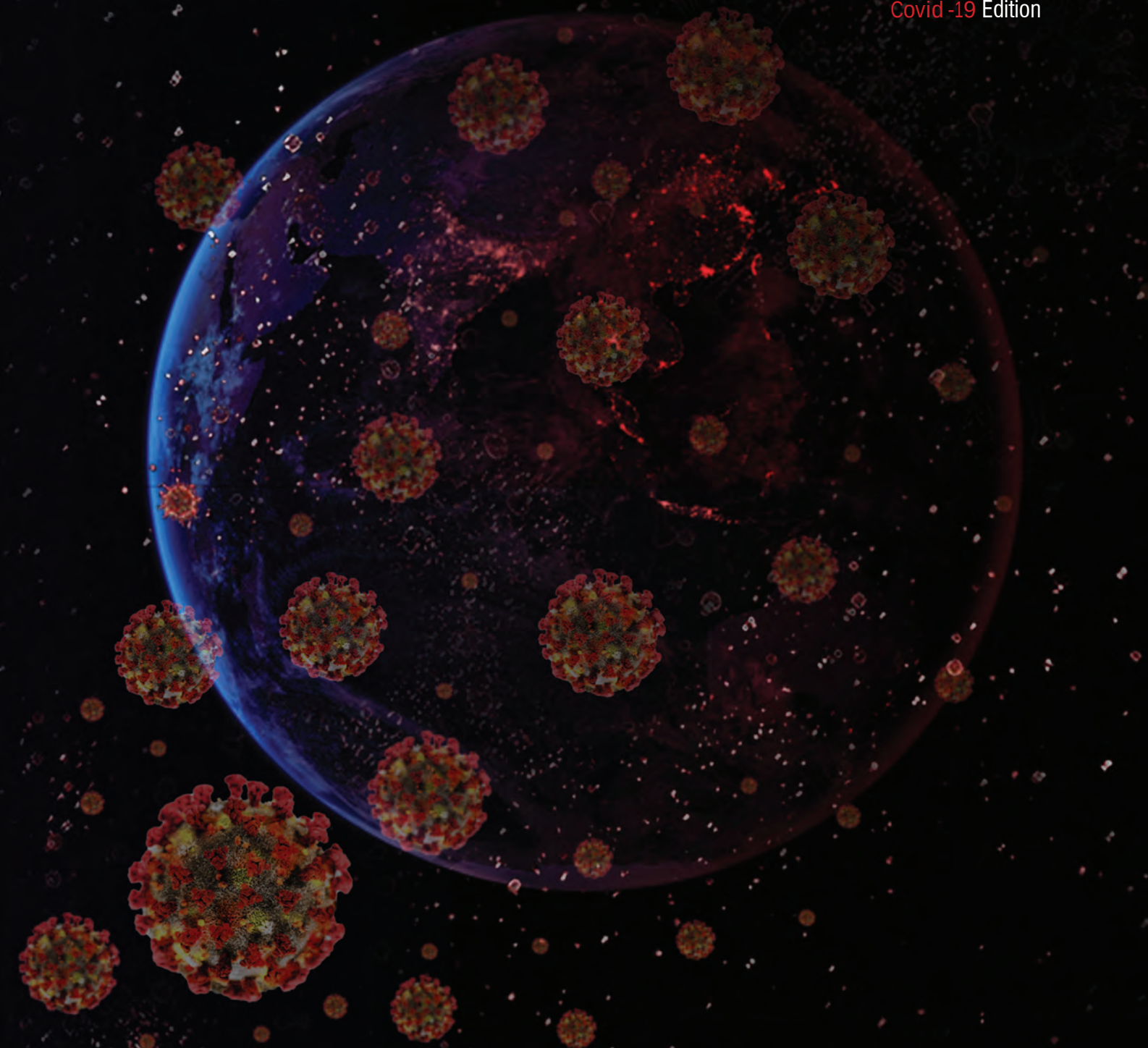
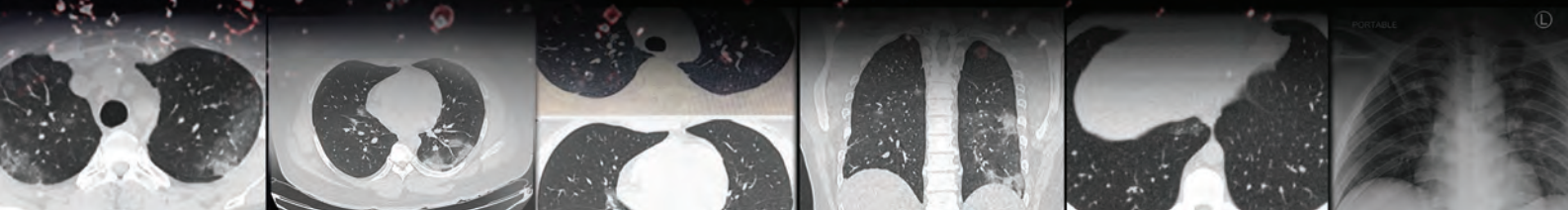
KIMSHEALTH™

# Scientific Proceedings

Covid -19 Edition





## Accreditations

- ACHSI (Australian Council on Healthcare Standards International)
  KIMS got ACHSI accreditation in the year 2006 for demonstrating continuous improvements in patient safety and delivery of quality healthcare that is at par with international standards.
- NABH (National Accreditation Board for Hospitals & Healthcare Providers - India)
  KIMS received NABH in the year 2006 as a recognition of its commitment to ensure safe healthcare practices and infection control measures.
- NABL (National Accreditation Board for Testing & Calibration Laboratories)
  The Laboratory at KIMS is accredited by NABL in the year 2008, for ensuring precise diagnosis and following safe practices.
- NABH (National Accreditation Board for Hospitals & Healthcare Providers - India)
  KIMS Blood Bank is accredited by NABH in the year 2011, as recognition of its commitment to make safe blood and blood products easily available at the hour of need by adhering to modern techniques and quality standards.
- KIMS is certified with nursing excellence by NABH in the year 2015, as a recognition of its commitment towards safe and ethical nursing care.
- NABH Medical imaging services is awarded in the year 2016 for its outstanding contribution to sound and ethical radio diagnostics practices.

## Recognitions

- Workplace Assessment for Safety and Hygiene (WASH) Award by Quality Council of India 2020
- Association of Healthcare Providers of India(AHPI) Quality beyond Accreditation Award 2019
- Economic Times National Best Healthcare Brand Award 2019
- Scroll of Honour for Teaching and Clinical Excellence NBE accredited hospital 2018.
  National Award from the Association of National Board Accredited Institutions(ANBAI) & National Board of Examinations (NBE)
- Best Hospital IT Project Award 2017.
- Australian Council on Healthcare Standards International Medal for outstanding contribution at an international level to improving quality and safety in health service.
- NIB Awards 2016 for House Journal - Best Content
- Golden Peacock National Quality Award 2014 in Healthcare Sector.
- Best Service Provider Award 2014 from Star Health and Allied Insurance Company Ltd.
- Golden Peacock International Business Excellence Award for the year 2013 initiated by Institute of Directors, United Kingdom.
- Commendation Certificate of Kerala State Government for energy conservation for the year 2012.
- TRIMA CSR award 2012, for excellence in CSR Activities undertaken for the financial years 2010-2011 and 2011-2012.
- Dr. Prathap C Reddy Safe Care award for Best Medication Safety Initiative 2011.
- Avaya Global Connect Customer responsiveness Award 2010.
- South Asian Federation of Accountants (SAFA) award for best presented accounts and corporate governance disclosure.
- A – stable rating by CRISIL for best financial reporting in the year 2008.
- Hospital Management Asia (HMA) Award for the Project Musculo skeletal injuries in 2009.
- AV Gandhi Memorial Award 2007 and 2008 for excellence in Cardiology.
- Award for transparency in financial reporting in the year 2005 and 2008.
- Best Power User Award by Cyber India Online for optimal power utilisation in the healthcare industry in India in 2004.
- Kerala State Pollution Control Board Award for biomedical waste management in 2004 & 2006.
- Health Tourism Award 2005 for maximum foreign exchange earnings.
- Best Customer Site Award from HCL Infosystems Ltd.
- Regional ACLS Training Center by American Heart Association.

KIMSHEALTH

# Scientific Proceedings

Issue Twelve

**KIMSHEALTH**
PB No. 1, Anayara P.O.
Trivandrum - 695 029
Phone : +91 471 294 1000 / 2941400

Acknowledgements

**Departments**

Infectious Diseases and Infection Control

Psychiatry and Behavioral Medicine

Internal Medicine

Paediatrics

Laboratory Medicine

Anaesthesiology

Nursing

Imaging and Interventional Radiology

Respiratory Medicine

Critical Care Medicine

Ophthalmology

Clinical Engineering

College of Nursing

## Editorial

2020 began with new hopes, great expectations and on high spirits. But COVID-19 has affected the world in ways that none of us could have imagined. The challenges confronting the world due to the unprecedented corona virus pandemic has increased manifold in the last six months. The world still grapples with the health and humanitarian crisis unleashed by the pandemic. Innumerable lives were lost and the global economy has been profoundly affected.

The main obstacles in managing this pandemic is the high infectivity, which spreads the infection very fast, involving large numbers of the population. Providing protective equipments like PPEs, sanitizers and masks involve lot of money. We need to screen more individuals and the community spread makes this very difficult. The ways to contain this enemy is by strictly following preventive measures like social distancing wearing masks and hand sanitizing. We have to resume our regular work to uplift the already sinking economy. Currently all eyes are on the development of a vaccine to provide protection. We must specially thank the medical personnel, law and order administrators and social organizations for their untiring work.

It is with a desire to help others and provide guidance during this pandemic, which led us to dedicate an entire special edition of KIMS Scientific Proceedings to Covid-19. This edition begins with an article by Dr. M I Sahadulla, Group Chairman and Managing Director which highlights critically important topics including the transition to telehealth visits, changes in clinical practice, the financial impacts on the healthcare industry, and how it has affected us all. It provides insights into how the post-COVID world may have improvements that are far-reaching. This edition also discusses the challenges in the development of a vaccine. The pandemic is not only about the disease, but also about the psychosocial impact and how this is to be managed. The challenges of the clinical engineering team is highlighted. Finally a lot of appreciation on our behalf and some dedicated pages for our nursing department who continue to do a remarkable job. Their inhouse research on the various dimensions of the pandemic from a clinical and public perspective is included.

KIMS Infection Control Department has been strictly following international scientific norms for prevention and control of this infection. We have been using Telemedicine effectively in all departments. Social stigma, fear, anxiety, depression and so on have to be addressed, while treating the disease. Especially elderly patients with co-morbidities need special attention. Our clinicians, the nursing, the security team and those involved; all are heroic warriors in this fight.

We pray, that mankind acquires the strength and will to tide over this crisis. Near and far cries for a vaccine is in the air. Let us hope for a breakthrough in the near future.

It is our sincere wish that this special edition provides clear, concise guidelines that will help us all navigate safely through this unprecedented scenario. We would like to specifically thank the authors of these articles for working rapidly to contribute the articles and case reports during this crisis.

We hope that you all are safe, healthy, and come out on the other side of this pandemic even stronger than before. Best wishes to you, your families, teams and patients during this difficult time.

The Editorial Board

# CONTENTS

KIMSHEALTH
Scientific Proceedings

For feedback and suggestions mail to:
kimsproceedings@kimsglobal.com
9048080800

Articles

Covid -19 Edition

# Administrative Challenges in COVID-19 – A KIMSHEALTH Perspective

Dr. M I Sahadulla
Group Chairman & Managing Director

The COVID 19 pandemic has disrupted the lives of almost the entire human race on the face of earth. Having started in Wuhan, China in December 2019, it has spread to almost all countries in the world. It is interesting to note that this invisible and invincible disease has affected the mankind irrespective of gender, cast, creed, economic disparities and racial discrimination. The effect of this pandemic is being felt across the entire healthcare industry, heralding the onset of clear and irreversible changes to come. The public and private healthcare systems are fighting an uphill battle against a largely unknown enemy, while also coping with lack of adequate personnel and resources.

This dramatic period we are going through requires the courage to change. Those who work in the health sector have to rethink the architectural models. Governance of the health system has to take into account the need of less fragmentation and the realization that any spending reviews for the health sector should be designed and envisaged in restarting the economy. This time we have to move in a sustainable way, with prevention and preparedness as goals in addition to an economic development focused on respecting people, community and environment and this way we should take advantage of a dramatic crisis. As noted above the impact of this crisis could be classified as related to:

Healthcare
Governance
Economy

The governance and management challenges need to be considered the most crucial for every organization during this crisis period. It indeed took a few weeks even for the most educated and informed people to realize the horror of the pandemic. Even WHO knowingly or unknowingly has been groping in the dark to provide any plausible explanation for the outbreak as well as its spread across the continents.

One is not sure who promoted the idea of lockdown but it caught the imagination of all the global leaders and all the countries started following it with their own ideas not understanding what exactly to be done during that time or what are the real objectives of the process or a uniform methodology. At best one could consider it as a social vaccine in curbing this tactical war. Therefore, it is difficult to gauge what the lockdown did to the disease evolution worldwide and to the global economy, only time would tell. But certainly, in the initial period it gave time for many governments to face and phase the crisis in terms of material movements and logistics.

