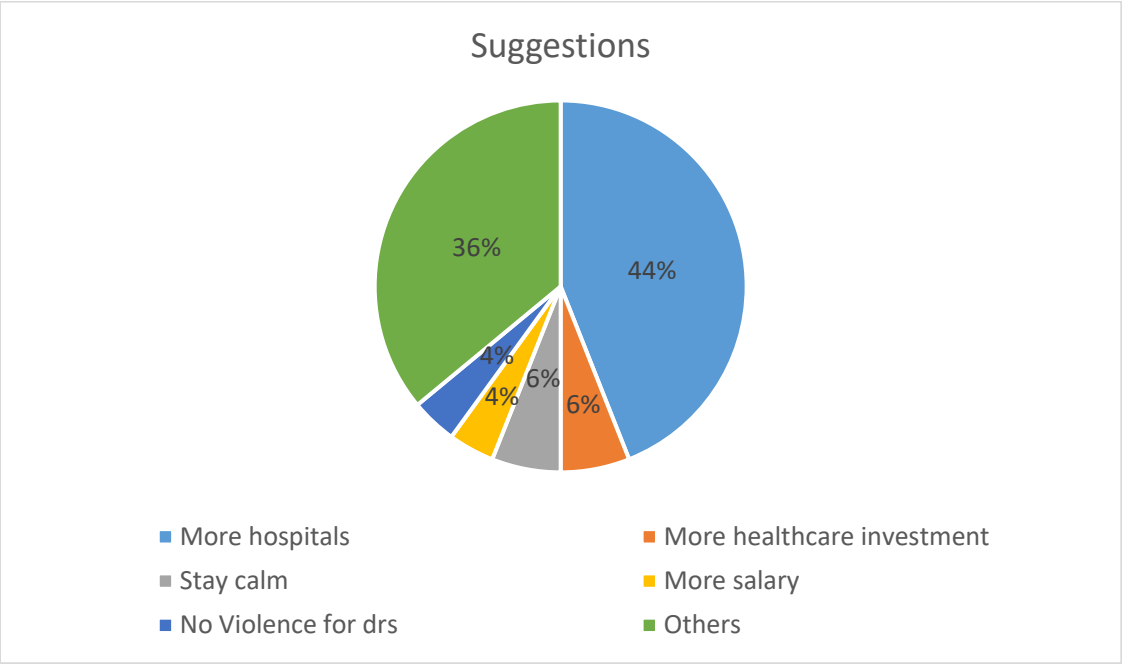


Figure 1.43 Participants sharing their suggestions to tackle another pandemic like situation in near future

- Medical facilities should be increased, increase the number of man power with good income to them
- Educating patients without inducing fear, educating staff for controlling such situations
- Increase funds allocated towards medical sector
- Invest money in healthcare not Bollywood
- more hospital in rural area, more seats for MBBS and more doctors

- we need more healthcare facilities in the villages and other rural areas also. if more money is spent on healthcare there will be less problems
- More makeshift hospitals like BKC and ones in China We need more medical colleges.
- more educating the general public, more beds needed
- cut off for admission should be low so that there are more people who can qualify for MBBS and our country can get more doctors on field.
- hospitals should have more ward and beds. they should also start a pandemic specific hospital
- more MBBS colleges in the area resulting to more doctors.
- more advanced surgical facilities needed. more doctors and staff
- more hospitals
- awareness
- As a doctor I would suggest govt to have more hospitals and need more qualified staff in healthcare
- suggest having backup 02 cylinders and medicines
- get more healthcare centers designated to pandemic only.
- bring more nurses and admin people to help manage the hospital
- stay very calm and handle it patiently. get more Drs and hospitals
- awareness and resources increased
- we need more organized healthcare system like Japan and China

4.4 Summary of Findings

For General Public:

The general public sample age ranges from 23-57. The sample is from general population of the country. 64% male and 35% female participated in the survey. Majority of the people claimed that they suffered from COVID 19.

Various factors contributed as their exposure factor to the virus. Some of them were public places, hospitals, market visits, family member, construction sites, local trains, offices etc. Maximum people isolated themselves at home and remaining at the hospital. 48% people claim that the local authorities helped them tackle issues during COVID 19 and 20% denied the same.

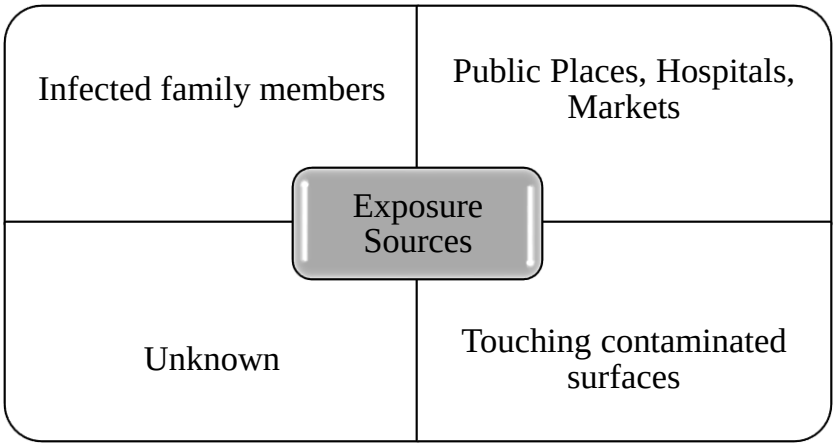


Table 2: Sources of COVID 19 Virus exposure on general public

When asked that during pandemic how easily were they able to get supplies like masks, sanitizers, medication etc. 46% claimed that they got it easily whereas 14% said that it was difficult for them to get supplies.

Figure 1.44: Important supplies required at the time of pandemic (Source: Google)

Participants were asked if they took health as a serious factor in their life before getting COVID 19 to which 45% said yes and 28% said no whereas 27% weren't sure.

Health is one of the major factors in this pandemic. We noticed that people who had a sedentary lifestyle and habits like smoking, drinking, consumption of junk food were at more risk as compared to the people who were having healthy lifestyle habits.

The COVID-19 pandemic is a major challenge worldwide, and there is a high probability that other antimicrobial-resistant infections will also spread in society. Nutrition is essential to maintain a strong immune system against viruses. Factors such as lifestyle, age, health, gender and medications affect a person's nutritional status. Optimal nutrition and nutrient intake have an impact on the immune system's ability to function, including gene expression, cell activation, and signaling molecule conversion. In addition, different food components determine the gut's microbial composition and subsequently shape the body's immune responses. Therefore, the available evidence suggests that the only sustainable way to survive in the current situation is to strengthen the immune system.

In the current scenario, COVID-19 has created new challenges for people to maintain a healthy diet. Self-reliance, confinement and social distancing are important means of flattening the curve for humanity. however, these measures have a significant impact on a person's life. Being at home has significant effects on health, including changes in eating habits, sleep patterns and physical activity. A balanced diet ensures a strong immune system that can resist any attack caused by a virus.

There is currently no evidence that any dietary supplement can "boost" our immune system and treat or prevent viral infections, with the exception of vitamin C.

Vitamin C is one of the most important components of water-soluble vitamins that tend to build a strong immune system. The daily recommended dietary allowance for vitamin C is 90 mg/day for men and 75 mg/day for women.

In this global humanitarian crisis of the COVID-19 pandemic, mental health issues have been reported from all over the world.

The main mental health problems reported were stress, anxiety, depression, insomnia, denial, anger and fear.

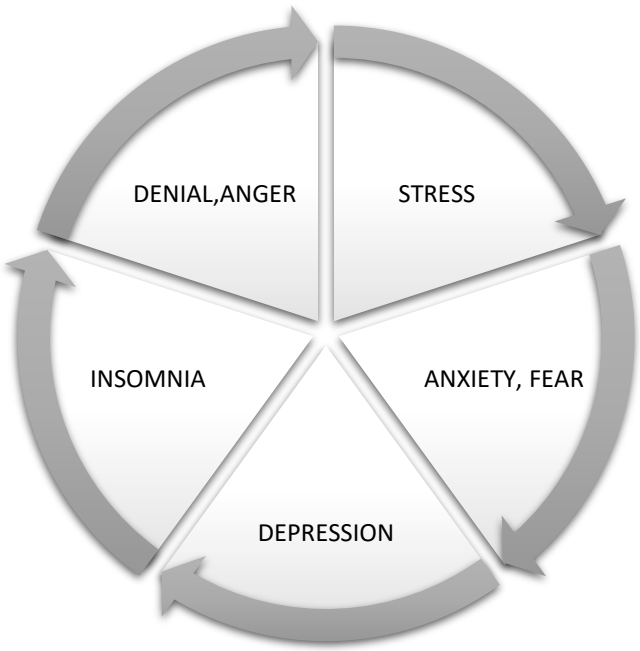


Figure 1.45: Most common mental health issues during COVID 19

Children and the elderly, frontline workers and people with mental health problems were vulnerable in this context. Suicides related to COVID-19 have also become more common. Actions have been taken worldwide to address mental health issues through guidelines and intervention strategies. The role of social media has also been huge in this context. The Government of India has published country-specific intervention strategies, telepsychiatry consultations and toll-free numbers for psychological and behavioral problems. (Singh et al., 2020)

With the outbreak of the COVID-19 pandemic, many people's lives have changed very quickly. Worry and anxiety were natural companions in all changes—including adjusting to new routines, loneliness, and financial pressures. Information overload, rumors and misinformation didn't help. Global surveys conducted in 2020 and 2021 found higher than usual levels of stress, insomnia, anxiety and depression. By 2022, levels had decreased, but were still higher than before 2020. Although anxiety caused by COVID-19 may come and go, it is still a problem for many people. You are not alone if you are worried about COVID-19.

And you're not alone if you've dealt with stress in less-than-healthy ways, like substance abuse. Healthier self-care choices can help you cope with COVID-19 or other issues you may be facing. And knowing when to seek help can be the most important self-care tool of all.

Stress and anxiety are common during a crisis. But the COVID-19 pandemic could push people beyond their ability to cope.

Surveys have shown the most problems with sleep and anxiety or nervousness. The number of people reporting these symptoms in studies has waxed and waned over time. Depression and loneliness were less common than nervousness or sleep disturbances, but were more consistent across studies over time. Among adults, the use of drugs, alcohol and other intoxicating substances has also increased over time.

The first step is to notice how often you feel helpless, sad, angry, upset, hopeless, anxious, or afraid. Some people may feel numb. See how often you have trouble concentrating on daily tasks or completing routine tasks. Are there things you used to enjoy doing that you stopped doing because of how you felt? Note significant changes in appetite, substance use, body pain, and sleep disturbances.

These feelings may come and go over time. But if these feelings don't go away and make it difficult to perform daily tasks, it's time to ask for help.

When discussed if COVID19 impacted mentally, physically and emotionally to the participants, 31% said they were impacted on all fronts i.e. physically, emotionally and mentally.27% people were physically affected. 19% were emotionally affected and 18% people were mentally affected. On the contrary 34% people said that they were not affected at all during the pandemic time.