International agencies like WHO brought in many ideas to contain the disease but a uniform model never evolved. Therefore, many governments made their own decisions and applied corrections as they went along making slip-ups resulting in loss of lives and livelihood.

The first case in India was reported in Kerala on 30th Jan 2020 and the Government of Kerala was very proactive in declaring a state medical emergency though it was criticized by many. KIMSHEALTH as an organization realized in the early period itself that proper planning and collaborative effort perhaps would bring in the best dividend. The gravity of the matter was taken seriously and a consolidated effort made to bring in awareness among all the staff which got them involved in the

process. The first effort in this regard was the formation of CCMT (COVID Crisis Management Team) in early March consisting of Medical and Infectious Diseases experts, Senior Administrators as well as the Nursing and supporting teams to prepare our main hospital at Trivandrum. Daily meetings of the CCMT helped to design a plan for the safety of the healthcare workers and the guests visiting the hospital.

An exclusive website was created, "KIMS Covid.com" to provide information congregated and to make guidelines to approach the issues on a day-to-day basis fully comprehending the directives of the State and Central Governments. This committee was empowered to cut across all the in-house bureaucracies and get things done at a faster pace.

Consequently, the realization daunted that there is a need to change and adjust to these times, adapting and augmenting newer mechanisms to service delivery while navigating the financial and operational challenges. Individually also the mind set and adoption of newer choices was considered equally important realizing that only those businesses which are able to manage these impacts could emerge stronger using the best of available opportunities. In this context, a concrete Post-COVID exit plan along with revival strategies, both short and long term to get hospital services to normal was planned. In retrospect this may seem too early when the disease itself is not showing any sign of abatement. The major impacted areas were and continue to be:

Reduction in OP and IP to 30% and 40% since middle of March

Decline in medical value travel

Continued neglect of private healthcare by the State and Central Governments.

Failure to recognize healthcare industry as one of the highest employers of the country

Working capital challenges

Manpower issues

Dealings with internal & external stakeholders in the new environment

New Projects and their expansion

Infrastructure changes

Brainstorming zoom sessions were initiated to draw ideas and action plans from international service providers like KPMG and E & Y as well as from among the KIMS Clinical and Management Teams.

**Governance Challenges**

- Implementation of new hygiene system for staff
- Procurement of consumables except emergency items
- Stocking of PPE and Anti COVID drugs
- Innovations and indigenous medical devices – untested
- Renewed of clinicians in medical administration
- Salary adjustments and redundancy
- Keeping the morale of the staff and doctors
- Liaison with the Government to support staff and the society.

**Debottleneck in Operations**

Strict adherence to Government regulations in COVID prevention

Extended OP timings to avoid crowding and patients seen only by appointment.

Identification of reserve staff to provide backup both clinical and nonclinical.

Consideration to the holistic risk profile of employees

Reorganization of infrastructure and design of clinical pathways

**Decentralized care**

Setting up an exclusive screening centre detached

from the main building with drive in facility for COVID testing.

Encouraging clinical engineering department to design and manufacture indigenous equipments for hospital use.

Use of audio-visual media for health awareness & promotion campaigns.

Planning Family Medicine clinics in various parts of the city.

**Digital & Technological initiatives**

Incorporation of digital technology through Telehealth, Telemedicine, Tele-Lab and second opinion consultations.

Organization of discussions, seminars, conferences organized through zoom

Setting up in house facilities for COVID Diagnostics and liaison with outside laboratories.

**Looking forward**

While the COVID pandemic has strained the healthcare system not only in India, but worldwide, the serious challenge that is round the corner is how will the healthcare models evolve once the pandemic dies down. There is no way hospitals can go back to functioning how they used to. A lot of changes will have to happen on the administrative and clinical levels to adapt to the paradigm shift that this pandemic has created.

Catering to COVID & non COVID patients with individual safety being of paramount importance.

- Establishing KIMS as a totally safe environment for the non COVID patients both for elective and emergency situations.

Initiating cost saving measures for patients by optimizing tests, investigations and procedures as well as minimum use of consumables and drugs.

Restructuring human resources based on lean management

Public Private-Partnership

Promoting loyalty programme for regular KIMS guests

Partnership with likeminded private hospitals as well as government hospitals with focus on quality of care

Improving patient experience with best outcome, least hospital stay and providing service with courtesy and compassion.

**Conclusion**

It has been a learning curve for all of us to float through this crisis. We need to be prepared to bounce back with resilience and determination and hope to “see light at the end of the tunnel”. All our efforts till date have been carried out with full cooperation and participation of the KIMS COVID Crisis Management Team and COVID Clinical Management Team and they deserve all the credit.

We are living in an era of uncertainty and this uncertainty, unfortunately is the new normal. The virus and the healthcare risks are part of the new normal that we are living and operating in. The COVID 19 virus has done something that all kinds of activism could not achieve. It has shown what it means to have cleaner air and a healthier environment. It has given a much-needed break to Mother Earth to repair herself from all the insults mankind had thrust upon her.

We are confident that with the abundance of trained talent and a commitment to hard work, we can make the best use of our innovative thinking and set up a thriving start up culture. KIMS leadership is determined to strategize, motivate and inspire our talents to go forth and claim our rightful place in the national healthcare stage.

Dr. M I Sahadulla, MD, FRCP (Ire), FRCP (Lon), MBA
Group Chairman & Managing Director
KIMSHEALTH

# When can we expect a specific drug for COVID-19?

Prof. Dr. C C Kartha
Senior Adviser, SOCOMER

More than six months have elapsed after the first report on a cluster of cases of pneumonia, whose cause was later identified as a novel corona virus (severe acute respiratory syndrome coronavirus 2 or SARS-CoV-2). The levels of spread and severity of the new disease named COVID-19, continue to be alarming in most parts of the world. An effective specific treatment for COVID-19 remains elusive despite concerted intensive efforts. Repurposing (adapting)drugs used for other diseases is our only hope in the short term. The new uses of an already approved drug used for a specific disease, are usually discovered by a happy accident or through a doctor's surmise that the drug may work for conditions other than the one it is approved for. Recently, complex tools using biological network analysis and artificial intelligence are being used to predict the potential usefulness of various drugs in current use, for COVID-19 repurposing.Anti-viral agents used for the treatment of human immune deficiency virus infection (HIV), infection by other corona viruses (SARS), infection by hepatitis C virus and influenza and a drug commonly used to treat malaria are being tested for SARS-CoV-2 infection.[1] Drug repurposing is not without demerits and challenges as the interaction between a drug and the human body is complex.

This article provides a historical perspective of drug discovery and the opportunities and challenges for identifying safe and efficacious drugs for COVID-19.

**Birth and Growth of Pharmacology**

Palaeopathology is the study of the history and manifestations of diseases in the prehistoric periods. Investigations in Paleopathology have revealed evidences for both infectious and non-infectious diseases contemporaneous with first indication of life on earth. Earliest human ancestors would have probably searched for the cause of illnesses in the actions of Gods, spirits, sun, moon, of thunder or lightning and explored the therapeutic value of prayers, light, heat, sun and water from various natural sources. Observing animals, they would have learned the curative benefits of certain plants.

Interestingly, plants defend themselves by synthesizing new toxins. Animals eating those plants have protected themselves from poisoning by plant derived toxins,by evolving new or modified enzymes to detoxify the toxins. These mechanisms have expanded in humans, into the evolution of enzymes which can metabolize drugs.

Early humans are likely to have noticed the effects of plant derived molecules through accidental experiences with roots, vines or barks of plants. They found some of them induce vomiting or sleep or lessen fever. The science of life or Ayurveda originated from the above knowledge. Interest in herbs as medicinal agents advanced considerably by 1500 BC. Eber's papyrus has references to herbs for medicinal use. Hippocrates (460-355 BC), considered the father of Modern Medicine made extensive use of medicinal herbs in his medical practice. Pedanius Dioscorides (AD 50), a physician of the Roman army during the time of Nero, in his documentations discussed the therapeutic uses of over 500 plants. Galenicals is a term used to denote crude mixtures of medicinal compounds of plant origin and it has its origin in the name of the famous Roman physician Claudius Galen (AD 130-200),who compiled many books on medical

subjects, including writings on about 400 plants. During the Roman period, the recorded information on herbals had grown significantly, though they were not essentially accurate. Much of these were lost following the decline of the Roman empire. However, during the Dark Ages (early Middle ages), the Arabs and several monastic orders in Europe took steps to preserve the knowledge on herbals.

The Greek systems of Medicine had a rebirth during the second half of the Middle Ages. New universities were founded. Be that as it may, medicines and treatments were still based on only religious or philosophical perspectives. Resentment to the doctrine of authority had a champion in Theophrastus Bombastus von Hohenheim, also known as Philippus Aureolus Paracelsus (1493- 1541), a professor at the University of Basle. Paracelsuswas a Swiss physician and also an alchemist (alchemy is the medieval forerunner of chemistry), theologian and philosopher of German Renaissance. Paracelsus emphasized the value of observation in combination with acquired wisdom. He perceived that physicians needed a sound knowledge in the natural sciences, especially chemistry. Paracelsus pioneered the use of chemicals and minerals in medicine and advocated the use of metals in the treatment of diseases. He is credited with aiding the use of mercury in the treatment for syphilis.He was thus a pioneer in the medical revolution of the Renaissance.

A deficiency of early herbal medicines was that the active ingredients of crude drugs were unknown and that the plant extracts were adulterated with other substances. Traditional medicine which varied among different cultures was hence later regarded to be pseudoscience.

Systematic studies on drugs and growth of the discipline as a branch of medicine commenced in the 17th century. The branch of medicine devoted to the study of drugs or theiractions is known as Pharmacology (derived from Greek, pharmakon, “drug, poison, -logia “study of”, “knowledge of). A drug can be natural or man-made, and is a molecule which exerts a biochemical or physiological effect on the cell, tissue, organ, or organism.

The birth date of pharmacology is unclear. Much of clinical pharmacology was established by the work of William Withering in the 18th century. Yet, even in early 19th century, many of the pharmacologic studies were done by physiologists. In 1809, François Magendie presented to the Paris Academy, his observations on the action of nux vomica (a strychnine-containing plant drug) on dogs. He had observed that the action of the drug was on the spinal cord. In1842, Claude Bernard discovered that curare, a poison used in arrows, interrupts the stimulation of muscle by nerves.According to Walter Sneader, the emergence of Pharmacology as a distinct science happened in 1847, when Rudolf Buchheim was appointed as a professor of Pharmacology at the University of Dorpat in Estonia. Buchheim turned the purely descriptive and empirical study of medicines into an experimental science. Buchheim’s student Oswald Schmiedeberg (1838–1921) is considered as the founder of modern pharmacology. The classic text, Outline of Pharmacology was published by him in 1878. Schmiedeberg had a great influence on the German pharmaceutical industry up to World War II.IN India, Col. Sir R. N. Chopra (1882-1973) is considered the father of Pharmacology in the country. He set up the experimental pharmacology laboratory in the Tropical School of Medicine in Kolkatta and strived to provide a scientific basis for the beneficial action of several herbals used in Ayurveda. His efforts led to the establishment of the first National Drug Research Institute (now known as CDRI – Central drug Research Institute) at Lucknow.

Pharmacological research was propelled by advances in tools to measure the responses of the body and organs to drugs and techniques to analyse the effects of the drugs on cells and molecules. Modern pharmacologists use techniques of diverse disciplines such as genetics, molecular biology, biochemistry and computational biology. These tools aid to transform information about mechanisms of drug action at the levels of cell and molecule into treatment directed against disease and or causative agents of diseases.

**Drug Discovery Cycle**

Drug discovery programs are devoted to identification of new drugs. Drug discovery starts with drug design, which is an inventive or innovative process. This involves the design of molecules that are similar or complementary in structure to a given target.For example, insights into the structure of the SARSCoV 2, ways of how the virus reproduces (replication) itself and the mechanisms of viral interaction with various cells in the human body can help in identifying potential targets for treatment of COVD 19. Presently, several promising targets have been identified. These include blocking SARS-CoV-2 entry into the host cell (blocking of spike protein), inhibiting molecules expressed in several types of cells in the lung and with which the virus docks, and enzymes in the host cell (proteases)which trigger fusion of the cell and viral membranes. There are other targets such as viral enzymes which process the protein which mediate the maturation of the non-structural proteins of the virus (an essential step in the replication of the virus).After a useful activity has been identified, many similar compounds called analogues are made, to try to maximize the desired medicinal effect(s).A slight change in the chemical structure of a medicinal compound can alter its medicinal properties, depending on how the change affects its relationship to the structure of the site on which it is intended to act.

The drug discovery cycle also involves several primary and secondary assessments in cells and animals. Studies are done to evaluate the harmful effects (toxicity), decipher transformation of the drug within the body (metabolism), drug availability after administration to animals (bioavailability) and the stability of the drug within the body. Alarge number of candidate drug compounds are assessed before identification of suitable compounds. After identification of a chemical molecule that has pharmacological or biological activity and is likely to be useful for treatment (a lead compound) there are further several steps to be taken before the drug can enter the market.