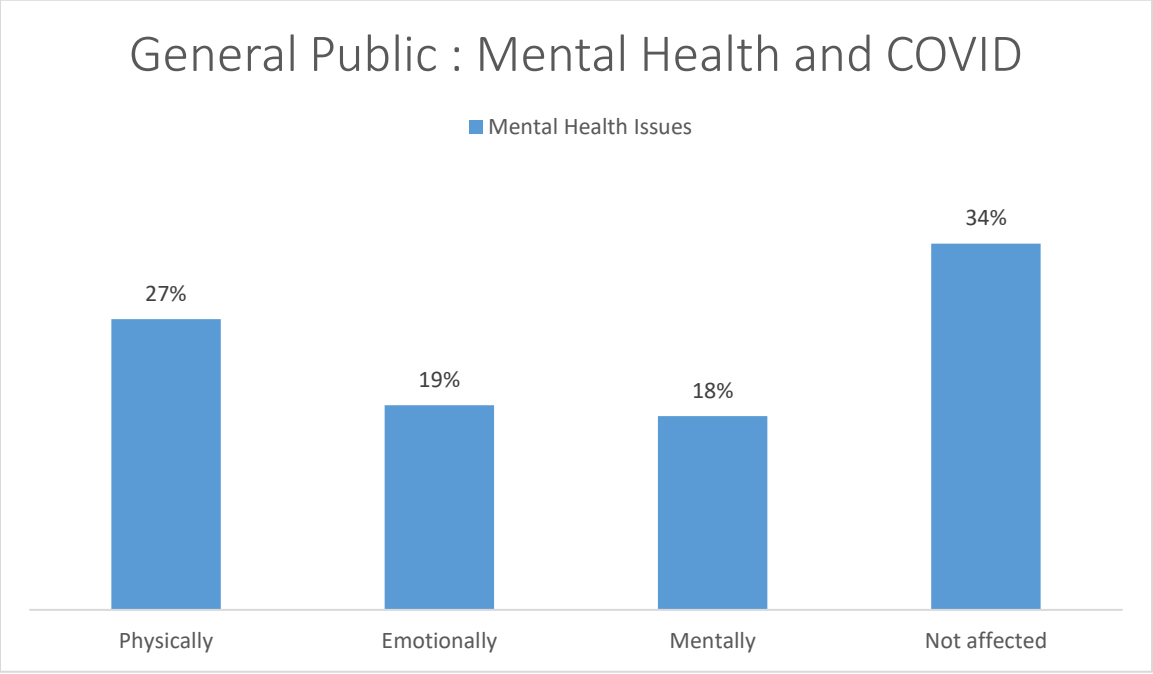


Table 3: COVID and its effect on general public's mental health

To contain the spread of novel Corona Virus (Covid-19), Ministry of Health & Family Welfare has provided these helpline numbers of States & Union Territories (UTs).

1075 is the toll-free number. 01123978046 is the All-India helpline number.

The Government of India has launched Aarogya Setu, a mobile application aimed to connect health services and we the people of India in our combined fight against COVID-19.

65% of the sample population didn't try to call the government toll free number. 25% people tried calling the government toll free number. 8% people didn't know about the government toll free number. Aarogya Setu is an Indian COVID-19 "contact tracing, syndromic mapping and self-assessment" digital service, primarily a mobile app, developed by the National Informatics Centre under the Ministry of Electronics and Information Technology. According to the survey conducted 88% people used the Aarogya Setu application whereas 12 % people didn't use Aarogya Setu application.

India has approved two homegrown vaccines for children under the age of 12 amid a slight rise in Covid cases.

Covaxin, made by Bharat Biotech, has been granted emergency use permission for the six-12 age group. It is already administered to children aged 12-18, and adults.

Two other vaccines have also been given emergency approval - Corbevax for children aged five-12; and Zydus's two-dose jab for children above 12.

Corbevax is also currently being administered to children in the 12-14 age group.

8% of the sample didn't get any COVID vaccination whereas the remaining got their vaccination done. The cost for the vaccine had different range of cost like Rs 650/-, Rs 800/-, Rs 850/-, Rs 400/-, Rs 550/-, Rs 750/-, Rs 1000/-, as per the participant's working place and the locality. Some of them even got free of cost. When asked on a scale of 1 to 10 how did COVID19 pandemic affected their mental health from 1 being normal to 10 being severe, 19% people voted 5, 15% people voted 3,12% people voted 2,11% people voted 6,10% people voted 4, 9% people voted 7,8% people voted 1, 7% people voted 8, 5% people voted 9, 4% people voted 10.

Many suggestions were then recommended by the sample to tackle pandemic like situation in the future. Some of them were:

- New hospitals opening
- More consumables stock in the warehouses
- Better medical and healthcare infrastructure
- More salaries to the staff
- Reducing the cut off in medical colleges so that more students can take admission in private or government medical colleges
- To spread awareness about the disease and its features
- More focus on health of nation and emphasizing on the mental health of the people.
- Need of more awareness in the rural areas
- More hospitals and healthcare centers in the villages and so on

For Administrative/ Support staff:

The administrative/support staff age ranges from 22-47. The sample is from various hospitals that have operated during the COVID 19 pandemic.

Some of the hospitals are Arunoday surgical and trauma hospital, Indravati hospital, Dr Prabhat Singh Hospital.

Qualifications of the participants are ANM, BCom, MHA, Nursing in-charge, ward assistants, senior lab technicians, BMLT.

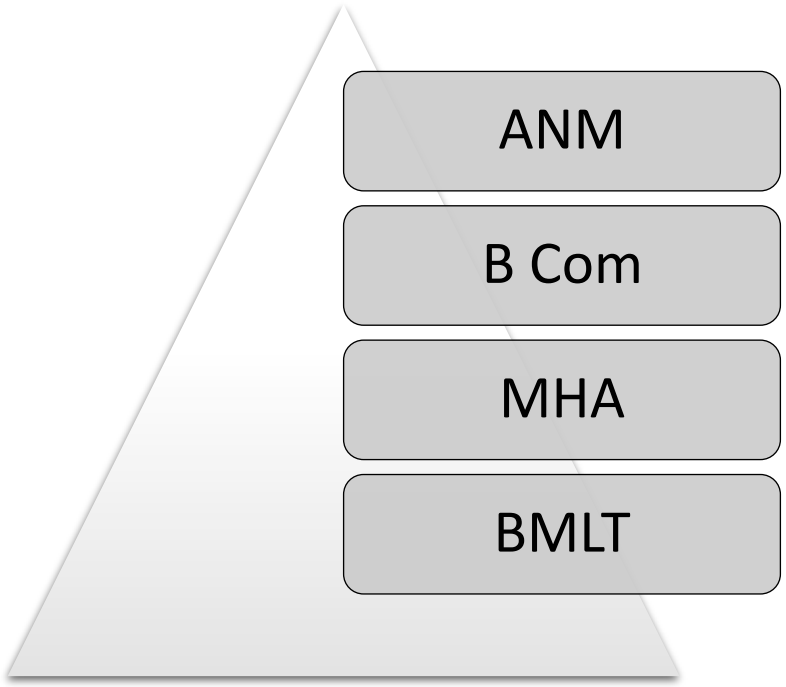


Figure 1.46: Qualifications of the participants

Physical resources, like food and medical equipment, are not enough, while financial shortages due to a weakening economy are the most significant shortage in this pandemic.

21.1% of the population claimed that they had faced resources shortage during COVID 19 pandemic. Whereas 73.7% population claimed that they didn't face any resource shortage during the COVID 19 pandemic in the hospital they were working in. 5.3% didn't really know about the resource shortage in their hospital.

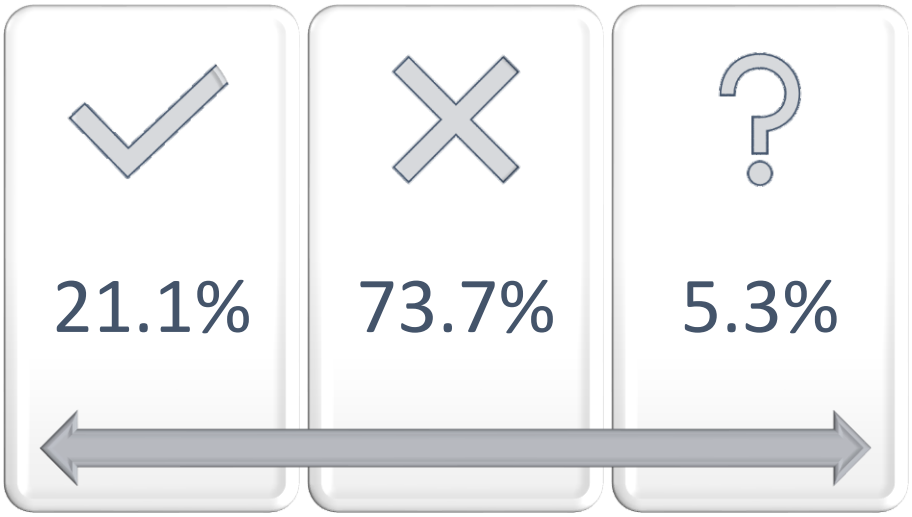


Figure 1.47: Resource shortage as reported by the administrative staff

Some of the resources that were facing shortage during COVID 19 pandemic were hospital bed, remdesivir injection and staff.

It's very natural to develop stressful mindset when the person is working in an environment where there is a constant exposure to life and death. We realize this now after doing the survey that so many healthcare worked have overworked and were in a lot of stress. They were doing extra shifts in order to control the infection and treat the patients as effectively as possible. Most of the staff didn't even get time to either eat, sleep or even go home to meet their own family members. Hence it took a toll on their mental, physical and emotional health.

When asked if the participant faced an extremely stressful, disturbing, or traumatic experience due to COVID-19 36.9% people claimed yes and 26.3% denied. 36.8% weren't so sure.

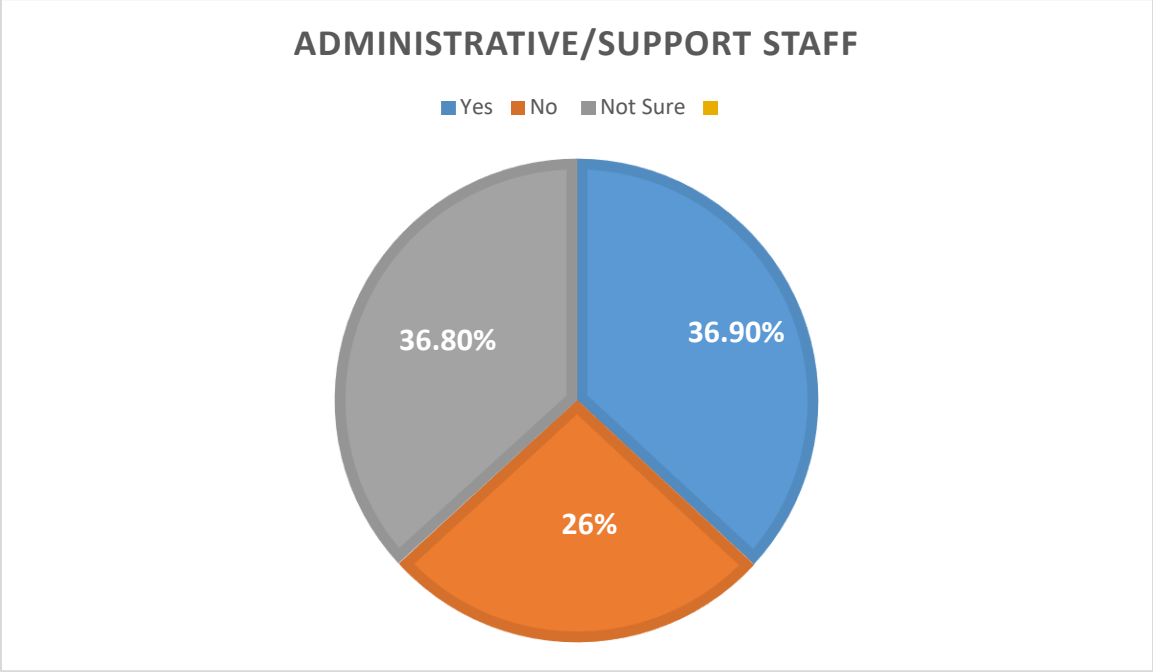


Figure 1.48: Participant facing extremely stressful/disturbing, or traumatic experience in COVID

The COVID-19 crisis has had a significant impact on wages. The uncertain economic scenario, combined with difficulties in online negotiations, has led to a general postponement of collective agreements until 2021, especially at the company level. As the COVID-19 pandemic continues to affect the labor market, the survey found that 40 percent of the country's workers have seen their wages decrease.

The "Human Capital Survey" was conducted by Grant Thornton to 16,700 respondents from a variety of industries, including consumer, retail, e-commerce, financial services, manufacturing, automotive, pharmaceutical and healthcare. While total wages fell by 40 percent of those surveyed, only 16 percent of workers experienced a temporary fixed wage, according to the survey.

However, the study showed that there was a downward trend in variable pay, or benefit-based pay, with more than 31% of workers not receiving variable pay and 33%of workers downsizing. variable salary

57.9% participants said that they were satisfied with the salaries paid to them during the pandemic. 26.3% of them weren't happy with the salary remuneration given to them.

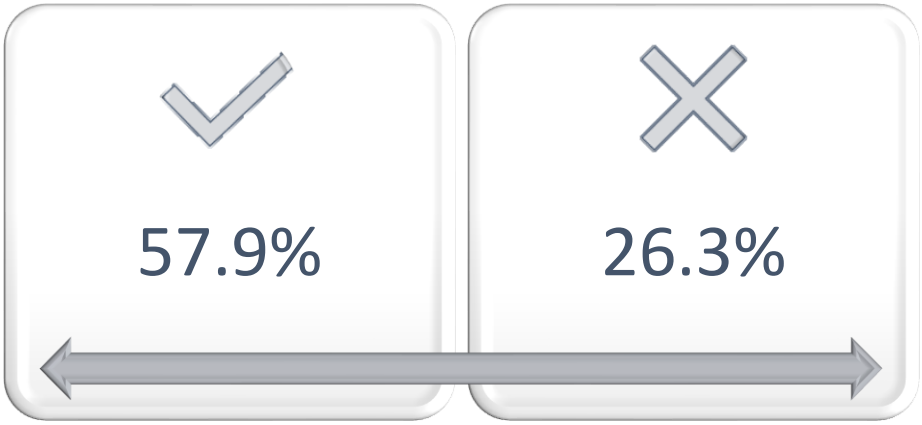


Figure 1.49: Participant view about their salaries renumeration during the pandemic.

42.1% of the population said that they suffered from COVID19 while treating or managing the patients of the COVID ward and 52.6% of the population said that they didn't contract COVID 19 while treating or managing the patients. Sample when asked if they were required to work beyond your shift to finish existing work or provide adequate care to patients to which 57.9% said that daily, they used to work extra. 31.6% population said that they worked extra on a weekly basis beyond their shifts. 10.5% population said that they worked rarely beyond their shifts. Apart from this, various suggestions were given by the administrative staff to tackle pandemic like situation in near future.

For Doctors:

The doctor/healthcare worker the age ranges from 26-60. The sample population are the doctors who have worked during the COVID 19 pandemic. Doctors' qualifications are BDS, MBBS, MD Medicine, MD Radiodiagnosis, MS Surgery, MD Pathology, DM amongst others.

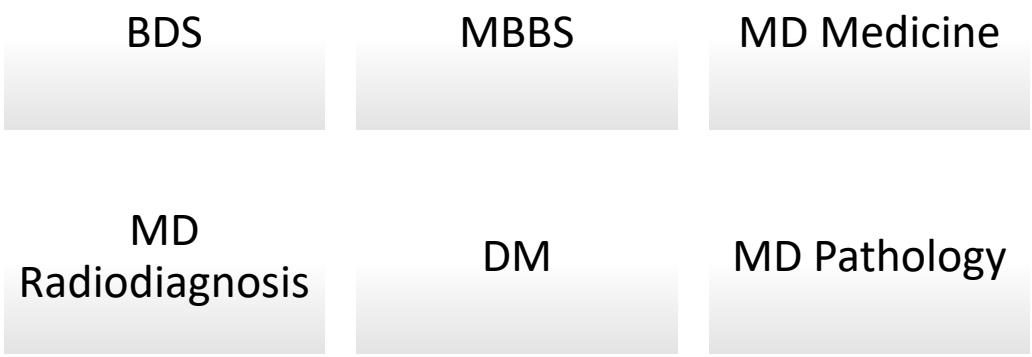


Figure 1.50: Doctors qualifications

Various hospitals were considered for the survey. The main criteria was that they should have treated COVID 19 patients. The hospitals include Sri Aurobindo institute of medical sciences, Nair Hospital Dental College, Sion hospital, Sharda Hospital Nashik, Dr Anarthe Clinic, LTMMC Sion, DY Patil Hospital, UPHC Dhamdhanaka, Krishna Trauma Centre, Smart hospital and diagnostic centre Jaunpur, SRG Hospital. Out of participants 96% population worked in a service/department/clinic dedicated to/or where patients with COVID-19 were hospitalized whereas 4% didn't work.

Doctors are an integral part of the effective response to the COVID-19 pandemic. We argue that because of these special skills they have a duty to contribute to the pandemic, but these skills vary from doctor to doctor and their role is limited by other competing rights. They play a vital role in diagnosis, isolation and treatment, and their commitment to care despite increased personal risks is essential to successful public health. Frontline workers experienced heavy workloads, personal risks and social pressures to meet the extraordinary demands of health care.

Despite this, public health ethics paid little attention to the protection of the rights of doctors. Emerging threats from infectious diseases like COVID-19 are demanding much more than doctors continuing to do business as usual. Pandemics can require longer working hours (and correspondingly increased exposure to the virus), possible quarantines and extracurricular duties. What distinguishes a normal duty from an additional duty is not always clear.

However, experience shows that in the current epidemic, doctors are at risk of illness, death, fatigue due to long working hours, moral stress (when making difficult medical decisions, such as preferring patients to ventilators) and possible legal and professional risks are asked to work to the limit of their abilities.

The 2003 SARS outbreak provided important insights into the experiences and pressures of healthcare workers during an outbreak and highlighted some important gaps in ethical thinking and practice. Many who cared for SARS patients expressed concern about the safeguards to protect their health and that of their families. Some refused to attend SARS wards, leading to permanent dismissal, and some chose to resign after the pandemic.

Especially during SARS, it was realized that there was a lack of consensus on how clearly and strictly the appropriate requirements should be expressed. The researchers recommended planning ahead with local and national medical professional organizations to build consensus on the scope of professional responsibilities in the event of a pandemic. It has been suggested that this includes the development of clear and unambiguous guidelines on the professional rights and responsibilities and ethical duties and responsibilities of healthcare workers during such epidemics. Nearly two decades later, there is still little consensus and clarity about reasonable expectations for medical professionals.

We have argued that doctors must participate in the pandemic because of their special skills, but that these skills vary from doctor to doctor and other competing rights limit their role. In special situations, such as a pandemic, these obligations can be considered extra (in ethics, an action is extra if it is good, but not morally binding). This means that an ethically justified policy of elimination is based on the evaluation of these competing tasks, although not desirable.

From both an ethical and pragmatic perspective, physicians must be viewed in the context of a rich life with many competing demands. We should encourage doctors to respond to calls for medical help during a pandemic, but there are also mutual responsibilities to make sacrifices and efforts. In case of non-fulfillment of mutual obligations, doctors are also justified in refusing certain tasks, if this is proportional to the unfulfilled obligation.

To encourage physicians to respond to health care demand and to avoid structural inequalities that undermine the mutual obligations of physicians, it is important to clearly define mutual obligations to physicians.

Further work is needed to define these professional standards and they should take into account the ability of structural factors that can influence the actions of the doctor who should try to fulfill these mutual obligations.

28% doctors contracted with COVID19 while treating their patients whereas 72% didn't came in contact with the virus.

Doctors were asked if they believed the equipment given to them were enough to protect them from COVID 19 to which 46% said yes, 22% said no and others weren't too sure about the same.

The working hours of the doctors were as follows- 40% doctors working hours were 10 hours/day, 26% doctors working hours were 12 hours/day, 16% doctors working hours were 8 hours/day, 4% doctors working hours were 9 hours/day, 4% doctors working hours were 7 hours/day, 4% doctors working hours were 9 hours/day, 2% doctors working hours were 6 hours/day, 2% doctors working hours were 13 hours/day, 2% doctors working hours were 24 hours/day.

When asked if things like sanitizers, gloves, PPE kits were readily available or not 52% doctors said in affirmation whereas 10% denied. The others chose maybe as an option.

79.64 were the average number of patients per day that were treated by my sample during COVID 19 pandemic.

From business point of view, we asked the sample about the business of their hospital when the pandemic was going on. 66% of the doctors said that they didn't know. 30% said that the business increased at the time of the pandemic. 4% said that it was the same.

Many also said that the pandemic affected their mental health too. Stress, tension, increased work load, anxiety was some of the symptoms. 20% of the doctors said that they were unaffected from all the above-mentioned symptoms.

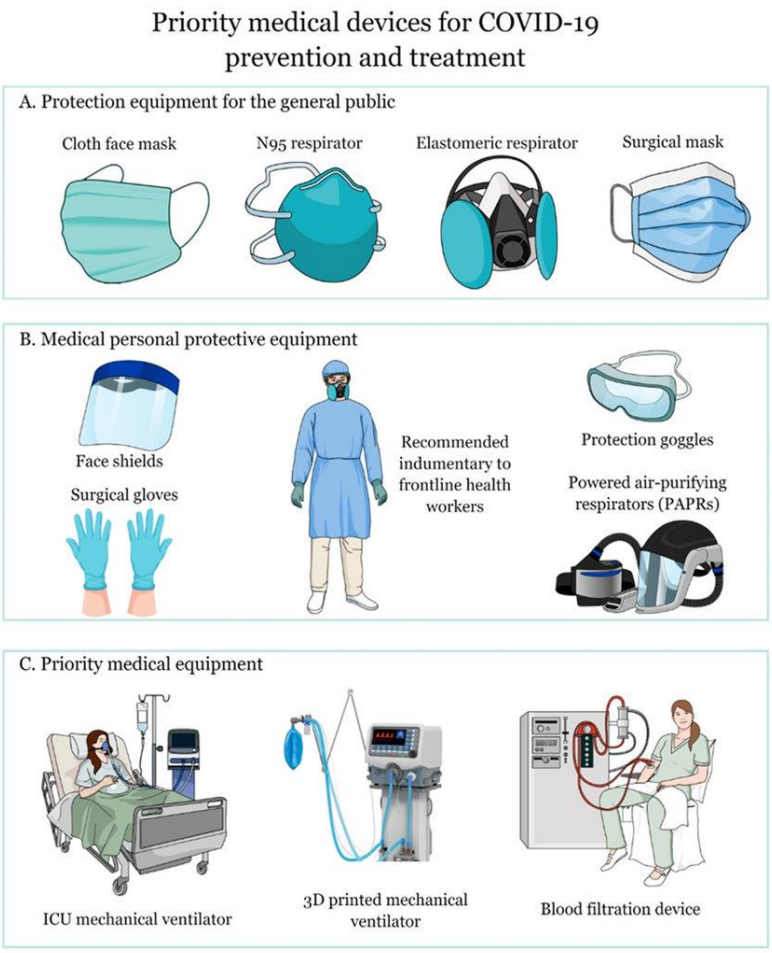


Figure 1.51: Devices needed for COVID 19 precaution and treatment (Source: Google)

All healthcare workers and caregivers should receive appropriate training in infection prevention and control practices, including risk assessment, standard and widespread precautions, WHO hand hygiene, donning and doffing PPE, and waste management to ensure effective use of PPE when indicated. and does not become a source of contamination for the user. The competence of PPE users in appropriate donning and doffing procedures and other occupational health and safety measures necessary to treat patients with COVID-19 should be regularly reviewed.

All healthcare workers are advised to use droplet and contact precautions (medical masks, gowns, gloves, eye protection) when treating patients with suspected, probable or confirmed COVID-19. When performing procedures that generate aerosols, WHO recommends taking air and contact precautions. Universal masking and targeted continuous use of medical masks are recommended for certain outbreaks. When treating patients who are in isolation due to a suspected or confirmed infection, all healthcare workers who care for or interact with the patient's environment should be aware of the infection. When deciding which personal protective equipment to use in the patient environment, one must consider the risk assessment according to the work tasks, their duration and the possible level of exposure to body fluids.

76% doctors experienced increased workload. 32% doctors suffered shortage of staff. 30% doctors complained of scarcity of resources. 28% stated they faced mental health issues. 10% of the doctors said that they haven't experience any of the factors mentioned in the survey. High income was experienced by 6% of the doctors. 2% experienced low income.

Various imaging methods were discussed with the doctors. 90% people said that both Chest X ray and CT scan of the chest were used as a diagnostic tool. 10% people used Chest X Ray and 28% people used Chest CT Scan.