Potential undesirable effects of drugs are to be investigated (Safety pharmacology).The best form (tablet or injection or aerosol) for delivery to the desired organ system in the human body is also to be assessed. Pharmaceutical engineering is concerned with formulation, manufacturing and quality control of drugs.The cost and benefits of drugs are also to be evaluated (Pharmacoeconomics).

Any newly developed drug has to be evaluated for their effects on the outcomes of a diseasethrough Clinical Trials. The evaluations are done in people who volunteers to take part in studies to test the drugs.

The drug discovery process can thus take a few years or a decade or more and is considerably expensive as well. Out of every 5000 potential new medicines, typically only one is likely to reach the market.

**Drugs for COVID-19**

In a stimulating recent article in Frontiers in Pharmacology, John P Hussman discusses the cellular and molecular pathways of COVID-19 and potential targets for therapeutic intervention.[2] The proposed pathway is compatible with the known clinical features and pathophysiological mediators of the disease. The pathway consists of membrane fusion and cytoplasmic entry of SARS-CoV-2 virus into respiratory epithelial cells, including pulmonary type-II pneumocytes via ACE2 and TMPRSS2. An initial immune response is evoked and consists of inflammatory cytokine production as well as a weak interferon response.Membrane-bound immune receptor subtypes and downstream signalling pathways mediate differentiation of pathogenic T-cells and pro-inflammatory monocytes. This is accompanied by chemotaxis of monocyte-derived macrophages and neutrophils into the lung tissue. Damage to the endothelial barrier and capillary leakage leads to alveolar cell damage. Pulmonary thrombosis and cytokine storm result from the release of inflammatory cytokines, neutrophil apoptosis and NETosis. The proposed pathway provides several targets for investigation of potential therapeutic interventions.

Candidate interventions suggested are prophylactic measures to improve epithelial defense (e.g., AT1 receptor blockade, type III and type I interferons, melatonin, calcitriol, camostat, and lopinavir), and ways todecrease viral load (e.g., remdesivir, ivermectin, emetine, Abelson kinase inhibitors, dopamine D2 antagonists, and selective estrogen receptor modulators). Further options are modulating inflammatory signaling (e.g., dexamethasone, doxycycline, Ang1-7, estradiol, alpha blockers, and DHA/EPA, pasireotide), as well as inhibiting mediators of the maladaptive immune in COVID-19 (e.g., IL-6, TNF-a, IL-17, JAK, and CDK9).

Athri D Rathnayake and colleagues, in the first week of August reported a structure-guided development of a series of inhibitors of the coronavirus 3C-like protease (3CLpro), an enzyme essential for viral replication[3]. Their compounds have been found effective against several human coronaviruses including MERS-CoV, SARS-CoV and SARS-CoV-2 in an enzyme assay as well as in cell-based assays. Two of the compounds have antiviral effects against SARS-CoV-2 in cultured primary human airway epithelial cells. In a mouse model of MERS-CoV infection, a lead compound administered one day after virus infection was observed to reduce lung viral titres, pulmonary lesions and also increase survival from 0 to 100%. Their results indicate the potential of the compounds as broad-spectrum drugs against human coronaviruses.

In summary, discovery of a safe and efficacious drug and bringing it into clinical use is no easy task and involves tenacious efforts for many years. In the short-term, to blunt the effects of the COVID-19 pandemic, speedy clinical trials with repurposing of existing drugs is the choice available. In the long term, meticulous studies on already known viral proteins and host cell targets are warranted. A drug with broad spectrum activity against corona viruses and with acceptable safety would be ideal for long term clinical use.

Heartening, scientists at several Indian research institutes and Universities are in the pursuit of diagnostics, drugs and vaccines for COVID-19. Various funding agencies of the Government of India collectively have approved nearly 100 project proposals for these explorations. Let us wish good luck to all those engaged in these efforts and hope they have early success.

**References**

1. Khan Z,Karataş Y, Ceylan AF, Rahman H. COVID-19 and therapeutic drugs repurposing in hand: The need for collaborative efforts.Le Pharmacien Hospitalier et Clinicienhttps://doi.org/10.1016/j.phclin.2020.06.003
2. Hussman JP. Cellular and molecular pathways of COVID-19 and potential points of therapeutic intervention. Front Pharmacol29 July 2020;11:1169. https://doi.org/10.3389/fphar.2020.01169
3. Rathnayake AD, Zheng J, KimY, Perera KD, Mackin S, Meyerholz KD, Kashipathy MM, Battaile KP, Lovell S, Perlman S, Groutas WC, Chang KO. 3C-like protease inhibitors block coronavirus replication in vitro and improve survival in MERS-CoV-infected mice.Science Translational Medicine 03 Aug 2020:eabc5332. DOI: 10.1126/scitranslmed.abc5332

Prof. C C Kartha, MD, FRCP (London)
FAMS, FASc, FNASc, FICPath, FIACS
Senior Adviser
Society for Continuing Medical Education & Research (SOCOMER)
Clinical Research Division, KIMS Trivandrum
drkartha.cc@kimsglobal.com

# Infection control measures during COVID-19 pandemic

Dr. A Rajalakshmi

Department of Infectious Diseases and Infection Control

This pandemic has been challenging for all as what we think we knew yesterday may not be true today. The biggest debate in the recent years would be about the modes of transmission of SARS CoV2 and how does it matter in our practice?

Droplets are classically described as larger entities (>5 $\mu$m) that rapidly drop to the ground by force of gravity, typically within 3 to 6 feet of thesource person. Aerosols are smaller particles (<5 $\mu$m) that rapidly evaporate in the air, leaving behind droplet nuclei that are small enough and light enough to remain suspended in the air for hours. The dichotomy between droplet and airborne(small particles, aerosols or droplet nuclei) transmission is used in healthcare settings to help in choosing appropriate PPE. But in reality it is more of a continuum, are rarely absolutes in biological systems, people produce both droplets and aerosols, transmission may take place along a spectrum based on many factors- importantly activity of the patient, procedure done, ventilation of the indoor space.[1] Many respiratory viruses can remain suspended in closed poorly ventilated spaces. In outdoor areas air flows freely decreasing the possibility of breathing the same air. Indoors the number of air exchanges is important, more the better. Recognizing that SARS-CoV2 can also spread via small particles should not lead to panic but modify our behaviour in the community by avoiding crowded indoor settings, universal source control with face covering and maintaining physical distance. All these can be incorporated in hospitals to make hospitals a safe place.

It appears from current data that SARS CoV2 is not spread evenly among close contacts when there is a PPE breach, but varies depending on the duration and intensity of contact. The risk is highest among household members, in whom transmission rates range between 10% and 40% and these encounters are without mask.[2] Close but less sustained contact such as sharing a meal is associated with a secondary attack rate of about 7%, whereas passing interactions among people shopping is associated with a secondary attack rate of 0.6%.[2] What this means in practice for public is that keeping 6-feet apart from other people (most difficult of the measures), good quality cloth masks or face shields when it is not possible to be 6-feet apart, in addition to frequent hand hygiene should be adequate to minimize the spread of SARS-CoV-2. In healthcare setting in non-COVID areas, with ongoing community transmission, the important factors that decide the type of mask to be worn are aerosol generating procedure (AGP) and indoor ventilation. Face shield or eye protection are important for all close encounters with patient. Masking of patients can help to reduce infectious aerosol exposures to health-care workers, but not a substitute for other infection control measures.[2]

Filtering facepiece respirators (FFR) or the N95 mask is advised in healthcare setting in COVID isolation areas, in non-COVID areas for any AGP, for prolonged close patient contact in a poorly ventilated setting. Filtering facepiece respirators (N95 mask) are only as effective as their fit, as the weak point of these respirators is the face-mask leak.There is wide variability among filtering facepiece respirators, it may be of more benefit to wear a respirator model with good-fitting characteristics without fit testing

(but should perform the seal check which is mandatory after each time it is worn and ensure no air leak before entering the patient area) than to wear a respirator model with poor-fitting characteristics after passing a fit-test. So to make N95 use effective, training need to be given about seal check for all those who wear. As discussed below PPE is important to prevent infection transmission but occupies lower tier in the inverted pyramid because in involves compliance at the personal level and PPE breaches occur due to poor fit and human behaviour of removing it frequently.

Transmission of SARS CoV-2 through inanimate surfaces is not a major route, but instances where an infected person coughs or sneezes on the surface, and someone else touches that surface soon after are considered infectious.[3] Although periodically disinfecting surfaces is a reasonable precaution especially in hospitals, fomites that have not been in contact with an infected carrier for many hours do not pose a measurable risk of transmission especially in non-hospital settings. Most important measure would be performing hand hygiene frequently after touching high touch surfaces like phone, computer key boards, table and door knobs, and always before touching the face- an important measure to break the chain.

PPE are indicated for patient encountersbut it is not a stand-alone measure, highlighting the need for improved administrative controls, such as facilitate enhanced ventilation and other environmental control options likepatient isolation, surface and air disinfection, more

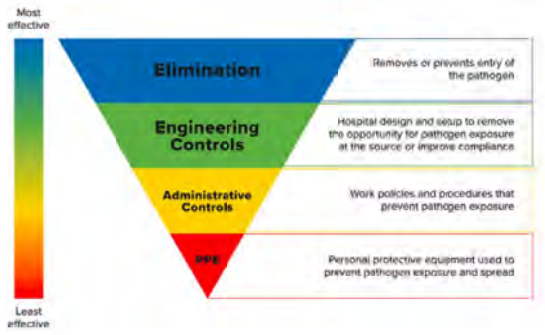



Fig. 1- Hierarchy of infection control in healthcare facilities

rapid diagnosis and patient isolation etc., The hierarchy of infection control in healthcare facilities is shown in Fig. 1. Administrative and engineering controls are by far the most important measures followed by PPE.[4]

What measures were taken in each step of infection control to prevent infection transmission in our hospital?

Elimination of sources of pathogen exposure involves physically removing (or preventing) the hazard (i.e., pathogen) from entering the facility. While elimination controls are the most effective at reducing hazards, they are often the most difficult to implement. The measures taken to implement this step are-

1. A triage questionnaire and temperature check at all entrances and referring those suspected to screening clinic or resuscitation ED.
2. Designated pathway for transport- those suspected or confirmed to have COVID-19 are taken in designated pathway to designated isolation unit in rooms or ICU away from general patients.
3. Teleconsultation for symptom check and follow up of patients.
4. Once suspected or diagnosed to have COVID, immediately reduce further risk by transporting to isolation area.
5. Primary contacts are traced and advised quarantine based on the exposure risk.

Engineering controls include measures designed into the facility to remove a hazard at its source or to improve compliance with infection control procedures. These measures can be highly effective but generally have higher initial costs. The measures taken in this regard are -

1. Screening clinic isolated from general OP.
2. Separate resuscitation ED and pathway.
3. Identified OR.
4. Identified high dependency unit with physical isolation and improved air exchange.

5. Identified critical care unit with improved air exchange in adult and paediatric units.
6. Identified isolation areas in labour and post-delivery care.
7. Donning and doffing area in all isolation units.
8. Innovation by clinical engineering team- basic ventilator, portable UV light disinfection unit, intubation hood, patient transport pod (with inputs from clinicians), UV disinfection rooms for N95 mask disinfection.
9. Improve ventilation in OP, ICUs by improving air exchanges.

Administrative controls include protocols or changes to work practices, policies, or procedures to keep patients or staff separated from a known hazard as well as providing staff with information, training, and supervision for these measures. Administrative controls address the way people work and move through the hospital (traffic flow) when an onsite infectious disease is known or suspected.

**The measures taken in our hospital are-**

1. Ensure physical distancing by adequate spacing of patients.
2. Reducing the work force crowd and work depending on unit demand, work from home - to limit exposure and have a reserve pool and save PPE resources.
3. Everyone wear mask – patient, HCW and all other staff.
4. Promote and provide measures for hand hygiene compliance.
5. Implementing policies to reduce the risk of COVID transmission in OR and all other high risk areas where AGP is done.
6. Have a safe work pool by self-reporting their illness, symptom tracker in respective units who check for symptoms in their department.
7. No meeting in groups- mostly converted to on-line meetings.
8. Educate, train HCW and public about infection control measures.
9. Frequent environmental cleaning -surface, floor and surrounding.
10. Accelerate diagnostics and thus help in deciding isolation or discontinuing isolation.
11. Develop management protocols and drug availability.
12. Encourage usage of stairs instead elevator, limit number of personnel in elevators.
13. Ensure ownership among HCW to identify and correct lapses in infection prevention practices.
14. Formulate templates, policies, practices and communicate to departments.

Personal protective equipment (PPE)- The use of PPE though is a very important measure, is considered a relatively less effective means of controlling exposures because it relies on human factors such as staff compliance and appropriate education and training. Although less effective, lower tiers (e.g., PPE) remain critical for effective infection control and should be used when indicated. The following are done in our hospital-

1. Availability of different forms of PPE as per exposure risk.
2. Train and audit appropriate PPE donning and doffing.
3. Re-use of N95 by UVGI.