The doctors also shared their list of equipment, resources that were amiss during your whole tenure of COVID 19. Some of them included PPE kits, oxygen plants, beds, nurses, staff, salaries, O2 cylinders, masks, X Ray machines, CT Scan machines, sanitizers to name a few.

70% of the doctors said that they were understaffed during their period of COVID 19 pandemic. 8% of the people claimed that they weren't understaffed at the time of the pandemic.

As we are aware that the government helped the people a lot so we asked the participants view also. 70% doctors said that the government helped them whereas 30% said that the government didn't help them.

Multiple aids include free food, free accommodation, specific hospital for doctors' treatment of COVID etc.

Lot of expectations were discussed of the doctors from the government which includes:

- Easily available oxygen for patients and extra income for all health workers
- More PPE Kits
- Hiring of more staff
- More financial support
- Low patient to doctor ratio
- Increase the number of hospitals in the rural places
- More recovery time after contracting COVID as they were called within 2 days of the infection
- More employment of doctors
- Doctors also expected more on time breaks between shifts
- A little mental support is something they would have wanted

As a doctor we had asked them to give some suggestions of their own to tackle/handle another pandemic like situation in the future.

4.5 Conclusion

The current coronavirus disease 2019 (COVID-19) outbreak is a worldwide emergency, as its rapid spread and high mortality rate has caused severe disruptions.

India has 1154686 registered doctors in the specialty of modern medicine. At present single Government Allopathic Doctor cater to the need of 10926 persons. Currently, 60% of the total of India's population lives in rural India. To provide healthcare facilities to the people living in rural India, the government has established 25743 Primary Health Centers, 158417 Sub Centers, and 5624 Community Health Centers. Currently, 713986 beds are available in government hospitals in India which amounts to 0.55 beds per 1000 population. Some states like Jharkhand, Assam, Haryana, Bihar, Gujrat, Odisha, Madhya Pradesh, Maharashtra and Manipur which is home to more than 70% of the total Indian population has the population to bed ratio even lower than the national average but some states like Kerala, Sikkim, and Tami Nadu have the better population to bed ratio (Singh, 2020)

- We can conclude that the equipment’s were not sufficient for the treatment of many patients.
- There was shortage of hospital beds, oxygen cylinders, during pandemic. Many people lost their lives due to the unavailability of these equipment.
- According to BBC world news data hospitals across the country ran out of oxygen in April and May 2022 during a deadly second wave and there were daily reports of people dying from a lack of oxygen.
- India has reported more than 5,33,612 Covid deaths so far.

- Many doctors said that they were managing oxygen on hourly basis due to the shortage of oxygen.
- India's health infrastructure began to crumble as the demand for hospital beds, oxygen and medicines soared. Social media was flooded with desperate pleas for help from both families and doctors as patients gasped for breath. The trauma was on vivid display day after day and made global headlines.
- We even found various articles for the same. One of which was written by the New York Times where they showed the ordeal of Delhi hospital and how within a night many patients lost their lives due to oxygen shortage.
- The nurses at that time grabbed small plastic pumps to fill the lungs of critically ill patients by hand.
- Jaipur Golden, a respected hospital in Delhi, had run out of medical oxygen. Over the next seven hours, 21 coronavirus patients died.
- In another article by India Today claimed that 24 patients, including Covid positive, die at Karnataka hospital due to oxygen shortage.
- We can now say that our country is lacking the most important thing in the world and that is healthcare system. Our healthcare system miserably failed as per the articles.
- We need more and more investment to be done in healthcare departments
- The increase of illnesses made us open our eyes with respect to the situation of hospitals and wards in India.

- Our country isn’t prepared for another pandemic like situation.
- We have already removed the makeshift hospitals and even now the doctors to patient ratio is almost 1:100. They are overloaded with patients.
- Its high time that we as a country should now work together to build a safe and efficient healthcare ecosystem to help the citizens of our country.

CHAPTER V:

DISCUSSION

5.1 Discussion of Results

Over a period of four months, we conducted a survey targeting three different categories of participants: the general public, doctors, and administrative/support staff. In this survey, we aimed to gather insightful information about the experiences of people during the COVID-19 pandemic and the factors that affected them the most. For the general public, we found that mental health was the most significant concern during the pandemic. The majority of people reported that they suffered from COVID-19, with many contracting the virus due to visits to markets or hospitals or exposure to family members. While some people found it easy to obtain medical supplies, others struggled to access them. Some people were aware of their health, while others didn't take it seriously before the pandemic. Most people received their COVID-19 vaccinations, with those working in offices receiving them for free. We also asked people to suggest ideas for handling future pandemics, and some of the most common suggestions included improving medical infrastructure, opening new hospitals, increasing awareness of diseases and infections, improving hospital facilities and hygiene, and more. For administrative and support staff, we invited hospitals to participate in the survey, and participants had various qualifications, including BSc, GNM, and masters of hospital administration. While some participants reported a shortage of staff at their hospital or clinic during the COVID-19 pandemic, the majority didn't.

However, bed shortages, nursing staff shortages, and a lack of Remdesivir injections were common issues reported by participants. Mental health classes or therapy sessions were suggested for staff working in stressful environments like hospitals.

A significant number of people claimed to have contracted COVID-19 while treating patients, highlighting the importance of safe equipment and the virulence of the virus. Improving the quality of PPE kits, masks, gloves, etc., should be emphasized by the government to help hospital staff tackle pandemics better. Many participants were asked to work beyond their shifts due to the lack of staff to handle patients. Regarding doctors who treated COVID-19 patients, stress, anxiety, and an increased workload were common issues reported. Only a few doctors contracted COVID-19 while treating patients, and participants reported that PPE kits were not available in all sizes, making wearing them difficult for some.

Proper storage of clean PPE and regular cleaning of the environment in all areas where PPE is donned and removed are essential for effective use and reduce the risk of contamination and self-contamination of clean PPE during disposal. Areas where personal protective equipment is used must be properly cleaned and hand hygiene items must be available. PPE disposal areas should ideally be separate from clothing areas, have hand hygiene and clear instructions for disposal of PPE. Areas where PPE is removed can quickly become contaminated with SARS-CoV-2 and should be prioritized for frequent cleaning and disinfection. Hand hygiene should be performed before wearing PPE and repeated each time PPE is handled during treatment. Care should be taken to achieve the correct fit of the PPE during donning to ensure comfort and protection and to avoid handling the PPE after donning.

Gloves should be removed for hand hygiene and discarded if used within the WHO five moments of hand hygiene, and replaced with new gloves if necessary to continue treatment.

Personal protective equipment must be a priority for health workers and nurses at the local, national and international levels when their lack threatens the safety of health workers in the delivery of essential health services. Due to the ongoing global shortage of PPE, strategies that can facilitate optimization of PPE use in healthcare facilities include: minimizing PPE use and frequent replacement, ensuring rational and appropriate use of PPE, and optimizing PPE supply chain management mechanisms to increase procurement opportunities. WHO strongly recommends operational planning strategies to be used during PPE shortages, which is done well in advance of the expected health impact. Health professionals and patient advocacy groups should be empowered to collaborate with decision makers in selecting strategies for use on the ground. It is recommended that standard operating procedures include inventory management and forecasting processes that define local/institutional escalation strategies to be used in the event of shortages, criticalities and stockouts.

In areas with PPE shortages, the following healthcare measures (individually or in combination) can optimize the availability of PPE for direct care of patients with COVID-19 while protecting healthcare workers from exposure to SARS-CoV-2.

• Whenever possible and appropriate, consider alternatives to face-to-face outpatient visits using virtual consultations, such as via telemedicine, to provide clinical support without direct patient contact.

• Use physical barriers during the exam, such as glass or Plexiglas walls that extend over the heads of all standing residents, viewing windows or transparent curtains in critical care areas, and liquid-resistant privacy curtains to separate patients in hospital wards.

• Co-occupy patients with COVID-19 (not co-infected with other healthcare infectious agents) and assign healthcare workers/teams to care only for these patients to streamline clinical workflow and facilitate increased use of PPE if needed.

• Limit the number of healthcare workers entering the rooms of patients with COVID-19 unless they are engaged in first aid. For example, consider consolidating care activities to minimize room visits, check vital signs during medication administration, or have healthcare workers deliver food during other care activities.

• Ensure that healthcare workers carry out a risk analysis when choosing appropriate personal protective equipment, based on whether it is possible to maintain physical distance or whether the patient and his environment are in direct contact. For example, wearing a medical mask and not wearing gloves, gown or eye protection when you briefly enter a patient's room to ask questions or perform a visual inspection.

• In areas where the spread of SARS-CoV-2 infection in a community or cluster is known or suspected, the traffic of visitors should be limited in hospital treatment, but the number of visitors and the allowed time should to be limited Provide clear instructions on what personal protective equipment is required during the visit, how to put on and remove personal protective equipment, monitor/check frequent hand hygiene, and consider escorting the visitor to and from the health center if necessary.

Indications for the use of personal protective equipment must be based on the environment, the target population, the risk of exposure (e.g., the type of activity) and the dynamics of pathogen transmission (e.g., contact, droplet or air).

• The type of PPE required when treating patients with suspected or confirmed COVID-19 disease varies according to the mode of infectious disease, the type of personnel and the activity being performed.

• Transmission-based precautions (touch/droplet/air) and related isolation measures should be applied appropriately when patients are contagious, and their treatment can be stopped when they are no longer needed for patient care.

• Coveralls, double-layer gloves or coats, shoe covers, or head and neck coverings (hoods) used in filovirus outbreaks (e.g., Ebola virus) when treating patients with COVID-19.

The average number of patients treated by doctors per day ranged from 20 to 100, and chest X-rays and CT scans were the most common diagnostic methods. The government should implement more policies to ensure doctors' safety, as many doctors reported facing violent and aggressive relatives of deceased patients. Suggestions included employing more staff and doctors, providing good salaries and support, following proper protocols, decreasing the patient-to-doctor ratio, and building more hospitals. In conclusion, this survey provides valuable insights into the experiences of people during the COVID-19 pandemic and the challenges faced by hospital staff and doctors. The findings highlight the importance of improving medical facilities, providing better support to hospital staff and doctors, and developing effective policies to tackle pandemics in the future.

5.2 Discussion of Research Question One

1. Name and age

General Public	Administrative staff	Doctors
23-57	22-47	26-60

Table 5.1: Name and age

5.3 Discussion of Research Question Two

General Public
Q-2: Gender
Male: 64 Female: 35 Prefer not to say:1

Table 5.2: Gender of general public

Administrative staff
Q-2: Hospital/Clinic Name
Yadu Raj health clinic & pain Relief clinic Indravati Hospital & Research Centre LLP, Navi Mumbai Arunodaya Surgical and Trauma Centre Dr Prabhat Singh hospital

Table 5.3: Hospital/clinic of administrative/support staff

Doctors
Q-2: Qualification and Designation
MPT, assistant professor
B.D.S.
MBBS
MS Gynaecology
MBBS. Diabetologist
MBBS, DM
MBBS MD MEDICINE
MBBS, MD ENT
MCH Neurosurgery
MBBS MD, Gastroenterology
MD Pediatrics
MS Surgery
MD Ortho
BAMS
MBBS, MD Pathology
MD Anesthesiologist

Table 5.4: Qualifications of the doctors

5.4 Discussion of Research Question Three

Sample was selected from all over India. People were given google forms to fill in the answer to the questions. Proper confidentiality and anonymity were maintained throughout the research process. It was made sure that the participation was voluntary and not forced.

People from all walks of life and of all ages participated in this survey. Participants took their own free time to respond to their surveys. And those who didn't want to fill the forms, their decision to do so was well respected and honored.