**Conclusion**

Avoiding crowding by providing spacing, protocols for early identification and isolation of potentially infectious cases, increased air exchanges, PPE- all have important role to play. Debate centered on whether respirators or medical mask are needed should not distract us from the bigger challenges of administrative and engineering controls. At a personal level by following the 3 mantras- wearing a mask, hand hygiene and physical distancing, one shall consider their risk of exposure to COVID is low. Let us work on all possible measures to reduce the risk of transmission in our hospital setting.

**References**

1. Kevin P Fennelly. Particle sizes of infectious aerosols: implications for infection control. Lancet Respir Med 2020 / doi.org/10.1016/ S2213-2600(20)30323-4
2. Klompas M. Airborne Transmission of SARS-CoV-2 Theoretical Considerations and Available Evidence. JAMA. Published online July 13, 2020. doi:10.1001/ jama.2020.12458
3. Goldman E. Exaggerated risk of transmission of COVID-19 by fomites. Volume 20, Issue 8,P892-893, August 01, 2020
4. National Institute of Occupational Safety and Health (NIOSH), CDC

Dr. A Rajalakshmi
Senior Consultant in Infectious Diseases
Group Co-ordinator, Hospital Infection Control

## KIMS hospital protocol for the use of N95 respirators

Dr. Kalpana John
Dr. Anupama Kothari

Personal protective equipment (PPE) used for respiratory protection in a healthcare facility are either surgical masks or N95 respirators. Supply of N95 respirators can become depleted during wide-spread outbreaks of infectious respiratory illnesses e.g. COVID-19. Existing CDC guidelines recommend a combination of approaches to conserve supplies while safeguarding health care workers in such circumstances.[1] Based on these guidelines, a combination of approaches were implemented in our healthcare facility.

These were

1. Risk stratification of personnel for the use of respiratory protective PPE with priority to frontline workers.
2. A protocol to optimize N95 use.
3. Also assessed was the "burn rate" of N95 respirators to estimate the potential deficit, and decide how stringent the control of respirator use must be.

To optimize use of N95 respirators in such situations, CDC recommends practices for extended use/limited reuse of NIOSH-certified N95 respirators[2].

Extended use refers to the practice of wearing the same N95 respirator for repeated close contact encounters with several patients, without removing the respirator between patient encounters.

Reuse refers to the practice of using the same N95 respirator for multiple encounters with patients but removing it 'doffing' after each encounter. The respirator is stored in between encounters to be put on again 'donned' prior to the next encounter with a patient. Facility protocols dictate the number of reuses feasible, and so this is termed 'limited reuse'. For COVID-19, the potential danger in reuse of a respirator (if used without adequate days between uses) is the chance of transmission of the infective agent through contact. Keeping this in mind, we looked at methods to sterilize or decontaminate the respirators between uses.Another concern is that extended use and reuse per se can affect the fit of the respirator. Therefore a user seal check is mandatory each time the respirator is donned.

Many studies have evaluated methods for decontamination of respirators. Methods evaluated include ultraviolet germicidal irradiation (UVGI), ethylene oxide, hydrogen peroxide gas plasma, hydrogen peroxide vapor,

microwave-oven-generated steam, bleach. Some studies assessed microbial kill after processing, while others evaluated effects on filtration capacity. In April 2020, CDC published Crisis Standards of Care Decontamination Recommendations [3] for N95 respirators. It states that UVGI, vaporous hydrogen peroxide (VHP), and moist heat showed the most promise as potential methods to decontaminate FFR (filtering facepiece respirators).

Of the methods available in our facility, UVGI, ETO, autoclaving and plasma sterilization were considered. With limitations noted with ETO sterilization, plasma sterilization, and autoclaving, UVGI was the only feasible option. A UVGI chamber was set upusing a widely cited protocol[4] as reference.

After each UV treatment, the mask was examined under an optical microscope to detect damage in the non-woven layers and fibres. Optical microscopy results revealed minor damage to the masks after the first UVGI treatment. However, this did not affect the filtering properties of the mask. This process was repeated two more times. The masks were observed to be reusable after the second UVGI treatment.

**The protocol for N95 use is as follows**

- N95 respirators used for confirmed cases of COVID 19 is single use only.
- For all other areas and identified health care personnel (HCP), 2 N95 respirators is provided for one week (documented under their ID) and each can be reused 2 times after UVGI. It is essential to ensure a good seal each time a respirator is donned.

**Alternatively "wait and re-use" method [2] can be followed**

- Issue 5 respirators to each healthcare worker who may care for patients with suspected or confirmed COVID-19.
- The healthcare worker will wear one respirator each day and store it in separate breathable paper bag at the end of each shift. The order of FFR use should be repeated with a minimum of five days between each FFR use.
- The maximum number of times it can be reused is 5 or until damage whichever is earlier.[2]

Points to be noted are-

- Discard N95 respirators contaminated with blood, respiratory or nasal secretions, or other bodily fluids from patients.
- Consider use of a cleanable face shield (preferred) over an N95 respirator and/or other steps (e.g., masking patients, use of engineering controls), when feasible to reduce surface contamination of the respirator.
- Keep them in a clean, breathable container such as a paper bag, with name written on the mask and the paper cover- between uses. Clearly identified. Storage containers if used should be cleaned regularly.
- Clean hands with soap and water or an alcohol-based hand sanitizer before and after touching or adjusting the respirator (if necessary for comfort or to maintain fit).
- Avoid touching the inside of the respirator.

**References**

1. Strategies for optimizing the supply of N95 respirators during the COVID19 response- CDC
2. Recommended Guidance for Extended Use and Limited Reuse of N95 Filtering Facepiece Respirators in Healthcare Settings, CDC
3. Decontamination and Reuse of Filtering Facepiece Respirators, CDC
4. N95 Filtering Facemask Respirator Ultraviolet Germicidal Irradiation (UVGI) Process for Decontamination and Reuse, Lowe J et.al

Dr. Kalpana John
Registrar, Hospital Infection Control

Dr. Anupama Kothari
Consultant, Public Health

# Psychosocial impact of COVID-19 pandemic

Prof. Dr. K A Kumar

Department of Psychiatry and Behavioral Medicine

The COVID-19 pandemic, which originated in Wuhan in China in December 2019, and spread to countries and continents defying early predictions has emerged as one of the most catastrophic medical disasters in history of mankind. The demography, pathways of transmission, natural history, pathophysiology, and prognostic determinants of this disease remain yet to be delineated, clearly and convincingly. Absence of a prophylactic vaccine, presence of large number of asymptomatic, and therefore unidentifiable cases and nonspecific clinical manifestations make it a formidable public health challenge. The unpredictable, often abrupt, transition from the benign mild stages of the illness to serious catastrophic clinical stages make it a medical challenge, as well. In the larger community the public health challenge, and in the hospital settings the medical crises bring substantial psychosocial impact. The consequent emotional disturbances and behavioural disorders are augmenting and compounding the medical burden of disease, and complicating the preventive public health efforts.

## Introduction

Given the magnitude of dissemination of the disease, and uncertainties about its pathophysiology, clinical course and management strategies, the wide spectrum and prevalence of its psychosocial impact are hardly surprising Prospective and retrospective surveys and review articles on this are abundant in literature, and getting added day by day from across the world. The following is a comprehensive outline with accent on practical aspects, rather than a pedantic academic review.

The psychosocial impact of COVID-19 can occur in the following-

1. In the general population
   (a) Community at large
   (b) 'Worried well' individuals
   (c) Vulnerable Population
2. Exposed persons in Quarantine
3. Asymptomatic cases under observation
4. Clinical subjects in Treatment settings – Neuropsychiatric manifestations
5. In Health Care Workers (HCW)
   (a) Engaged in COVID-19 care
   (b) In general (noncovid) health care

It is customary to describe these disorders separately under each category of clinic and general populations, This would necessarily be a repetitive narrative, since many disorders involve population segments, patients, as well as care givers. For reasons of brevity a brief outline of these disorders in general is given below. Specific aspects and perception, as applied to each settings and category of individuals will be indicated in respective sections.

## Antecedents and Determinants

The spectrum of Psychosocial Impact of COVID-19 epidemic is wide ranging -- from direct neuropsychiatric manifestations of the disease per se on the one hand, to the non-organic emotional and behaviour disorders associated with the illness, and efforts and frustration in

containing its spread and ravages in the community. The former is confined to the minority of patients reaching the clinical horizon and appears in concert with disorders and dysfunction in other bodily organs and systems. These neuropsychiatric manifestations are possibly related to virus invasion to nervous system, cytokine activation, immune dysfunctions or other intrinsic pathophysiology of the illness involving nervous system. The nonorganic (loosely called 'functional') impact reaches out to clinical populations, Health Care Workers in the clinic and community, infected asymptomatic individuals, uninfected worrying persons and individuals put in isolation and quarantine.

Certain aspects of the epidemic predisposes individuals for developing these manifestations. The unfamiliarity of the pathogen and its transmission pattern, difficulty in identification of early signs of infection, social distancing, quarantine regulations, and stigma of infection throw large segments of population vulnerable to emotional and behaviour disorders. Individuals with pre-existing personality disorders, vulnerability, psychiatric disorders, physical diseases & disabilities and struggling with ongoing accumulative stresses in their lives are more vulnerable. Loss or deprivation of livelihoods, financial burden, unemployment, uncertainty about future employment and interpersonal stresses can augment the predisposition or actually precipate behaviour disorders. Persons who have been leading their lives precariously with marginal compensation of ongoing stresses, easily collapse under the impact of the pandemic.

Lack of definitive knowledge about the disease transmission and manifestations, perceived inability to identify the impending infection and inability to indentify asymptomatic cases cause anxiety, panic, phobia, helplessness, depression, compulsive hand washing or even delusion of having COVID-19 infection. Exposure to excessive and conflicting deluge of information in Mass Media and Social Media, seems more detrimental in this respect. Inconsistent, conflicting, and rapidly changing instructions from Public Health and Enforcement Agencies create disbelief, distress, revolt or even resignation -- all of which can cause emotional and behaviour disturbances. Stigma and social ostracism hurt patients, families, quarantined individuals and recovered patients (and even their family members).

**Profile of common psychological disorders**

**Fear and Anxiety**

Fear of infection is shared by 'the worried well' in general population, suspected contacts, and at risk population. Excessive and recurrent exposure to adverse reporting in the Media augments and sustains this. Many subjects start monitoring themselves, for loss of smell, taste, throat pain, cough, and breathlessness -- the symptoms they believe herald the Covid infection.

**Phobia**

Phobic Anxiety is an intense circumscribed anxiety about Covid infection, which results in avoidance behaviour to imagined exposure.

**Sleeplessness**

Disturbance of sleep is common, with sleep onset or continuation difficulties. Early Morning Awakening is one of the diagnostic feature of depressive disorder.

**Depression**

Feeling of sadness, despondency, helplessness, hopelessness, worthlessness, loss of self esteem and suicidal ideation are common.

**Panic**

Panic can occur in a setting of anxiety or depression. It can occur as an independent disorder also, without either of them.

**Suicide (DSH Ideas) attempts**

When Depression is deep, and anxiety and panic are intense suicide attempts can occur.

**Depersonalization**

A feeling of unreality about one's Self and Reality around him, constitutes Depersonalization. It is conceived as a defence against the torment of severe anxiety, depression or mental disintegration.

**Dissociation**

An unbearable psychological stress can cause a dissociation of the stream of consciousness. It can manifest as Amnesia, Somnambulism or Fugue. Conversion features can be added and get manifested as motor, sensory, sensory-motor manifestations. Psychogenic seizure is a common presentation.

**Obsessive Compulsive Disorder**

Repetive ideas of contamination, guilt or doubts of right of wrong can occur as obsessions and they can be accompanied by repeated acts of hand washing, rituals of cleaning, counting, checking etc (compulsions). The hand washing and sanitizer usage instructions can be over subscribed and carried out by an OCD patient, along with his other symptoms. Other compulsive symptoms also can occur.

Acute Stress Reaction and Post Traumatic Stress Disorder (PTSD)

Affront of psychological trauma can cause severe stress reactions, which include dissociative, depersonalization, flashback, and even psychotic features. When it manifests during stress it is called Acute Stress Reaction, and when it manifests later it is called PTSD. PTSD can cause severe behavioural disturbances.

**Psychoses**

Phobia of Covid infection can get transformed into an over-valued idea and then into a false belief that he has contracted Covid. This is Delusion, which is a feature of Psychosis. Mood disorder with hyperactivity, irritability and dysphoria can evolve into a Mania. A more drastic psychotic decompensation into a schizophrenia illness also is possible, though it is rare. These cases of psychoses are few, far between, and often occurs in predisposed individuals.

**Substance Abuse / Substance Dependence**

Psychological stress of any kind can augment Alcohol and Drug Abuse in an affected person, It can initiate Alcohol / Drug Abuse in a stressed individual; in vulnerable people this can progress into Dependence (Addiction)

**Apathy and Amotivation**

Ongoing stress can cause disinterest, apathy, amotivation (lack of motivation) and a state of callousness or 'numbness'. This can cause disruption in the work environment. When it happens in a HCW, the functioning of the clinical team gets adversely affected.