General Public
Q-3: City/Locality
Navi Mumbai Mumbai Uttar Pradesh Varanasi

Table 5.5: City/Locality of general public

Administrative/Support Staff
Q-3: Qualification and Designation
BAMS Master of Hospital Administration, HR Asst BSc /IT B.com, Front Desk Executive ANM Staff in charge, GNM Staff nurse BMLT senior lab technician ANM nursing, staff in charge Front desk executive HSC and Reception Nursing In charge sister GNM (design in charge) Matron (GNM) Receptionist. 12th pass BA, ward assistant

Table 5.6: Qualifications of administrative/support staff

Doctors
Q-3: Hospital/Clinic Name
Sri Aurobindo institute of medical sciences
Nair Hospital Dental College
Dr Patni's healthcare Clinic
Sharda hospital
Anarthe clinic
LTMMC, Sion
Terna Nerul
Daxini Clinic
DY Patil Hospital
Vedicure clinic
Yadu Raj health clinic &pain Relief clinic
UPHC Dhamdhanaka
Smart diagnostic centre and hospital
Smart hospital and diagnostic centre jaunpur
Krishna Trauma Centre, Jaunpur
Lakshmi Hospital
SRG Hospital

Table 5.7: Hospital/clinic name of doctors

5.5 Discussion of Research Question Four

General Public
Q-4: Have you ever been infected with COVID 19?
Yes: 59 No: 41

Table 5.8: General public infected with COVID 19

Administrative/ Support Staff
Q-4: Did your hospital/ clinic face a shortage of staff during COVID-19?
Yes: 4 No: 14 Maybe: 1

Table 5.9: Administrative/support staff if they faced a shortage of staff during COVID-19

Doctors
Q-4: Do you work in a service/department/clinic dedicated to/or where patients with COVID-19 were hospitalized?
Yes: 48 No: 2

Table 5.10: Doctors working in clinic/center/hospital where patients of COVID 19 were hospitalized

5.6 Discussion of Research Question Five

General Public
Q-5: How were you exposed to COVID 19?
Construction Site Social Contact Contact with the positive patient From family member From public place Due to market or hospital visits for checkup Father had covid-19 so had to go to hospital few times to visit him and take care of him Infection in locality By wearing a mask, cleaning hands with sanitizer and maintaining social distance Traveling in local trains, During COVID duty I believe it could be during my travel to office or in the office. Infected by a family member who got it from where he was getting Dialysed My wife is a nurse and she work on the front line during covid19 pandemic My dad had covid 19 at that time

Table 5.11General public source of exposure to COVID 19

Administrative/ Support Staff
Q-5: List the resources that were facing a shortage in a covid ward.
Hospital beds Shortage of staff Remdesivir Injection

Table 5.12: Administrative staff facing shortage of resources in COVID ward.

Doctor
Q-5: Did you contract COVID 19 while treating your patients?
No: 36 Yes: 14

Table 5.13: Doctors contracting COVID 19 while treating patients.

5.7 Discussion of Research Question Six

General Public
Q-6: Where did you isolate yourself during the infection?
Home: 48 Hospital: 10 Not applicable: 42

Table 5.14: General public place of isolation during COVID 19

Administrative/ Support Staff
Q-6: Have you had an extremely stressful, disturbing, or traumatic experience due to COVID-19?
Yes: 7 No:5 Maybe: 7

Table 5.15: Administrative/support staff having extremely stressful, disturbing, or traumatic experience due to COVID-19

Doctor
Q-6: Do you believe the equipment given to you were enough to protect you from COVID 19?
Yes: 23 No: 11 Maybe: 16

Table 5.16: Doctors if they got enough equipment to protect them from COVID 19.

5.8 Discussion of Research Question Seven

General Public
Q-7: Did the local authorities help you to tackle with issues during your COVID 19 journey?
Yes: 48 No: 20 Maybe: 32

Table 5.17: General public on local authorities helping them to tackle with issues during their COVID 19 journey

Administrative/ Support Staff
Q-7: Were you paid enough salary remuneration for your work in COVID ward?
Yes: 11 No:5 Maybe: 3

Table 5.18: Administrative/Support staff on salary renumeration during their work in COVID 19.

Doctor
Q-7: Working hours at a stretch?
Average ranges between 6- 24 hours

Table 5.19: Working hours of doctors

On an average the working hours of the doctors ranged from 6 hours a day to 24 hours a day. Many of the doctors even worked extra shits for months without thinking about their families or even their health. They sacrificed almost everything just so that they can treat the ill and fight the nation against the calamity that befell us.

5.9 Discussion of Research Question Eight

General Public
Q-8: During the pandemic how easily were you able to get supplies like masks, sanitizers, medication etc.?
Easily: 46 Difficult: 14 Neutral: 40

Table 5.20: General public on supplies availability like masks, sanitizer etc.

Administrative/ Support Staff
Q-8: Did you suffer from COVID-19 while treating or managing a patient?
Yes: 8 No: 10 Maybe: 1

Table 5.21: Administrative/support staff on suffering from COVID 19 while treating a COVID 19 patient

Doctor
Q-8: Were the things like sanitizers, gloves, PPE kits readily and easily available?
Yes: 26 No: 5 Maybe: 19

Table 5.22: Doctors on supplies availability like masks, sanitizer etc.

5.10 Discussion of Research Question Nine

General Public
Q-9: Did you take health as a serious factor in your life before getting COVID 19?
Yes: 45 No: 28 Maybe: 27

Table 5.23: General public on taking health as a serious factor in their life before getting COVID 19?

Administrative/ Support Staff
Q-9: How often are you required to work beyond your shift to finish existing work or provide adequate care to patients?
Daily: 11 Weekly: 6 Rarely: 2

Table 5.24: Administrative staff on working beyond their shift timings.

Doctor
Q-9: How many patients on an average you have treated during COVID 19?
80 patients per day

Table 5.25: Average number of patients treated per doctor during COVID 19

5.11 Discussion of Research Question Ten

General Public
Q-10: Did COVID19 impact you mentally, physically and emotionally?
Mentally: 18 Physically: 27 Emotionally: 19 All of the above: 31 None of the above: 34

Table 5.26: COVID 19- mental, physical and emotional impact on general public

Administrative/ Support Staff
Q-10: As a support staff, what suggestion would you like to give to tackle a pandemic like situation in the near future
● Don't panic and done be afraid of the situation. ● Take care of others with yourself also in panic situation. And be strong in any situation ● The government should give some help to always maintain the spirit of working in the field. Proper guidance to public. More Nurses needed

Table 5.27: Suggestions from administrative staff to tackle pandemic in future

Doctor
Q-10: How has your clinic or hospital fared in terms of business?
High: 33, Low: - Same:2, Don't know: 33

Table 5.28: Doctors on business of hospital during COVID 19

5.12 Discussion of Research Question Eleven

General Public
Q-11: Did you try to call the govt given toll free number?
Yes: 67 No: 25 Maybe: 8

Table 5.29: General public on contacting government toll free number

Doctor
Q-10: How has COVID 19 affected your mental health? List the symptoms
Stress, insecurity, anxiety, fear Emotional stress Insomnia Exhaustion Increased work load STRESS

Table 5.30: COVID 19 and its impact on doctors' mental health

5.13 Discussion of Research Question Twelve

General Public
Q-12: Did you use Aarogya Setu application?
Yes: 88 No: 12

Table 5.31: General public on using Aarogya Setu application

Doctor
Q-12: Have you done or experienced any of the following as a result of COVID 19
Low income: 1 Low staff:16 High income: 3 High staff: 0 Mental Health issues: 14 Scarcity of resources: 15 Increased workload: 38 Decreased workload: 0 None: 5

Table 5.32: Doctors on various factors experienced during COVID 19

5.14 Discussion of Research Question Thirteen

General Public
Q-13: Did you take COVID 19 Vaccination? If yes how much did you pay for it?
Yes: 92 No: 8 Range: Rs 650, Rs 400, Rs 800, Rs 750, Rs 550, Rs 1000 and some of them even got it for free as per their work place rules.

Table 5.33: General public on vaccination and its cost

Doctor
Q-13: Imaging method used to diagnose COVID 19
Chest X Ray: 10 Chest CT Scan: 14 Both: 45

Table 5.34: Imaging methods used by doctors

5.15 Discussion of Research Question Fourteen

General Public
Q-14: On a scale of 1 to 10 how did COVID19 pandemic affected your mental health from 1 being normal to 10 being severe.
1: 8 2: 12 3: 15 4: 10 5: 19 6: 11 7: 9 8: 7 9: 5 10: 4

Table 5.35: COVID19 and its effect on mental health of general public.

Doctor
Q-14: List of equipment, resources that were amiss during your whole tenure of COVID 19.
Oxygen plants PPE Kits, masks, sanitizers O2 cylinder Hospital beds Staff Wards shortage

Table 5.36: Doctors on equipment that were amiss during COVID19 pandemic

5.16 Discussion of Research Question Fifteen

General Public
Q-15: Suggest, how as a country we can be prepared in future if we face another pandemic like situation
More hospital needed, awareness, taking proper precautions, and spreading public awareness. Keep the medical services handy for economically backward people Take safety measures and get proper vaccination Proper planning and execution of situation and spread of awareness. Mental Health Support and awareness Make use of party halls for accommodation of beds, proper supply of medicines There should be proper planning before imposing any force majeure law. The pandemic has affected the people belonging in the lower part of the human pyramid due to improper awareness and lack of communication. Need to have good physical health Keep different provision as contingency for the next upcoming pandemics Strong and resilient health systems, hospital capacity should be increased, have well-functioning supply chain. Better to wear a mask always when we go out even after covid was gone

Table 5.37: General public's suggestion to handle pandemic like situation in future

Doctor
Q-15: Were you understaffed in COVID 19.
Yes: 35 No: 4 Maybe: 11

Table 5.38: Doctors on staff shortage situation in COVID 19

5.17 Discussion of Research Question Sixteen

Doctor
Q-16: Did the govt help you during COVID-19 duty? If yes specify
Yes: 36 No: 6 NA: 8

Table 5.39: Doctors on help given or not by the government during COVID 19

5.18 Discussion of Research Question Seventeen

Q: What were your expectations from your hospital or our government in terms of treatment and well-being during COVID-19?

The government is the primary agency responsible for controlling epidemics; Thus, expectations about government intentions and capabilities influence citizens' flexibility and behavior. Given the severity of the COVID-19 pandemic and the urgent need for people to collaborate in the prevention and response processes, understanding public perspectives would be crucial and instructive.

- Easily available oxygen, extra income for all health workers
- To follow protocol and ensure safety of the staff
- To increase staff and provide good salary
- more support for the doctors
- Free treatment
- Patient load to doctor ratio
- More hospitals needed
- More help to doctors in terms of mental health

5.19 Discussion of Research Question Eighteen

Q: As a doctor what is your suggestion to tackle another pandemic like situation in near future

- More hospitals needed
- Medical facilities should be increased, increase the number of man power with good income to them
- Educating patients without inducing fear, educating staff for controlling such situations
- The government should increase investment in healthcare sector
- Increase funds allocated towards medical sector
- More hospital in rural area
- More makeshift hospitals like BKC and ones in China
- We need more medical colleges.
- Cut off for admission should be low so that there are more people who can qualify for MBBS and our country can get more doctors on field.
- More advanced surgical facilities needed. more doctors and staff
- Good infrastructure

CHAPTER VI:

SUMMARY, IMPLICATIONS, AND RECOMMENDATIONS

6.1 Summary

In December of 2019, the World Health Organization reported the emergence of a new strain of coronavirus in Wuhan, China, which was officially designated as severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). Since its initial discovery, SARS-CoV-2 has spread rapidly around the world, causing a significant number of infections and deaths, and prompting a global response to contain its spread and mitigate its impact. This virus is responsible for coronavirus disease 2019 (COVID-19), which has since spread to over 36 countries and territories, causing a global pandemic. The virus is highly contagious, and it spreads through respiratory droplets from an infected person's coughs, sneezes, or breathing. India is one of the countries that has been severely affected by COVID-19. The virus has exposed the weaknesses in India's healthcare system and highlighted the urgent need for improvements. India has 1154686 registered doctors in modern medicine, but there is only one government allopathic doctor for every 10926 people. This ratio is far below the World Health Organization's recommended ratio of 1:1000. Currently, 60% of India's population lives in rural areas, which are underserved by healthcare facilities. To provide healthcare facilities to people living in rural India, the government has established 25743 Primary Health Centers, 158417 Sub Centers, and 5624 Community Health Centers. However, these facilities are often understaffed and lack the necessary equipment and supplies. The COVID-19 pandemic has also highlighted the shortage of hospital beds and

healthcare workers in India. Currently, there are only 713986 beds available in government hospitals in India, which amounts to 0.55 beds per 1000 population.