**Aggressive / Disruptive behaviour**

Certain vulnerable individuals switch over to external directed expression of their negative feelings in stressful situations. Argumentation, work disruptions, stubbornness, abusive speech, destructive actions – all these can occur.

When it happens to HCW in active work station it leads to major disruptive events. With confrontations or even without it, the HCW may walk out, throwing a resignation letter (or without it).

**Sexual deviance and disturbance**

Some individuals may resort to inappropriate expression of sexual behaviour, either in excess, in indiscretion, or in deviance. They are part of inappropriate maladaptive coping strategy to stressful situation, but can have serious consequences in work stations or social situations.

**General population perspectives**

Fighting an epidemic in the community is akin to fighting a forest fire. The intensive efforts unleashed in an extensive locality, surrounding the actual location of fire is often viewed with disbelief and denial by the residents there. 'The fire is out there, why should I suffer to fight it? – This attitude is common. The situation is exactly same when

an epidemic spreads. The initial response of individuals and human communities on the face of an epidemic often has features of disbelief, denial, dissent and discord.

The early response of many countries and governments were no different in the early months of 2020. Consequent attitude of denial and administrative inaction played a major role in interfering with early public health initiatives in many countries.

In the absence of a prophylactic vaccine, the only preventive measure available is to break the chain of transmission through social distancing and contact reduction. Lockdown involved significant deprivation in living patterns and practices of people. Social isolation deprive their livelihoods and supportive social substrate. Hand hygiene and respiratory hygiene regulations necessitated modification of behaviour and change of habits in a precipitous way. Confined to home, constrained to make habit changes, deprived in means of livelihood and subjected to restrictions on mobility and interactions, the individual felt a sense of alienation and dehumanization. Lockdown, extended repeatedly, created a sense of fatigue, exhaustion and despair. The uncertainty about the magnitude and duration of the epidemic and the enormity of its socio-economic consequences threaten the stability and functioning of minds of millions of the people. The wide spectrum and spread of psychological disturbances and behaviour disorders, originating from this altered state of existence emerges as a major community mental health pandemic, in tandem with the medical pandemic.

There are individuals in any population who over-read messages of risk and disaster and gets drifted into its psychological and behavioural consequences ('well worried'). They include many people who are identified as vulnerable (elderly, those with morbidities), but not confined to them. Anxiety, fear, depression and even delusional disorders are seen among them.

Contact cases, asymptomatic cases, and mild cases in Quarantine and Isolation.

Though institutional quarantine was favoured and prescribed earlier, it has given way to home quarantine. The duration of quarantine also has been brought down from 28 days to 7 – 14 days. These changes have reduced the psychological burden imposed by quarantine, but not mitigated it substantially. The reason lies in the intrinsic psychological characteristics and interpersonal needs of individuals, living in human societies.

**This psychological substrate is outlined below-**

The basic requirements and factors fulfilling a person's identity and well being are-

1. Competence

The ability to work properly and get fulfilled. For this there needs to be a work to do, a condition for working properly, the satisfaction in the work done.

('I work, therefore I am')

2. Autonomy

The ability and opportunity to decide one's course of action, out of free choice. A sense of autonomy is an essential requirement to feel self esteem.

('I will, therefore I am')

3. Connectedness

Man is a social 'animal', so to say. One's sense of worth and identity gets derived from, and defined by the interactions he makes with 'significant others' in life.

('I relate, therefore I am')

These three basic human needs are deprived to many people during lockdown period. They are drastically curtailed during quarantine. Those who are privileged to have Work From Home (WFH) choice with maintenance of income, the need for competence is taken care of; but for the large majority of individuals in unorganized employment sector, this psychological deprivation compounds their agony of financial deprivation. Autonomy is deprived to a large extend while in quarantine. As regards connectedness,

those who undergo quarantine (and lockdown) now with access to communication channels and social media are far more privileged than their counterparts during earlier epidemics. Being connected through telephony or social media can largely compensate for lack of actual contact, if used with discretion.

Home quarantine is mostly room quarantine. It can create a psychological feeling of oppression and suffocation to a person confined therein, as if the brick and mortar walls of the room are compressing him from all around. Lack of knowledge about the test protocol, and its implication, consequences of test results, uncertainity about the outcome, vagueness or inconsistencies about release- all these can cause anxiety and depression. A sense of helplessness and hopelessness is common in such a situation. The stigma attached to Covid-19 adds a sense of worthlessness as well. The triad of helplessness, hopelessness and worthlessness is the substrate of a depressive disorder. Ringel describes a Presuicidal syndrome, which has constriction of the mind, as its prime characteristic .

The constricted mental state of the maladjusted quarantine subject approximates the clinical triad of depressive disorder and presuicidal syndrome described by Ringel. It is not surprising that depression, anxiety and suicidal ideation are not uncommon in quarantine subjects.

**Prevention of psychosocial impact**

Just as in the case of pathophysiology and physical symptomatology disease prevention is better than cure in the case of its psychological impact also. The following aspects need attention.

1. Information : Balanced, optimum and lucid scientific information should be imparted to patients, families and HCW. Excessive exposure to distressing or conflicting information is detrimental. Excess news feed is to be avoided.
2. Social distancing should not lead to social isolation, loneliness or inertia. Phone, internet and social media should be used effectively and optimally.
3. Regularity of habits with respect to sleep, food intake, hygiene and self care, exercise.
4. Recreation on permitted lines.
5. Relationships

   Being connected with family members in a functionally viable way, and friends in a mutually supporting manner would go a long way in undoing stress of isolation and loneliness.
6. Hobbies and Interests

   Reading, music, watching movies, painting, handicrafts etc. would be helpful to tide over the difficult times.
7. Religion and Spirituality

   Depending on the personal belief and precious practice, prayer, meditation, yoga, mindfulness practices etc can be used.
8. One can learn to see mandatory restriction and deprivations in a broader social humanistic context. The quarantine one undergoes, is aimed at protecting one's family, dear ones and fellow human beings, valued by oneself. Such a line of thinking can help in inculcating an altruistic dimension in mind and enable to accept the negative experience gracefully.
9. Psychological First Aid (PFA)

   The widespread psychosocial adversities unleashed by casualties and devastation in World War I, brought attention to the need for preventive and interventional measures applied to them. Subsequent natural and man-made disasters brought more attention and efforts in this respect.

9.1. Work Schedule arrangements

Should be laid out with transparency, equity, relaxation, communication with family and friends, flexibility, team sense and feeling of sharing.

9.2. Environmental Modification

Changes in work environment can mitigate stress. Space and facilities for rest, relaxation, collective

sessions, communication with families and friends should be provided in work stations.

9.3. Preventive Primary Counselling

The components of primary preventive counselling are clear unambiguous information, clear instructions, transparency in public health and clinical procedures, sharing of experiences and encouraging supportive relationships.

Coping strategies differ from person to person. It depends on his personality, previous experiences and support from peer group and family among other antecedents.

**Management of psychosocial impact**

Once psychosocial adversities occur the affected person should be given rest, emotional support and thoughtful guidance to get out of a feeling of collapse. Communication with families and preferred friends, should be encouraged. Relaxation exercises, Yoga mindfulness, meditation all these can help in regaining tranquillity. Prayer and Spiritual practices, familiar and preferred by the individual also can be helpful.

**Professional Counselling**

When the emotional distress and behaviour persist or escalate despite the above efforts. Clinical counselling, on professional lines may become necessary and should be arranged. Supportive, re-educative and Client centered counselling can be helpful. Cognitive Behaviour Therapy (CBT) or focussed counselling on CBT principles can help. Behaviour Therapy and Biofeedback may help many individuals.

**Psychotropic medical management**

When panic, depression, depersonalization or psychotic states emerge, psychotropic medications in appropriate dosage would be necessary Consultation with psychiatrists is to be arranged.

**Integrated approach**

An integrated clinical management with psychotropic medication and appropriate counselling or psychotherapy can help most patients to come out of the difficult phase of their lives, unleashed by the epidemic.

**Psychosocial impact on health care workers (HCW)**

Disaster Medicine in general, and Epidemic Medicine in particular, throws up many challenges before the Clinician and other Health Care Workers. The unfamiliar pathophysiology and labile clinical presentation calls for novel strategies and adaptations in management. The focus of attention, range of perception, and act of interventions need constant revision, refinement and reorganization. The comfort emanating from Evidence Based Medicine or confidence gained from inputs from eminent experts are not available , since there is hardly any previous evidence, nor any eminent expert regarding this clinical entity. Apart from the challenges to the professional competence, and academic standing of the clinician, or skills and competence of his nursing staff, the psychological impact on either of them also can impinge on their performance.

All the manifestations of psychosocial impact outlined above can occur in the HCW, as in general population. However, being engaged in frontline combat with the infectious virus, the actual risk and perception of risk are high. Fear of infection to one's self, family members and other contact persons is correspondingly high. . Feeling of uncertainity about adequacy of PPE and other protective measures while in duty can torment the care givers. The stress of work and the unfamiliarity of clinical situations compound the fear and distress. The opportunity to de-stress oneself from the fatigue and distress in work, while in contact with family, is curtailed by restrictions in contact during duty off.

HCWs are more prone to depression, panic, mood disturbance and irritability. A sense of callousness, numbness and amotivation can evolve, causing serious deficiencies in performance. Irritability and acting out behaviour can cause dissonance, discord and, even disruptions in work station.

All these problems are more likely to surface when there is lack of transparency, consistency and sense of support and fraternity in the Team. The Team Leaders and Managers should ensure the flow of smooth and consistent communication, equity in duty assignments, patient hearing of apprehensions and grievances and extension of mitigatory measures. Individual and group sessions to ventilate these should be arranged. Work schedules may be modified without affecting the functioning system.

When such measures are not sufficient, consultation, counselling or management services from mental healthcare providers need to be availed.

The presence of a decompensated dysfunctioning HCW can threaten the functioning of frontline services and challenge the resources of the peers and team leaders. With empathy, genuine concern and patience, most of such situations can be defused and most of dysfunctioning individuals can be helped to recover.

**Non-COVID HCWS in the time of COVID**

Emotional disturbances and behaviour disorders can involve HCWs working in non-covid clinical settings during the time of an epidemic. They share the fear of impending risk of infection to self and family members, stress of work, adequacy of protection etc to variable degree.

**Conclusion**

The psychosocial impact of COVID-19 pandemic is extensive and varied, and involves various segments of general population, patients and Health Care Workers. These adverse emotional disturbances and behaviour disorders can complicate clinical management and add to the burden of disease. Inadequate, improper or inconsistent information about the infection, its prevention, clinical course and complications can predispose to the adverse impact. Social isolation, loneliness, loss of job and income, fear of infection to self and family members, and the stigma affect various segments of general population. In the clinical settings patient's physical morbidity gets compounded by emotional disturbance. Among the HCW these manifestations get accentuated by concerns about additional risk, uncertainity about efficiency of protective measures and adequacy of PPE, alienation from families and burden of work. A sensitive clinician or epidemiologist can perceive the compounding effects of psychosocial impact in clinical clients, and in general community respectively. A psychosocial pandemic augments, override and possibly would outlive the viral pandemic – so to say. Strategies to contain and resolve the former, would help to refine and reinforce the concerted public health and clinical interventions in the latter.

**References**

1. Ten weeks to crush the curve editorial. Harvey V Fineberg. N.Engl.J.Medcine Downloaded from nejm.org. on April 5, 2020 for personal use only
2. Psychiatric and Neuropsychiatric Manifestations of COVID-19 https://www/thelancet.com/journals/lanps/article/PIIS2215-0366(20)30203-0/fulltext
3. Mental Health in the times of COVID-19 Pandemic - Guidance for General Medical and Specialized Mental Health Care Settings –NIMHANS -- publication – April 2020
4. Mental Health and Coping during COVID-19 / CDC 1st July 2020
5. Mental health and psychosocial considerations during the COVID-19 outbreak WHO - April 2020
6. Focus on Mental Health During the Coronavirus (COVID-19) Pandemic : Learnings from the Past Outbreak K.Shah et al. 10.7759/cureus.7405
7. WebMD – Coronavirus Special
8. A review of pathophysiology and neuropsychiatric manifestation of COVID-19 M Jasti, K.Nallabelle, S. Onteddu JI of Neurology (2020) https://link.springer.com.article/10.1007/s00415-020-09950.
9. Epidemics, quarantine and mental health – ncbi.nim.nih.gov

10. The psychological impact of quarantine and how to reduce it : rapid review of the evidence – The Lancet https://www.thelancet.com/journals/lancet/article/PIIS0140-6736(20)30460-8/fulltext

11. Psychologic Effects of Quarantine During Coronavirus Outbreak

- What Health Care Providers Need to know
- Centre for the Study of Traumatic Stress

www.CSTS online.org

12. Fear and the Front Line S.L.Murray. N.Engl.J.Med 382 : 1784 – May 7 - 2020-08-11

13. A Shift on the Front Line Silvia Castelletti N.Engl.J.Med 2020 382: e83 June 4, 2020

14. Building your resilience : American Psychiatric Association https://www.apa.org/topics/resilience

15. Post Lockdown Lifting : Resumption of Hospital Services – Public Health Foundation of India – May 2020

16. Physician Burnout, Interrrupted Pamela Hartzband and Jerome Croopmes N.Engl.J.Med.2020 : 382 : 2485-87

17. Mental Health and the Covid-19 Pandemic B.Pfetterbaum and CS North N.Engl.J. Med 2020 : 385 510 – 512, Aug 6, 2020

Prof. Dr. K A Kumar, MD Psych. Med (NIMHANS)
Hon. Senior Consultant
Dept. of Psychiatry and Behavioral Medicine

# Completed randomised controlled clinical trials during the current COVID-19 pandemic

Prof. Dr. Mathew Thomas

Department of Internal Medicine

## Introduction

The whole world is stunned by the current pandemic of COVID-19 infection. Current situation caused by the pandemic is completely new for all of us in every walk of our lives. Only those world citizens above the age of hundred years and now alive could tell us their experience about a similar pandemic which occurred in 1919. For the scientific world the sad fact is that we do not still have many provedeffective drugs for treating this disease. Any drug should undergo at least a few randomised case controlled clinical trials to get an approval from regulatoryauthorities like FDA and other bodies like EU (European Union). Such trials are few regarding COVID-19 pandemic. It is well known that it is very difficult to undertake and conduct such a trial during this time for various reasons. Still there are a few such well conducted trials.This is a short review of such completed clinical trials with their results and the possible lessons from them.