This is far below the WHO's recommended ratio of 3.5 beds per 1000 population. The shortage of hospital beds has been particularly acute in cities like Mumbai and Delhi, where there have been reports of patients being turned away from hospitals due to the lack of beds. To address the challenges posed by the COVID-19 pandemic, the government of India has taken several measures. These include ramping up testing, increasing the production of personal protective equipment (PPE), and setting up COVID-19 hospitals and isolation centers. The government has also launched a telemedicine initiative to provide healthcare services to people in rural areas. However, there is still a long way to go to build a robust healthcare system in India. The COVID-19 pandemic has exposed the weaknesses in the system and highlighted the urgent need for reforms. Some of the suggestions that have emerged from the study include:

- Increasing the number of hospital beds and healthcare workers to meet the demand.
- Investing in the healthcare infrastructure in rural areas to improve access to healthcare services.
- Increasing the production of essential medical supplies like PPE, masks, and sanitizers.
- Providing mental health support to healthcare workers and people affected by the pandemic.
- Increasing funding for the healthcare sector to build a more resilient healthcare system.

In conclusion, the COVID-19 pandemic has been a wake-up call for India's healthcare system. It has exposed the weaknesses in the system and highlighted the urgent need for improvements. While the government has taken steps to address the challenges posed by the pandemic, more needs to be done to build a robust healthcare system that can withstand future pandemics and provide quality healthcare services to all Indians.

6.2 Implications

Implication refers to the impact that my research might have on future research or policy decisions relating to the preparedness of the medical system during pre- and post-pandemic times. In other words, it is a crucial aspect of research that determines how the findings can be utilized to improve the system's preparedness to deal with pandemics. Our research topic is the status of the medical system during pre- and post-pandemic times in terms of preparedness. The COVID-19 pandemic caught the entire world off guard, and India was no exception. We conducted thorough research with doctors, administrative and support staff, and the general public to understand the situation on the ground. Based on our findings, we concluded that during the pandemic, there was a significant shortage of essential medical supplies such as hospital beds, PPE kits, masks, and sanitizers. This led to a chaotic situation in hospitals, especially in densely populated cities, where patients were unable to receive proper medical attention. The shortage of oxygen and oxygen cylinders in hospitals caused most of the patients to lose their lives during the second wave of the pandemic. Our research aimed to ascertain if our healthcare system is equipped to deal with another pandemic or similar situations in the future. Unfortunately, we discovered that our country is not adequately prepared to deal with such situations. We observed a significant gap in the healthcare system where one doctor was handling more than 80 patients in a day. This is an alarming situation and highlights the need for more healthcare workers, including doctors, staff, nurses, ward boys, and sisters. We should also build more makeshift hospitals so that we can be better prepared to handle a sudden increase in the number of patients. Our country should maintain a stock of extra oxygen cylinders and basic consumables that can be used during emergencies.

Additionally, there should be more mental health centers as the pandemic affected many people emotionally and mentally. We need to focus on our physical health and well-being and prioritize it. Our country must provide good medical services in rural areas where there are currently no doctors. The government should thoroughly check the funds allocated towards the healthcare system and ensure that they are utilized appropriately. People should be taught to practice hygiene factors such as hand hygiene and coughing etiquette. The patient to doctor ratio in government hospitals should be increased by hiring more doctors. The government should also implement organized healthcare camps to spread awareness among people in villages. The next pandemic may be on the horizon, and climate change is giving rise to new pathogens. Multiple diseases are spilling over from animals to humans, causing over a million deaths each year. The key weakness observed during the COVID-19 crisis was the inadequacy of healthcare institutions and systems. The Pradhan Mantri Ayushman Bharat Health Infrastructure Mission (PM-ABHIM) seeks to fill the gaps at both the national and state levels. This program aims to develop and strengthen the health infrastructure of the country, especially in rural areas, and ensure that the benefits reach the underprivileged sections of society. In conclusion, our research highlights the urgent need to improve the preparedness of the healthcare system to deal with pandemics. The government, healthcare workers, and the general public must work together to ensure that we are better equipped to handle such situations in the future.

6.3 Recommendations for Future Research

The following discusses various aspects related to the COVID-19 pandemic and the measures that can be taken to prepare for and respond to future pandemics. To begin with, there is a need to focus on the government schemes that were declared during the onset of the COVID-19 pandemic. In this regard, India has taken a step forward by bringing several ministries, including health, animal husbandry, forests, biotechnology, and others under the Principal Scientific Advisor. This is a positive development as coordination between key institutions is essential to ensure an effective response to pandemics. India has laid the foundation for the National Institute for One Health in Nagpur which will identify major hotspots for endemic and emerging zoonotic diseases to contain their spread early on. Additionally, there is a need for various departments to reorganize and restructure using key lessons from the pandemic to prepare for post-COVID service delivery. Remote working is a viable option that should be promoted, and its analysis can be used as another parameter to understand people's views in the future. Furthermore, a robust supply chain for resource acquisition, including appropriate PPE and other clinical consumables, should be ensured at a departmental and institutional level. Continuous professional developmental activities should focus on simulated case scenarios of pandemics. Some of them are infection prevention and its control, efficient communication concerning the infection, and information dissemination approaches during crisis events. Other activities concerning efficient management, adaptation of diagnostic imaging protocols, and mental health and well-being training will be critical. Businesses need to adapt their business models in response to the new

challenges posed by the pandemic crisis. This includes areas such as real-time decision-making, digital nets, business continuity, and testing business resilience.

Several opportunities can be derived from the strategies of creative industries, such as using digital tools to engage with customers. Museums, musicians, artists, and other cultural organizations have adopted digital tools to interact with their customers and audiences and to deliver their services online. To prepare for future pandemics, plans should be developed for a period of at least five to ten years and subsequently revised in the light of technological advances and gains in knowledge. The State/city pandemic preparedness and response plan should have top policymakers as the coordinators. In a setup like India, where the district is the revenue unit, it is imperative to have a multisectoral multidisciplinary district pandemic preparedness and response plan in place. The key elements of the plan should comprise surveillance (including data management), laboratory diagnosis, case management, Infection Prevention and Control, Research and Development, supply chains, and community engagement, including support for mental health, and efficient supply chains for uninterrupted supply of personal protective equipment and ventilators, etc. The United Nations Development Program (UNDP) has advocated for the development and implementation of policies that strengthen health systems and accentuate the response to any future pandemic. Despite the aspirational nature and global commitments to achieve SDGs, progress till date has been suboptimal. The COVID-19 pandemic has further slowed down this process. There is a need for greater financial investment by countries to revitalize health systems and use COVID-19 as an opportunity to improve access, quality, and safety of the health system. Additionally, promoting factors that encourage healthy lifestyles will be critical in the days to come.

6.4 Conclusion

In this research, we presented a systematic literature review to understand the status of healthcare systems pre, during, and post-COVID-19. We argue that in different sets of sample populations, we have encountered both positive and negative effects as a result of the COVID-19 pandemic. Specifically, we identified areas within the subsectors that have responded differently to the COVID-19 pandemic. COVID-19 is a very virulent virus and it spreads through droplets in the air. We had a discussion with various people from all walks of life including doctors, administrative and support staff along with general public. This survey was done taking into consideration various parameters like available resources, mental health, working hours, etc.

According to research done in the past, currently, single government allopathic doctors can cater to the needs of 100926 people. 60% of the total India's population lives in rural India and we all know that there are fewer healthcare facilities and fewer hospitals in rural India. The main aim of conducting the research was to understand if our country's healthcare system is equipped enough to deal with another pandemic-like situation in the future. The motive of the current studies is to provide a review of literature and hospital practices about the analysis and outline a framework for the same. We even got suggestions from the public, doctors, and healthcare staff as to what things we can do in the future to prevent the current situation.

The major thing that we have noticed after completing our research is that our country faces to shortage of oxygen cylinders, PPE kits, and most importantly hospital beds. Apart from that we need to ramp up the supplies as early as possible

Management of PPE should be coordinated through key national and international supply chain management mechanisms, which include:

• Monitoring the full distribution of PPE to prevent shortages at the facility and supplier level; • use PPE forecasting tools based on reliable quantification models to ensure that the amount of PPE needed is proportional to demand and use in the facility

• Monitor and control the centralized procurement channel of PPE to countries and corresponding operations

• Provide supplies with the possibility of approval by the manufacturer and the relevant certification body tolerates rework

• Promote centralized requisition management to avoid inventory duplication and ensure strict compliance with essential inventory rules to limit waste, excess and inventory fragmentation

• Monitor and control the distribution of PPE from medical facilities warehouses

• Monitor and control waste management flows and used PPE disposal processes.

Strict regulatory standards for specifications and testing criteria for PPE used in local procurement processes may limit available supply options.

Due to the global shortage of PPE, the WHO PPE Expert Group reviewed regional and international standard specifications to facilitate the acquisition of PPE that meets the functional and protective criteria for the treatment of patients with COVID-19.

In response to COVID-19, a number of alternative PPE options have been proposed or introduced as products from healthcare and other industries seek to temporarily replace the limited availability of PPE.

If alternatives to personal protective equipment used in health care are proposed locally, if the stock is lacking or at risk/soon to be in stock, the local government must evaluate all proposed alternative personal protective equipment according to certain minimum standards and technical specifications. . (WHO, 2020)

Medical Masks

The use of FFP1 spirals, mainly used in industrial environments, has been proposed as an alternative to medical masks. FFP1 respirators are designed with technical features that offer healthcare workers the same level of protection as medical masks. However, many FFP1 models use exhalation valves that exit the filter media to reduce resistance during exhalation and thus do not allow for source control. The stock of medical masks offers alternatives to medical masks without a mask or in combination with non-medical fabric masks. However, it should be noted that both options are inferior to medical masks against respiratory pathogens and should be considered as a temporary last resort. . (WHO, 2020)

Coats

Disposable or washable aprons, lab coats, and patient coats have been recycled as an alternative to PPE because they are in short supply. In some cases, these options may not effectively protect the body or hands of healthcare workers from contaminants and may not be tested for adequate resistance to liquid ingress. . (WHO, 2020)

Eye protection

Due to a lack of eye protection, safety glasses and alternative production methods for face protection (e.g. 3D printing and homemade models) were used as an alternative. These options are not often tested for eye protection effectiveness and standards. Homemade models are unlikely to be judged on their ability to protect the eyes from accidental liquid splashes. (WHO, 2020)

Respirators

Powered air-purifying respirators (PAPR) and elastomeric respirators are universal devices approved to international standards and in some cases to manufacturer reprocessing recommendations. Both were used routinely and in relation to the lack of respirators in healthcare settings. Many PAPR and elastomeric respirators have filtration equal to or better than FFP2/N95 respirators, and some evidence suggests that they present less dermatological or inhalation hazards than FFP2/N95 respirators. (WHO, 2020)

Gloves

If gloves are not available, the best strategy is to temporarily reduce the use of gloves (including, if necessary, a set of personal protective equipment used as a contact precaution when treating suspected, probable or confirmed patients). COVID-19). Alcohol-based hand rubs and hand washing with soap and water have been shown to effectively disinfect hands from SARS-CoV-2, but only when done well, following the recommended surface contact rub and time.

Healthcare workers with intact skin on their hands should not directly care for patients without gloves. . (WHO, 2020)

Apart from the shortcoming we did witness some positive attributes as a nation during the time of pandemic:

1. **Demographics and mortality rate:** A young population helped India. More than 50% of the population is below 25 years of age (have lower risk and higher recovery) and less than 5% above 65 (highest risk of mortality). One of the main reasons given for India's low Covid-19 mortality rate of less than 3% is the high proportion of young people in the country's population. 27% of India's population is under the age of 14, which is a significant difference compared to major countries in the world. There seems to be a strong correlation between the percentage of the population over 65 and the mortality rate. Italy, Spain, France, the UK and Belgium all have very high proportions of their population in this group, with alarming mortality rates.

   By comparison, India has a relatively low overall mortality rate of just 2.71%, as only 6% of the population is over 65. Other factors can also be considered as the reason for India's low mortality rate: strict lockdown, BCG vaccine, high temperature, high rural population, etc. But having a large proportion of young people and a very small proportion of old people could have saved many lives for the country.
2. **Multidisciplinary district pandemic preparedness:** In a setup like India, where the district is the revenue unit, it is imperative to have a multidisciplinary district pandemic preparedness and response plan in place.
3. **Financial Investments:** There is a need for greater financial investment by countries to revitalize health systems and use COVID-19 as an opportunity to improve access, quality, and safety of the health system.

4. **Unity**: Togetherness and helping attitude towards each other during and post lockdown. Society raised to the calamity that befell our nation in various ways. Many NGOs helped the people by providing food packets, medicines and other essential supplies. Successfully managing major health crises required a coordinated response across different health facilities, the entire public health system, as well as government and legislative institutions. The country was united, united, otherwise, the mission would not be possible. The Indian Prime Minister also stated that his biggest lesson during the pandemic was the importance of last-mile delivery – first through the Direct Benefit Transfer (DBT) program, which allowed direct transfers of funds into the bank accounts of millions of people. The willingness of people to adapt to changes in their behavior – such as wearing masks and social distancing without forced enforcement; which, with the unified cooperation of the public and private sectors, ensured an "effective fight".
5. **Strong Immune system/ Pre-existing Immunity:** It played a huge role that maximum healthcare workers were not affected. The concept of herd immunity is key to controlling the pandemic. Under this concept, only a portion of the population needs to be vaccinated, either through natural infection or vaccination. The idea of herd immunity through natural infection rather than vaccination is controversial, as it is not yet clear how long antibodies last or whether reinfection or reactivation of the virus can occur once antibodies begin to clear from the body. It has been suggested that the coronavirus could become similar to seasonal influenza once herd immunity is achieved. Such an example was observed in a slum called as Dharavi in Mumbai.

It was considered to be a ticking time bomb of virus. But still due to herd immunity and strong immune system of the people living there. The severity of the virus was less as compared to the rest of the city areas.

6. **Geography**: A warm climate provides better protection against the Covid virus. Virus transmission can be influenced by several geographical factors such as climatic conditions (temperature and humidity) and population density (PD) (Gupta et al., 2020) (Dalziel et al., 2018). The heterogeneity in the spatial occurrence of infections might be attributed to local meteorology with its geographical location and population. (Gupta et al., 2020)
7. **Vaccine**: Vaccination availability was abundant for the nation. Free of cost at maximum places. Multiple vaccine options were also available with the citizens. On logistics, PM of India Narendra Modi mentioned that there are over 28,000 cold chain points that will store and distribute Covid-19 vaccines to ensure they reach their final destination. He also stated that specialized teams at the state, district and local levels shall ensure that the distribution and management of vaccines is done systematically and responsibly. A digital platform for registration, tracking and outreach to beneficiaries is being prepared.

The doctors who were working during the COVID-19 pandemic claimed that they were overloaded with work and even if somebody contracted COVID-19 while treating a patient they used to come back to work within 2 days. Multiple suggestions can be implemented after completing the research.

• Like our government should focus more on building hospitals, health care centers and more make-shift hospitals.

• Medical services should be free and readily available for economically backward people or people who come below the poverty line category.

• Vaccinations for every disease infection or virus should be readily available for people from all walks of life and it should be free of cost.

• We should have an extra backup of oxygen cylinders, oxygen, injections, consumables, masks, etc.

• More pandemic-focused hospitals should be built so that whenever a situation like this arises in the future our country is ready to fight it.

• Hiring of staff is very important as we have seen the doctors were overloaded with work and patients.

To resolve this problem our government should have schemes for people where they can apply to the hospitals or health care centers and get jobs easily. Overall, we need to understand that this pandemic was just the tip of the iceberg and there are so many developments and so many reforms that should be made in the healthcare system. We as a country have to unite together and fight this pandemic since we all know that it still exists.

APPENDIX A

SURVEY COVER LETTER

Smriti Pandey

#201, Sushila apartment, sector 8A, Airoli

Navi Mumbai, 400708

smritip95@gmail.com

9987001951

Mentor: Dr. Atul Pati Tripathi

University: Swiss School of Business Management (SSBM), Geneva, Switzerland

Dear Dr. Atul

Greetings of the day.

Presenting before you my thesis entitled " STATUS OF MEDICAL SYSTEM DURING PRE AND POST PANDEMIC IN RELATION TO PREPAREDNESS" for consideration towards Global Doctorate in Business Administration at SSBM. Enclosed, please find the completed manuscript along with any additional materials as required. This thesis represents the culmination of rigorous research, analysis, and synthesis of information in the pursuit of advancing knowledge and contributing to the academic discourse in this field.

The primary objective of my thesis is to identify weather or not our country is prepared to tackle a pandemic like situation in the near future or not. We have done a survey of general public, support staff and healthcare workers to understand the same. I have tried my best to formulate results based on my observation. I have endeavored to provide valuable insights and make meaningful contributions to the existing literature.

I would be grateful if you would consider my thesis for evaluation and assessment and help me with any feedback, suggestions, or recommendations that would further enhance the quality and impact of this work.

Thank you for considering my submission. Should you require any further information or clarification, please do not hesitate to contact me at 9987001951 or smritip95@gmail.com

Looking forward to the opportunity to discuss my thesis with you further.

Sincerely,

Smriti Pandey

APPENDIX B

INFORMED CONSENT

Interview Consent Form

Research project title: Status of medical system during pre and post pandemic in relation to preparedness

Research investigator: Smriti Pandey

Research Participants name: Mr. Shankar Chavan

The interview will take 20 mins. We don't anticipate that there are any risks associated with your participation, but you have the right to stop the interview or withdraw from the research at any time.

Thank you for agreeing to be interviewed as part of the above research project. Ethical procedures for academic research require that interviewees explicitly agree to being interviewed and how the information contained in their interview will be used. This consent form is necessary for us to ensure that you understand the purpose of your involvement and that you agree to the conditions of your participation. Would you therefore read the accompanying information sheet and then sign this form to certify that you approve the following:

- the interview will be recorded and a transcript will be produced
- you will be sent the transcript and given the opportunity to correct any factual errors
- the transcript of the interview will be analyzed by (name of the researcher) as research investigator
- access to the interview transcript will be limited to (name of the researcher) and academic colleagues and researchers with whom he might collaborate as part of the research process
- any summary interview content, or direct quotations from the interview, that are made available through academic publication or other academic outlets will be anonymized so that you cannot be identified, and care will be taken to ensure that other information in the interview that could identify yourself is not revealed
- the actual recording will be (kept or destroyed state what will happen)
- Any variation of the conditions above will only occur with your further explicit approval

Or a quotation agreement could be incorporated into the interview agreement

Quotation Agreement

I ALSO UNDERSTAND THAT MY WORDS MAY BE QUOTED DIRECTLY. WITH REGARDS TO BEING QUOTED, PLEASE INITIAL NEXT TO ANY OF THE STATEMENTS THAT YOU AGREE WITH:

	I wish to review the notes, transcripts, or other data collected during the research pertaining to my participation.
	I agree to be quoted directly.
	I agree to be quoted directly if my name is not published and a made-up name (pseudonym) is used.
	I agree that the researchers may publish documents that contain quotations by me.

All or part of the content of your interview may be used;

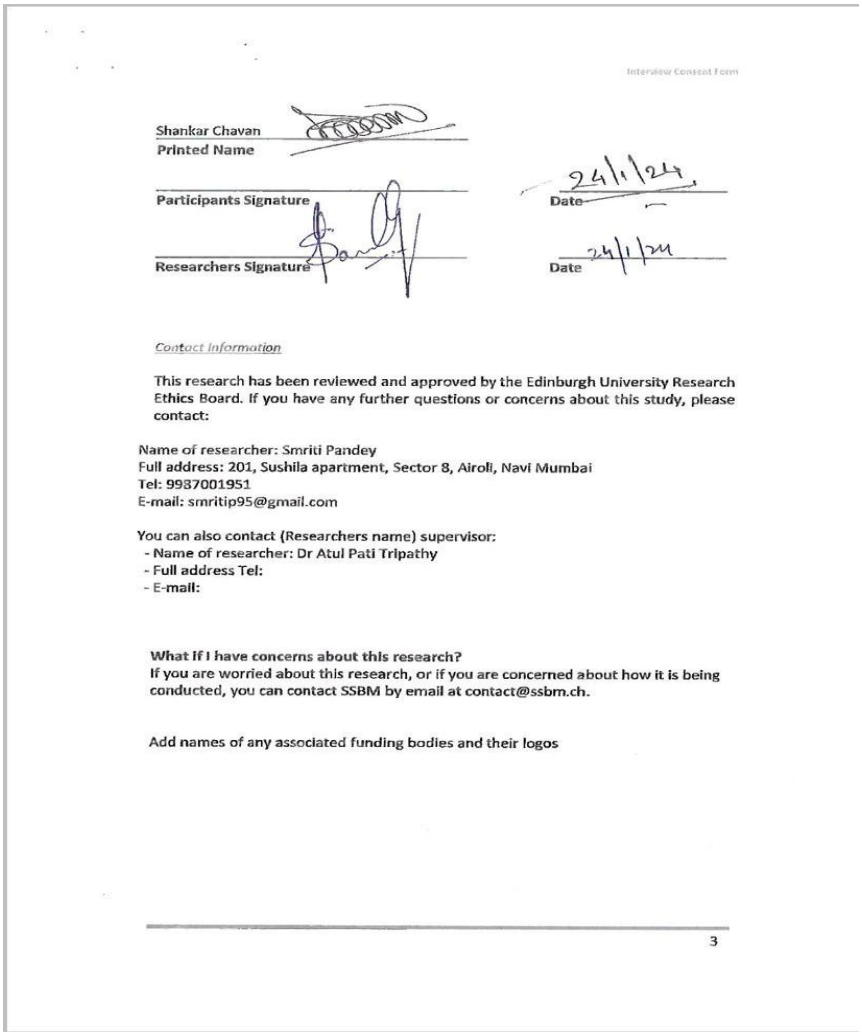
- In academic papers, policy papers or news articles
- On our website and in other media that we may produce such as spoken presentations
- On other feedback events

- In an archive of the project as noted above by

signing this form I agree that;

1. I am voluntarily taking part in this project. I understand that I don't have to take part, and I can stop the interview at any time;
2. The transcribed interview or extracts from it may be used as described above;
3. I have read the Information sheet;
4. I don't expect to receive any benefit or payment for my participation;
5. I can request a copy of the transcript of my interview and may make edits I feel necessary to ensure the effectiveness of any agreement made about confidentiality;
6. I have been able to ask any questions I might have, and I understand that I am free to contact the researcher with any questions I may have in the future.