**The recovery trial** (Randomised Evaluation of COVID-19 therapy)

This is a clinical trial done by researchers in the UK which has been recently concluded, and the results have been published. In UK and other parts of the world, only patients with serious findings like pneumonia, oxygen requirement and presence of other serious comorbidities are admitted to the hospital. This forms only 10 to 20% of the total patients who are test positive. But the case fatality rate of this group is between 20 and 30%. The drug used in this trial was dexamethasone in addition to many other drugs in different arms of the trial. Till now no treatment and therapeutic agents have been shown to reduce the mortality in this disease.

## Methods

The main inclusion criteria were-

1. The trial recruited only patients who were hospitalised and had laboratory confirmed SARS Cov-2 infection.
2. There should be no medical history that might in the opinion of the attending physician put the patient at substantial risk if they were to participate in the trial.
3. Initially the treatment was limited to patients who were above 18 years of age but later this age limit was removed.
4. Pregnant and breastfeeding women were included. This increased the power of the trial since all sections of patients were included.

Informed consent was taken from every patient. Eligible and consenting patients were assigned into a 2:1 ratio for randomisation to receive either the usual standard of care alone or the usual standard of care plus oral or intravenous dexamethasone. The dose of dexamethasone was 6 mg once a day for up to 10 days (or until hospital discharge if sooner). Patients were also randomised for the other suitable and available treatments that were evaluated in the trial (in the other arms of the trial).

A single online follow-up form was to be captured when the patients were discharged or had died or 28 days after randomisation which ever occurred first.

## The primary outcomes

The primary outcome was all cause mortality within 28 days after randomisation.

Further analyses were specified at six months.

**Secondary outcomes**

1. The time (number of days) for discharge from the hospital.
2. Among patients not receiving invasive mechanical intubation at the time of randomisation how many went on to require invasive mechanical ventilation later or had death.

**Results**

Of the 11,303 patients who underwent randomisation, a total of 9355 patients were eligible to receive dexamethasone. Of these patients, 6425 underwent randomisation toreceive either dexamethasone(2104) or usual care alone (4321) in the ratio of 2:1. The other patients 2930 (9355-6425) were assigned to receive other treatments (hydroxychloroquine,lopinavir/ritonavir, azithromycin, tocilizumab or convalescent plasma).At the time of randomisation,16% of the patients were receiving invasive mechanical ventilation, 60% oxygen only and 24% received neither.

Important results were:The mean age of the patients was 66+ -15 and 36% of the patients were female. History of diabetes was present in 24%, heart disease in 27%, chronic lung disease in 21% with 56% having at least one major coexisting illness recorded.

**Primary outcome**

1. Mortality at 28 days was significantly lower in the dexamethasone group than in the usual care group with deaths reported in 482 out of 2104 patients (22.9%) and in 1110 of 4321 patients (25.7%) respectively.(Rate ratio, 0.83; 95% confidence interval (CI) 0.75 to 0.93p value less than <0.001.
2. The incidence of death was lower in the dexamethasone group than in the usual care group among patients receiving invasive mechanical ventilation. (29.3% versus 41.4% rate ratio 0.64; 95% CI0.51 to 0.81).
3. The incidence of death was lower also in that thedexamethasone group among the patients receiving oxygen without mechanical ventilation when compared to the usual care group(23.3% versus 26.2% rate ratio, 0.82; 95% CI 0.72 to 0.94).

**Secondary outcomes**

1. Patients in the dexamethasone group had a shorter duration of hospitalisation than those in the usual care group.
2. Patients in the dexamethasone group had a great probability of discharge alive within 28 days.
3. Risk of progression to invasive mechanical ventilation was lower in the dexamethasone group than in the usual care group.

It is likely that the beneficial effect of glucocorticoids in severe viral respiratory infection is dependent on the selection of the right dose at the right time in the right patient.

High doses may be harmful. The timing of the corticosteroids after seven days (at the time of viral clearing and onset of immuno pathological elements-cytokines storm) is important.

This trial provides evidence that the treatment with dexamethasone at the dose of 6 mg once daily for up to 10 days reduces the 28-day mortality in patients with COVID-19 who are receiving respiratory support.

Remdesivir for the treatment of COVID-19 a preliminary report.

This was a double-blind randomised placebo controlled clinical trial of intravenous remdesivir, in adults hospitalised with COVID-19, with evidence of lower respiratory tract involvement. Patients were randomly assigned to receive either remdesivir (200 mg loading dose on day one followed by 100 mg daily for up to 9 additional days) or placebo for up to 10 days. The primary outcome was the time to recover as defined by either discharge from the hospital or hospitalisation for infection control purposes only. This study was led by US researchers.

1059 patients were randomised (538 assigned to remdesivir and 521 assigned to placebo). Those who received remdesivir had a median recovery time of 11 days (95% CI9-12) as compared with 15 days (95% CI 13-19) in those who received placebo(rate ratio for recovery 1.32; 95% CI 1.22- 1.55 p less than <0.001. Mortality by 14 days where 7.1% remdesivir and 11.9% with placebo (hazard ratio for death 0.70, 95% CI0.47 to 1.04).

Serious adverse events were reported for 114 of the 541 patients in the remdesivir group and 141 out of 522 patients in the placebo group who underwent randomisation.

It was concluded that remdesivir was superior to placebo in shortening the time to recovery in adults hospitalised with Covid19 and evidence of lower respiratory tract involvement.Remdesivir inhibits the viral RNA dependent RNA polymerasewith inhibitory activity against SARS-CoV and MERS CoV. So, it reduces the viral replication and the viral load.

This is another multi center, randomised, open label controlled clinical trial involving hospitalised patients with suspected or confirmed COVID-19 who were receiving either no supplemental oxygen or a maximum of 4 L per minute of supplemental oxygen. The patients were randomly assigned into 1:1:1 ratio to receive standard care, standard care plus hydroxychloroquine at the dose of 400 mg twice daily or standard care plus hydroxychloroquine 400 mg twice daily and azithromycin 500 mg once daily for seven days. The primary outcome was clinical status at 15 days as assessed by statistical methods. This study was done by researchers in Brazil.

667 patients were recruited, and they were randomised. Total of 217 patients were assignedto receive hydroxychloroquine plus azithromycin221 to receive hydroxychloroquine and 229 to receive standard care.

As compared with the standard care proportional odds of having the highest score on 7-point ordinal scale (which is an indicator of clinical status of 15 days) was not affected by either hydroxychloroquine alone or hydroxychloroquine plus azithromycin.Prolongation of the corrected QT interval and elevation of liver enzymes were more frequent in patients receiving hydroxychloroquine alone or with azithromycin than in those who are not receiving either agent.

It was concluded that among patients hospitalised with mild to moderate COVID-19 the use of hydroxychloroquine alone or with azithromycin did not improve clinical status at 15 days as compared with Standard care.

**Discussion**

Since the origin of COVID-19 in December 2019 many drugs were tried in the treatment of this disease without randomised clinical trials. There were so many logistical and other difficulties in conductingproper randomised clinical trials during a massive pandemic of this kind. Despite these varied problems some investigators slowly started doing randomised clinical trials in this setting. There are very important messages from the results of suchwell concluded randomised clinical trials. It has been shown that drugs like hydroxychloroquine and azithromycin which were extensively used are not likely to be useful in the treatment of this viral infection. The only two drugs useful are likely to be remdesivir and dexamethasone. We have learnt many aspects of this disease and still we are learning many more. COVID-19 infection probably has an early viremic phase in which there is active viral replication which mainly affects the lungs. This is followed by an immuno pathological phase where the damage is done more by the inflammatory process rather than by the virus itself. In the coming weeks and months, there should be more clinical trials which should sequentially use the drugs found to be effective by these clinical trials.It is prudent to use drugs like remdesivir in the initial phase of the disease to control the viral load. This may be sequentially followed by drugs like dexamethasone and tocilizumab to control the immuno modulatory phase of the disease. The timing of these sequential therapy should be studied in future

clinical trials. More effective and specific drugs in the second phase are necessary to prevent future sequela of Covid-19 in patients who have had moderate to severe infection.Randomised clinical trials will be the only answer for this also. Finally, the results of the ongoing randomised clinical trials of the vaccines will be soon available which are likely to relieve this Covid stricken world and bring it back to normal.

**References**

1. Horby P, Lim WS, EmbersonJ, Mafham M. et al. Dexamethosone in hospitalized patients with Covid-19 Preliminaryreport.N Engl J Med DOI:10.1056/NEJMoa 2021436
2. Beigel JH, Thomasheck KM, Dodd LE, et al.Remdesivir for the treatment of Covid-19-preliminary report. N Engl j Med DOI:1056/NEJMoa 2007764.
3. Cavalcanti AB, Zampieri FG, Rosa RG, et al. Hydroxychloroquine with or without azithromycin in mild-to-moderate Covid-19. N Engl J Med DOI: 1056/NEJMoa 2019014.

Prof. Dr. Mathew Thomas
Senior Consultant
Dept. of Internal Medicine

# Virology and Epidemiology

Dr. Sumi Saj
Dr. Gopinatha Menon

Department of Internal Medicine

## Introduction

A cluster of pneumonia cases cropped up in Wuhan, Hubei Province, China, towards the end of 2019 postulated to be caused by a novel coronavirus.

In February 2020, the WHO designated the disease as COVID-19 and the virus causing it as SARS-CoV-2[1]

## Virology

Coronaviruses are enveloped positive-stranded RNA viruses with crown-like spikes on their surface owing them their nomenclature. There are four main sub-groupings; alpha, beta, gamma, and delta.

Seven coronaviruses that can infect humans have thus far been identified: 229E (alpha coronavirus), NL63 (alpha coronavirus), OC43 (beta coronavirus), HKU1 (beta coronavirus), MERS-CoV (beta coronavirus causing Middle East Respiratory Syndrome), SARS-CoV (beta coronavirus causing severe acute respiratory syndrome) and SARS-CoV-2 (the novel coronavirus causing COVID-19)[2]

It appears that bats are the primary source for SARS-CoV-2. The host receptor for cell entry isangiotensin-converting enzyme2,aided by cellular protease TMPRSS2[3-5]

## Epidemiology

Geographic distribution: Globally, more than 22 million confirmed cases of COVID-19 have been reported, 3 million from India, and 50,000 so far from Kerala. This may be a gross underestimation as only a small fraction of infections are identified, diagnosed and reported. Cumulative incidence depends on population density, demographics, timing of mitigation strategies and extent of testing and reporting[6,7.]

**Transmission** It is safe to say the various modes of transmission is still uncertain.Initially in Wuhan it was believed to be spread from a seafood market that sold live animals[7] howeveras the epidemic progressed, person-to-person spread became the main mode.

*Person-to-person transmission:* The virus is released in respiratory secretions when a person with the infection coughs, sneezes, or talks. Droplets usually do not travel more than six feet. Infection is spread when these secretions reach a person's mucous membranes. This can be direct spread or if a person's contaminated hands are used to touch their eyes, nose, or mouth.

Much is yet to be ascertained about the other methods of transmission. Air-borne route is one which has been causing a great stir in recent times. A few studies identified viral RNA in ventilation systems and from air samples of infected patients however cultures for viable virus was negative.[8,13]

SARS-CoV-2 has also been detected in stool, blood, ocular secretions, and semen. Even after viral RNA could not be detected from upper respiratory specimens live virus has been cultured from stool[14,21]. The clinical implications of the above is unclear. There is no evidence yet that SARS-CoV-2 can be transmitted through contact with non-mucous membrane sites such as abraded skin.