1. Mr. Shankar Chavan – Director, Indravati Hospital, Airoli, Navi Mumbai



Interview Consent Form

Shankar Chavan
Printed Name

Participants Signature

24/1/24
Date

Researchers Signature

24/1/24
Date

Contact information

This research has been reviewed and approved by the Edinburgh University Research Ethics Board. If you have any further questions or concerns about this study, please contact:

Name of researcher: Smriti Pandey
Full address: 201, Sushila apartment, Sector 8, Airoli, Navi Mumbai
Tel: 9987001951
E-mail: smritip95@gmail.com

You can also contact (Researchers name) supervisor:
- Name of researcher: Dr Atul Pati Tripathy
- Full address Tel:
- E-mail:

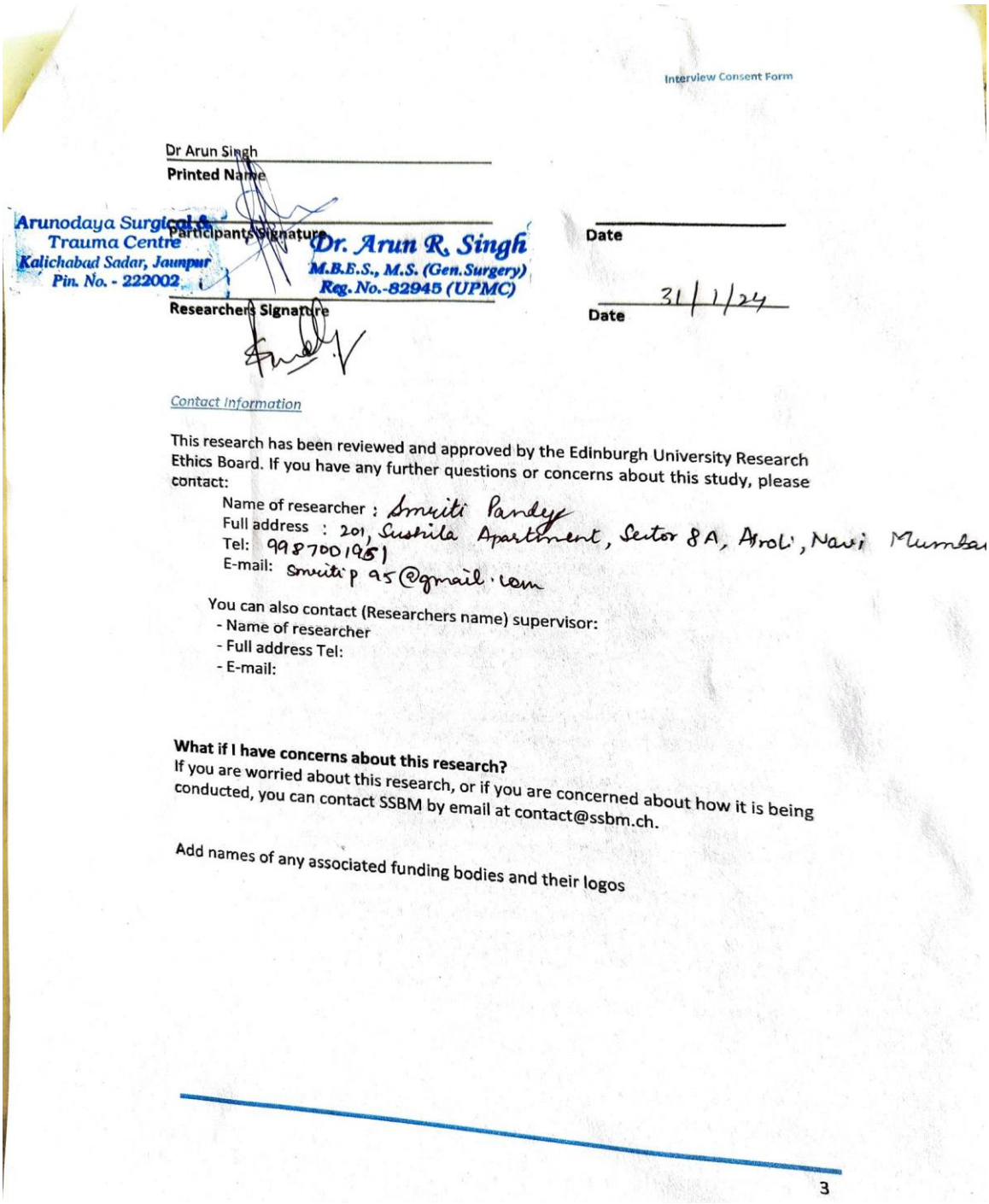
What if I have concerns about this research?
If you are worried about this research, or if you are concerned about how it is being conducted, you can contact SSBM by email at contact@ssbm.ch.

Add names of any associated funding bodies and their logos

3

2. Dr Arun Singh: Director

Arunodaya Surgical and Trauma Centre



Interview Consent Form

Dr Arun Singh
Printed Name

Arunodaya Surgical & Trauma Centre
Kalichabad Sadar, Jaunpur
Pin. No. - 222002

Participants Signature — Dr. Arun R. Singh M.B.E.S., M.S. (Gen.Surgery) Reg. No.-82945 (UPMC) — **Date**

Researchers Signature — **Date** 31/1/24

Contact Information

This research has been reviewed and approved by the Edinburgh University Research Ethics Board. If you have any further questions or concerns about this study, please contact:

Name of researcher : Smriti Pandey
Full address : 201, Sushila Apartment, Sector 8A, Airoli, Navi Mumbai
Tel: 9987001951
E-mail: smritip95@gmail.com

You can also contact (Researchers name) supervisor:
- Name of researcher
- Full address Tel:
- E-mail:

What if I have concerns about this research?
If you are worried about this research, or if you are concerned about how it is being conducted, you can contact SSBM by email at contact@ssbm.ch.

Add names of any associated funding bodies and their logos

3

3. Dr Prabhat Singh: Director

Parasnath Memorial Hospital

Interview Consent Form

Dr Prabhat Singh
Printed Name

Participants Signature Dr. Prabhat Singh MBBS, MD. Reg. No.-63935

31/01/24
Date

Researchers Signature

31/1/24
Date

Contact Information

This research has been reviewed and approved by the Edinburgh University Research Ethics Board. If you have any further questions or concerns about this study, please contact:

Name of researcher - Smriti Pandey
Full address - 201, Sushila Apartment, Sector 8A, Airoli, Navi Mumbai
Tel: 9987001951
E-mail: smritip95@gmail.com

You can also contact (Researchers name) supervisor:
- Name of researcher: Dr Atul Pati Tripathi
- Full address Tel:
- E-mail:

What if I have concerns about this research?
If you are worried about this research, or if you are concerned about how it is being conducted, you can contact SSBM by email at contact@ssbm.ch.

Add names of any associated funding bodies and their logos

APPENDIX C

INTERVIEW GUIDE

Smriti Pandey

#201, Sushila apartment, sector 8A, Airoli

Navi Mumbai, 400708

smritip95@gmail.com

9987001951

Mentor: Dr. Atul Pati Tripathi

University: Swiss School of Business Management (SSBM), Geneva, Switzerland

Topic: STATUS OF MEDICAL SYSTEM DURING PRE AND POST PANDEMIC IN RELATION TO PREPAREDNESS”

REFERENCES

- Zheng, M., Gao, Y., Wang, G., Song, G., Liu, S., Sun, D., Xu, Y., Tian, Z., 2020. Functional exhaustion of antiviral lymphocytes in COVID-19 patients. Cell. Mol. Immunol. 7–9. https://doi.org/10.1038/s41423-020-0402-2
- Abdelrahman, Z., Li, M., Wang, X., 2020. Comparative Review of SARS-CoV-2, SARS-CoV, MERS-CoV, and Influenza A Respiratory Viruses
- https://doi.org/10.3389/fimmu.2020.552909
- Bhatia, S.K.& R., 2020. Impact of COVID-19 pandemic on health system & Sustainable Development Goal 3 395–399. https://doi.org/10.4103/ijmr.IJMR
- Chetterje, P., 2020. Gaps in India's preparedness for COVID-19 control. Lancet. Infect. Dis. 20, 544. https://doi.org/10.1016/S1473-3099(20)30300-5
- From, T.W.O.L., Wave, T.H.E.F., 2020. AJPH COVID-19 INTERNATIONAL FORUM Learning From COVID-19: Prevention Is a Strategic Principle, Not an Option 110, 1803–1804.
- Garg, S., Bhatnagar, N., Singh, M.M., Borle, A., Raina, S.K., Kumar, R., Galwankar, S., 2020. Strengthening public healthcare systems in India; Learning lessons in COVID - 19 pandemic 7–11. https://doi.org/10.4103/jfmpc.jfmpc
- Gopichandran, V., 2020. COVID-19 Pandemic: A Litmus Test of Trust in the Health System 213–221.

- Konwar, A.N., Borse, V., 2020. Current status of point-of-care diagnostic devices in the Indian healthcare system with an update on COVID-19 pandemic. Sensors Int. 1, 100015. https://doi.org/10.1016/j.sintl.2020.100015
- Singh, A., Deedwania, P., Vinay, K., 2020. Is India' s Health Care Infrastructure Sufficient for Handling COVID 19 Pandemic? 1–4. https://doi.org/10.23937/2643-4512/1710041
- Subba, S.H., Pradhan, S.K., Sahoo, B.K., 2021. Empowering primary healthcare institutions against COVID - 19 pandemic: A health system - based approach. https://doi.org/10.4103/jfmpc.jfmpc
- Thome, B., Ph, D., Parker, M., Ph, D., Glickman, A., Zhang, C., Boyle, C., Smith, M., Ph, D., Phillips, J.P., 2020. Sounding Board Fair Allocation of Scarce Medical Resources in the Time of Covid-19 2049–2055.
- Agostino, D., Arnaboldi, M., Lampis, A., 2020. Italian state museums during the COVID-19 crisis: from onsite closure to online openness. Museum Manag. Curatorsh. 35, 362–372. https://doi.org/10.1080/09647775.2020.1790029
- Covid-, T., There, I., Covid-, T., 2020. Journal of Business Research 117, 284–289. https://doi.org/10.1016/j.jbusres.2020.06.008
- https://www.indiatoday.in/coronavirus-outbreak/story/24-patients-covid-positive-die-oxygen-shortage-karnataka-chamarajanagar-hospital-1798302-2021-05-03
- https://www.nytimes.com/2021/06/28/world/asia/india-coronavirus-oxygen.html
- https://blogs.worldbank.org/voices/how-make-india-pandemic-proof
- https://www.brookings.edu/articles/6-priorities-for-future-research-into-covid-19-and-its-effects-on-early-learning/

- https://www.sciencedirect.com/science/article/pii/S1078817421000845#sec7
- https://www.mayoclinic.org/diseases-conditions/coronavirus/symptoms-causes/syc-20479963
- https://library.sacredheart.edu/c.php?g=29803&p=185919
- https://www.sciencedirect.com/topics/computer-science/data-collection-procedure
- Aman, F., Masood, S., 2020. EFSA Panel on Dietetic Products, Nutrition and Allergies (NDA). Guidance on the scientific requirements for health claims related to the immune system, the gastrointestinal tract and defence against pathogenic microorganisms. Efsa J 2016; 14:4369. Pakistan J. Med. Sci. 36, 121–123.
- Roy, A., Singh, A.K., Mishra, S., Chinnadurai, A., Mitra, A., Bakshi, O., 2021. Mental health implications of COVID-19 pandemic and its response in India. Int. J. Soc. Psychiatry 67, 587–600. https://doi.org/10.1177/0020764020950769
- Aman, F., Masood, S., 2020. EFSA Panel on Dietetic Products, Nutrition and Allergies (NDA). Guidance on the scientific requirements for health claims related to the immune system, the gastrointestinal tract and defence against pathogenic microorganisms. Efsa J 2016; 14:4369. Pakistan J. Med. Sci. 36, 121–123.
- Zamora-Ledezma, C., Clavijo, D.F.C., Medina, E., Sinche, F., Vispo, N.S., Dahoumane, S.A., Alexis, F., 2020. Biomedical science to tackle the COVID-19 pandemic: Current status and future perspectives. Molecules. https://doi.org/10.3390/molecules25204620
- WHO, 2020. Rational use of personal protective equipment for COVID-19 and considerations during severe shortages: interim guidance, 23 December 2020. World Health Organisation.

- Zarei, L., Shahabi, S., Sadati, A.K., Tabrizi, R., Heydari, S.T., Lankarani, K.B., 2021. Expectations of citizens from the government in response to COVID-19 pandemic: a cross-sectional study in Iran. BMC Public Health 21, 1–11. https://doi.org/10.1186/s12889-021-10722-y
- Onigbogi, O.O., 2019. Family Medicine and Primary Care women 8, 5892–5895. https://doi.org/10.4103/jfmpc.jfmpc
- Gupta, A., Banerjee, S., Das, S., 2020. Significance of geographical factors to the COVID-19 outbreak in India. Model. Earth Syst. Environ. 6, 2645–2653. https://doi.org/10.1007/s40808-020-00838-2
- Dalziel, B.D., Kissler, S., Gog, J.R., Viboud, C., Bjørnstad, O.N., Metcalf, C.J.E., Grenfell, B.T., 2018. Urbanization and humidity shape the intensity of influenza epidemics in U.S. cities. Science (80-.). 362, 75–79. https://doi.org/10.1126/science.aat6030