## Viral shedding and period of infectiousness

SARS-CoV-2 can be transmitted prior to developing symptoms and throughout the illness, particularly early

on in the course. However, detection of viral RNA does not necessarily indicate the presence of infectious virus thus a prolonged viral RNA detection following resolution of illness does not necessarily indicate infectiousness[22,28]. Further data is required to confirm the clinical significance of the above.

The risk of transmission depends on exposure type, duration of exposure, use of preventive measures and individual factors (eg, the amount of virus in respiratory secretions). Most secondary contact cases have been found amongst household contacts, health care settings where personal protective equipment was not used and congregate settings like cruise ships and shelters. Outdoor settings are considered to be a lower risk for transmission than indoor[29,32].

**Environmental contamination**

Extensive SARS-CoV-2 contamination of environmental surfaces in hospital rooms of patients with COVID-19 has been described It is yet to be known how long SARS-CoV-2 can persist on surfaces however other coronaviruses may survive on inanimate surfaces for up to six to nine days[33,34].

Ethanol at concentrations between 62 and 71%, inactivated coronaviruses within one minute and simulated sunlight inactivated SARS-CoV-2 over the course of 15 to 20 minutes. The duration of viral persistence depends on the ambient temperature, humidityand size of the initial inoculum[35-39]

There is no evidence yet suggesting animals are a major source of infection in humans[40-43]

**Immunity and risk of reinfection**

Antibodies to the virus are induced in those who are infected but it is unknown whether all infected patients mount a protective immune response and how long the effect lasts.

Humoral immunity: A case series evaluating convalescent plasma for COVID-19 treatment identified neutralizing activity in plasma of recovered patients that appeared to be transferred to recipients following plasma infusion[44]

Animal studies have suggested that the immune response to infection offers some protection against reinfection, at least in the short term[44-48].

Cell-mediated immunity: Studies have also identified SARS-CoV-2-specific CD4 and CD8 T cell responses in patients who had recovered from COVID-19 and in individuals who had received an investigational SARS-CoV-2 vaccine, which suggest a lasting T cell immune response[49,50].

References:

World Health Organizationhttps://www.who.int/dg/speeches/detail/who-director-general-s-remarks-at-the-media-briefing-on-2019-ncov-on-11-february-2020

Wang W, Xu Y, Gao R, et al. Detection of SARS-CoV-2 in Different Types of Clinical Specimens. JAMA 2020.

COVID-19 Investigation Team. Clinical and virologic characteristics of the first 12 patients with coronavirus disease 2019 (COVID-19) in the United States. Nat Med 2020.

**References**

1. World Health Organizationhttps://www.who.int/dg/speeches/detail/who-director-general-s-remarks-at-the-media-briefing-on-2019-ncov-on-11-february-2020
2. Centres for Disease control and prevention
3. www.cdc.gov/coronavirus/2019-ncov/index
4. Perlman S. Another Decade, Another Coronavirus. N Engl J Med 2020.
5. Zhou P, Yang XL, Wang XG, et al. A pneumonia outbreak associated with a new coronavirus of probable bat origin. Nature 2020.
6. Hoffmann M, Kleine-Weber H, Schroeder S, et al. SARS-CoV-2 Cell Entry Depends on ACE2 and TMPRSS2 and Is Blocked by a Clinically Proven Protease Inhibitor. Cell 2020.

7. Centers for Disease Control and Prevention. Commercial Laboratory Seroprevalence Survey Data. https://www.cdc.gov/coronavirus/2019-ncov
8. World Health Organization. Novel coronavirus situation report -2. January 22, 2020.
9. Klompas M, Baker MA, Rhee C. Airborne Transmission of SARS-CoV-2: Theoretical Considerations and Available Evidence. JAMA 2020.
10. Van Doremalen N, Bushmaker T, Morris DH, et al. Aerosol and Surface Stability of SARS-CoV-2 as Compared with SARS-CoV-1. N Engl J Med 2020.
11. Ong SWX, Tan YK, Chia PY, et al. Air, Surface Environmental, and Personal Protective Equipment Contamination by Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) From a Symptomatic Patient. JAMA 2020.
12. Guo ZD, Wang ZY, Zhang SF, et al. Aerosol and Surface Distribution of Severe Acute Respiratory Syndrome Coronavirus 2 in Hospital Wards, Wuhan, China, 2020.
13. Liu Y, Ning Z, Chen Y, et al. Aerodynamic analysis of SARS-CoV-2 in two Wuhan hospitals. Nature 2020.
14. Zhou J, Otter JA, Price JR, et al. Investigating SARS-CoV-2 surface and air contamination in an acute healthcare setting during the peak of the COVID-19 pandemic in London. Clin Infect Dis 2020.
15. Chen W, Lan Y, Yuan X, et al. Detectable 2019-nCoV viral RNA in blood is a strong indicator for the further clinical severity. Emerg Microbes Infect 2020.
16. Wang W, Xu Y, Gao R, et al. Detection of SARS-CoV-2 in Different Types of Clinical Specimens. JAMA 2020.
17. Colavita F, Lapa D, Carletti F, et al. SARS-CoV-2 Isolation From Ocular Secretions of a Patient With COVID-19 in Italy With Prolonged Viral RNA Detection. Ann Intern Med 2020.
18. Cheung KS, Hung IFN, Chan PPY, et al. Gastrointestinal Manifestations of SARS-CoV-2 Infection and Virus Load in Fecal Samples From a Hong Kong Cohort: Systematic Review and Meta-analysis. Gastroenterology 2020.
19. Zheng S, Fan J, Yu F, et al. Viral load dynamics and disease severity in patients infected with SARS-CoV-2 in Zhejiang province, China, January-March 2020: retrospective cohort study. BMJ 2020.
20. Li D, Jin M, Bao P, et al. Clinical Characteristics and Results of Semen Tests Among Men With Coronavirus Disease 2019. JAMA Netw Open 2020.
21. Pham TD, Huang C, Wirz OF, et al. SARS-CoV-2 RNAemia in a Healthy Blood Donor 40 Days After Respiratory Illness Resolution. Ann Intern Med 2020.
22. Xiao F, Sun J, Xu Y, et al. Infectious SARS-CoV-2 in Feces of Patient with Severe COVID-19. Emerg Infect Dis 2020.
23. Zou L, Ruan F, Huang M, et al. SARS-CoV-2 Viral Load in Upper Respiratory Specimens of Infected Patients. N Engl J Med 2020.
24. To KK, Tsang OT, Leung WS, et al. Temporal profiles of viral load in posterior oropharyngeal saliva samples and serum antibody responses during infection by SARS-CoV-2: an observational cohort study. Lancet Infect Dis 2020.
25. Wölfel R, Corman VM, Guggemos W, et al. Virological assessment of hospitalized patients with COVID-2019. Nature 2020.
26. He X, Lau EHY, Wu P, et al. Temporal dynamics in viral shedding and transmissibility of COVID-19. Nat Med 2020.
27. COVID-19 Investigation Team. Clinical and virologic characteristics of the first 12 patients with coronavirus disease 2019 (COVID-19) in the United States. Nat Med 2020.
28. Cheng HY, Jian SW, Liu DP, et al. Contact Tracing Assessment of COVID-19 Transmission Dynamics in Taiwan and Risk at Different Exposure Periods Before and After Symptom Onset. JAMA Intern Med 2020.
29. Rothe C, Schunk M, Sothmann P, et al. Transmission of 2019-nCoV Infection from an Asymptomatic Contact in Germany. N Engl J Med 2020

30. Wang D, Hu B, Hu C, et al. Clinical Characteristics of 138 Hospitalized Patients With 2019 Novel Coronavirus-Infected Pneumonia in Wuhan, China. JAMA 2020.

31. Kakimoto K, Kamiya H, Yamagishi T, et al. Initial Investigation of Transmission of COVID-19 Among Crew Members During Quarantine of a Cruise Ship - Yokohama, Japan, February 2020. MMWR Morb Mortal Wkly Rep 2020.

32. Wallace M, Hagan L, Curran KG, et al. COVID-19 in Correctional and Detention Facilities - United States, February-April 2020. MMWR Morb Mortal Wkly Rep 2020.

33. Saloner B, Parish K, Ward JA, et al. COVID-19 Cases and Deaths in Federal and State Prisons. JAMA 2020.

34. van Doremalen N, Bushmaker T, Morris DH, et al. Aerosol and Surface Stability of SARS-CoV-2 as Compared with SARS-CoV-1. N Engl J Med 2020.

35. Ong SWX, Tan YK, Chia PY, et al. Air, Surface Environmental, and Personal Protective Equipment Contamination by Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) From a Symptomatic Patient. JAMA 2020.

36. Yung CF, Kam KQ, Wong MSY, et al. Environment and Personal Protective Equipment Tests for SARS-CoV-2 in the Isolation Room of an Infant With Infection. Ann Intern Med 2020.

37. Kampf G, Todt D, Pfaender S, Steinmann E. Persistence of coronaviruses on inanimate surfaces and their inactivation with biocidal agents. J Hosp Infect 2020.

38. Rabenau HF, Cinatl J, Morgenstern B, et al. Stability and inactivation of SARS coronavirus. Med Microbiol Immunol 2005.

39. Ratnesar-Shumate S, Williams G, Green B, et al. Simulated Sunlight Rapidly Inactivates SARS-CoV-2 on Surfaces. J Infect Dis 2020.

40. Otter JA, Donskey C, Yezli S, et al. Transmission of SARS and MERS coronaviruses and influenza virus in healthcare settings: the possible role of dry surface contamination. J Hosp Infect 2016.

41. World Organization for Animal Health. Questions and Answers on the 2019 Coronavirus Disease (COVID-19), section on Surveillance and events in animals.

42. Sit THC, Brackman CJ, Ip SM, et al. Infection of dogs with SARS-CoV-2. Nature 2020.

43. Newman A, Smith D, Ghai RR, et al. First Reported Cases of SARS-CoV-2 Infection in Companion Animals — New York, March–April 2020. MMWR Morb Mortal Wkly Rep 2020.

44. Shen C, Wang Z, Zhao F, et al. Treatment of 5 Critically Ill Patients With COVID-19 With Convalescent Plasma. JAMA 2020.

45. Chandrashekar A, Liu J, Martinot AJ, et al. SARS-CoV-2 infection protects against rechallenge in rhesus macaques. Science 2020.

46. Gao Q, Bao L, Mao H, et al. Development of an inactivated vaccine candidate for SARS-CoV-2. Science 2020.

47. Yu J, Tostanoski LH, Peter L, et al. DNA vaccine protection against SARS-CoV-2 in rhesus macaques. Science 2020.

48. Deng W, Bao L, Liu J, et al. Primary exposure to SARS-CoV-2 protects against reinfection in rhesus macaques. Science 2020.

49. Zhu FC, Li YH, Guan XH, et al. Safety, tolerability, and immunogenicity of a recombinant adenovirus type-5 vectored COVID-19 vaccine: a dose-escalation, open-label, non-randomised, first-in-human trial. Lancet 2020.

50. Grifoni A, Weiskopf D, Ramirez SI, et al. Targets of T cell responses to SARS-CoV-2 coronavirus in humans with COVID-19 disease and unexposed individuals. Cell 2020.

Dr. Sumi Saj
Registrar
Dept. of Internal Medicine

Dr. Gopinatha Menon
Co-ordinator & Senior Consultant
Dept. of Internal Medicine

# Covid experience in paediatrics

Dr. Prameela Joji
Dr. Neetu Gupta

Department of Paediatrics

Corona virus disease 2019 (COVID-19) is an illness caused by severe acute respiratory syndrome corona virus 2 (SARS-COV-2). Compared to adults relatively few cases have been seen in children so far. In China only about 2.4% of total cases occurred in those under 19 years of age. Similar trends have been observed in the United States, around 5 %.

Indian data is yet to be published but we are seeing an increase in the trend of children having paediatricinflammatory multisystem syndrome(PIMS) in various parts of the country. India has seen mortality in children especially in infants with comorbidities like congenital heart disease. Further studies are needed to identify risk factors for mortality in children.

Most cases in children are mild or asymptomatic and the treatment consists of supportive care alone. Children are important sources of infection for close contacts and health care workers, partly because they cannot follow the cough etiquettes. But children are mostly at home and this has helped in relieving them of the infections in this season.

We will share our experience in managing children with corona virus. All the kids we admitted had a parent or grandparent as the source. The reassuring fact is that majority of the children fall into asymptomatic or Cat A, with a few of them in Cat B. They were managed with Vit C,Zinc and other symptomatic management depending upon whether they had cold, cough and fever. Healthy food, relaxation games and most importantly the presence of parents or grandparents helped kids to be happy and for them it was like a family vacation.Only challenge we faced was when we admitted a six month old, as parents were extremely apprehensive and multiple sessions of initial counselling was needed. As the days went by we saw more of every child getting test positive, as community spread is at its peak.

Taking rounds and meeting my first patient, I was a bit apprehensive like any other person, but once I saw the little angel with parents, happily playing in mother's lap, I was happy. She was too young to know why she was admitted. On admission day we see the kids in the "zombie attire" (according to the kids), and the next day when you video call, kids are so happy and free to talk with us, as now they know that we are real. Over a period of ten days, a rapport is established and parents and children are moulded to face the new normal, boldly. A ten-year-old boy told me, I am fine doctor, I came here to see if my mom who is also covid positive, is regular with her food and medicines. So little angels are happy asymptomatics or mildlysymptomatic patients.

Why children are not suffering from severe disease? All over the world paediatricians are trying to figure it out. Few assumptions on the same by experts are,

- Decreased expression of the mediators necessary for the viral entry into the respiratory epithelium especially angiotensin converting enzyme 2 (ACE2 ) and transmembrane serine protease 2(TMPRSS2)
- Difference in immune system response like decreased neutrophil infiltration, decreased production of pro inflammatory cytokines etc.

- The developing lung in children may have a greater capacity to repair and recover after viral infections.

The natural history of the pandemic is the eventual waning of the transmission. This will occur after at least about of 50-60, possibly 70% of people had gone through the epidemic and developed immunity against the infection. Till such times, our priorities should be cocooning (reverse quarantine), the elderly and vulnerable subjectsand also restoring the confidence of health care workers so as to resuscitate the economy, save livelihood and lives. How health system is responding to such a formidable challenge, we have to wait and watch.

Dr. Prameela Joji
Consultant PICU & ER
Dept. of Paediatrics

Dr. Neetu Gupta
Consultant
Dept. of Paediatrics

# Laboratory diagnosis of COVID-19

Dr. Viji Mohan
Dr. Ratheesh R S
Dr. Muhammed Niyas

Department of Laboratory Medicine
Department of Infectious Diseases

## Introduction

Coronavirus disease 2019 (COVID-19) is an infection caused by the novel Coronavirus - Severe Acute Respiratory Coronavirus 2 (SARS-CoV-2). Laboratory diagnosis is essential forscreening, diagnosis, monitoring as well for epidemiological surveillance of SARS-CoV-2 infection.

Coronaviruses belong to the family Coronaviridae under order Nidovirales which includes four genera,

- Alphacoronavirus
- Betacoronavirus
- Deltacoronavirus and
- Gammacoronavirus

Coronaviruses are enveloped viruses containing a single non-segmented strand of positive-sense RNA genome. There are 7 corona viruses that can cause respiratory infections in humans – HCoV-229E, HCoV-HKU1, HCoV-NL63, HCoV-OC 43, SARS CoV, MERSCoV and SARS-CoV-2.[2]

SARS-CoV-2 is a beta-Corona virus belong to the subgenus Sarbecovirus, Orthocoronavirinae subfamily[2]. SARS-COV-2 genome encodes at least four structural proteins called nucleo-capsid (N), spikes (S), envelope (E), and membrane (M), respectively. The N protein holds the viral genome, while S protein mediates virus entry into the host cell and determines to a certain degree the host range during virus infection. S, E and M encodes the viral envelope.[2] Specimen Types and Collection Standard operating procedures must be adhered to while collecting, transporting as well as storing and disposal of the specimens

## Specimens

Appropriate specimen collection is the key step in the laboratory diagnosis of COVID-19.

Following are specimens for COVID-19 testing:

- Upper respiratory tract specimens
  - nasopharyngeal swab
  - oropharyngeal swab
  - throat swab
  - nasal swab
  - nasal wash/aspirate
- Lower respiratory specimens in patients with more severe respiratory disease such as:
  - sputum
  - bronchoalveolar lavage [BAL]
  - endotracheal aspirate [ET]

    *As the course of the disease progress lower respiratory samples are preferred[1]
- Other clinical samples
  - blood
  - stool
  - paired sera should be collected during acute and convalescent phase for retrospective study using serological assays (when available).
  - for post-mortem study, lung tissue for studying the pathophysiology of the disease.

For initial diagnostic testing for SARS CoV-2, CDC recommends collecting and testing an upper respiratory specimen. Swabs should be placed immediately into a sterile transport tube containing 2-3mL of viral transport medium (VTM)[4]

**3. Specimen collection and transport**

Appropriate specimens should be collected by well-trained healthcare provider with adequate PPE and must follow infection control measures including hand hygiene and adequate biosafety precautions. After collection specimen must be triple packed. Specimens should be transported to the laboratory as soon as possible under the cold chain maintenance of 2–8 °C.[4]

**4. Sample processing**

The processing of samples from clinically suspected cases must be done following appropriate biosafety measures. Biosafety level 2 laboratory is adequate for performing non-propagative molecular tests including the NAAT and point of care tests like genexpert and truenat. BSL 3 or above is required when procedures for propagation of virus like virus culture is needed.[4]

**5. Laboratory tests for SARS-CoV-2**

**Detection of sarscov 2 nucleic acid**

1. Nucleic Acid Amplification Test (NAAT)

1.Real time reverse transcription PCR [RT PCR] is a nucleic acid amplification test (NAAT) that detects unique genetic sequences of SARS cov 2 in specimens. These include genes encoding structural proteins, including envelope glycoproteins spike (S), envelope (E), transmembrane (M), helicase (Hel), and nucleocapsid (N).In addition to this, species-specific accessory genes that are required for viral replication like RNA-dependent RNA polymerase(RdRp), hemagglutinin-esterase (HE), and open reading frame 1a (ORF1a) and ORF1b are also tested. For the diagnosis of SARS-CoV-2, the CDC recommends two nucleocapsid protein targets (N1 and N2) while WHO recommends first-line screening followed by a confirmatory assay.WHO guideline recommend the use of RdRp,E,Nand S genes in different combination.

The choice of targeted genes varies with each country as well as with each kits. But as per WHO in areas with known SARS-CoV-2virus circulation, a single genetic target detection in the SARS COV 2 genome is sufficient for confirmation of diagnosis. The E gene is specific for all viruses in sarbecovirus sub genus which includes SARS COV 1, SARS COV 2 and related bat viruses. But the only sarbeco virus that currently circulates in human is SARS COV 2. And hence a positive result with e gene is enough for confirmation.

The detection of a single genetic target is confirmatory, but previous recommendation was detection of two different genetic targets for confirmation. In order to avoid potential cross-reaction with other endemic coronaviruses as well as potential genetic drift of SARS-CoV-2, at least two molecular targets/genes should be included in the assay.

Negative results must be combined with clinical observations, patient history, and epidemiological information. Negative results do not preclude SARS-CoV-2 infection and should not be used as the sole basis for patient management decisions.

A “positive” PCR result reflects only the detection of viral RNA and does not necessarily indicate presence of viable virus. The timeline of PCR positivity is different in specimens other than nasopharyngeal swab.

B. Point of care[POC] molecular assays-

A. Cartridge based nucleic acid amplification test CBNAAT Cepheid’s xpertxpress test is a rapid real time PCR tests used for the qualitative detection of SARS COV 2 in upper respiratory samples. Genexpert is an automated self enclosedsystem with sample preparation, nucleic acid extraction,amplification and detection of the target sequences occurring in a closed system i.e. the cartridge which contains RT PCR reagents and performs the RT PCR process in a self contained environment there by reducing the possibilities of cross contamination.[5]

The xpertxpressSARScov tests have two internal controls, i.e. the a sample processing control[SPC] and probe check control[PCC]. The controls ensure that with each reaction adequate sample is present and monitors the presence of potential PCR inhibitors. The controls also ensure that the PCR reaction conditions are achieved with each test.

Reports and its interpretations Xpertxpress targets two nucleic acids of SARS CoV 2- N2 gene and E gene.[5] SARS CoV 2 positive result is obtained when either both N2 and E gene are detected or when N2 gene alone is detected. Presumptive positive result means that only E gene is detected and negative means neither the target genes were detected. Invalid reports come if the control fails. Tests must be repeated in case of invalid reports. Repeat test can be done with the residual sample or with a fresh sample. Though the run time is 45 minutes, the genexpert system can process only few tests at a time. It is also costlier compared to other tests. Hence this is not a test of choice for surveillance purposes. This test is ideal for emergency cases like surgery.

B.Truenat test

Truenat test is a chip-based RT PCR test based on Taqman chemistry.It is used for the semi quantitative detection of Coronavirus RNAin human oropharyngeal and nasopharyngeal swab specimen.[6] Truenat has a screening test and a confirmatory test. The screening test called Truenat beta CoV is recommended for use asa first line screening test for COVID-19. Samples testing positive byTruenat beta CoV may be confirmed using confirmatory tests for SARSCoV 2. For the the screening test the target sequence is E gene and for confirmatory test it isRdRp gene

Specimens for truenat testing must be collected in VLM[ viral lysismedium] medium only. Collection of specimens in VLM has the advantagethat only minimal PPE is required for its processing.

**Results and interpretations**

If the E gene is detected it means the screening test is positive and this has to be confirmed using confirmatory test. If in confirmatory test RdRp is detected, it means sarscov 2 is detected. Positive reports gives the viral load as “high”, “medium”, “low” or “ very lowA number of factors could lead to a negative NAAT result in an infected individual, including:

- quality of the specimen – insufficient/poor
- timing of specimen collection-the specimen was collected late or very early in the infection.
- Type of specimen-BAL has the highest sensitivity.
- The specimen was not handled and transported appropriately (non-maintenance of cold chain).
- Technical reasons inherent in the test, e.g. virus mutation or PCR inhibition.

  If a negative result is obtained from a patient with a high index of suspicion for SARS-CoV-2 virus infection, additional specimens, including from the lower respiratory tract if possible, should be collected and tested.

Other molecular assays

- Next generation sequencing
- Microarray

2. Viral Sequencing

Sequencing does not have a role in the initial laboratory diagnosis of SARS-CoV-2 it is useful in the following circumstances:

- Providing confirmation of the presence of the virus.
- Monitor for viral genome mutations
- For molecular epidemiology studies.[3] Immunological assays

Most of the immunological tests are point of care tests and give rapid reports.

Antibody testing aid in investigation of an ongoing outbreak, retrospective assessment of the attack rate or extent of an outbreak and in determining the immune status of asymptomatic patients.

It has no any role in screening or for the diagnosis of early infections. Serological diagnosis is useful for patients with mild to moderate illness who may present late, beyond the first 2 weeks of illness onset

Based on the current evidence sero-conversion occurs between 7 and 11 days after onset of disease[1]

Antibody testing can be run ELISA,CLIA or rapid tests – lateral flow method[1] and can be used for detecting IgM, Ig A and IgG.

Ig M antibodies are produced within 5-7 days of infection and it indicates recent infection.IgG is produced within 10-15 days of infection and remain detectable for months[2]IgA can be detected in mucosal secretions.

In cases where the RTPCR reports are negative but there is strong epidemiological link paired sera testing is advised – sera from acute and convalescent stage]. Serodiagnosis is important in diagnosis of convalescent cases with negative PCR results[1]

Major disadvantage of serological assays is cross reactivity with other antibodies. IgM is detectable from second week of of symptoms and peaks in the third week and graduallay decreases[1]

The most sensitive and earliest serological marker is total antibodies, levels of which begin to increase from the second week of symptom onset.

IgM and IgG seroconversion occurs in all patients between the third and fourth week of clinical illness onset. Thereafter IgM begins to decline and reaches lower levels by week 5 and almost disappears by week 7, whereas IgG persists beyond 7 weeks.

CLIA or ELISA-based IgM and IgG antibody tests have greater than 95% specificity for diagnosis of COVID-19. Testing of paired serum samples with the initial PCR and the second 2 weeks later can further increase diagnostic accuracy.

Typically, the majority of antibodies are produced against the most abundant protein of the virus, which is the NucleoCapsid protein (NC). Therefore, tests that detect antibodies to NC would be the most sensitive. However, the receptor-binding domain of S (RBD-S) protein is the host attachment protein, and antibodies to RBD-S are more specific. Therefore, using one or both antigens for detecting IgG and IgM would result in high sensitivity.

Antibodies may, however, have cross-reactivity with SARS-CoV and possibly other coronaviruses.

Sensitivity of serological tests varies from 34-80%[1]. Most of the available antibody tests have specificity gereatedd than 98%.

**Antigen testing**

Sarscov 2 has multiple virus encoded proteins and among these Sand N are the two main antigenic targets of SARS COV 2 antibodies.[2]Immunochromatography is the most commonly used method for SARS COV 2 antigen detection[2] SARS COV 2 antigen testing is done in upper respitatory tract specimens. Antigen tests have goodspecificity but limited sensitivity.They are POC tests and results areinstant and cheaper.Negative results must be followed up with NAATtesting.

4. Viral Culture

Viral culture is not recommended for the laboratory diagnosis ofSARS-CoV-2. But viral culture can be used for research purposes like isolation of the virus, studying the properties of the virus and development of vaccine.

**References**

1. New Microbes New Infect. 2020 Jul; 36: 100713.Laboratory diagnosis of SARS-CoV-2: available approaches and limitations J.M. Abduljalil
2. Laboratory diagnosis of coronavirus disease-2019 (COVID-19ClinicaChimicaActaVolume 510, November 2020, Pages35-46ChenxiLi[a1]ChengxueZhao[a1]JingfengBao[a1]BoTang[b]YunfengWang[c]BingGu[ad]
3. Diagnostic strategies for SARS-CoV-2 infection and interpretation of microbiological results panelG.Caruana[1]A.Croxatto[1]A.T.Coste[1]O.Opota[1]F.Lamoth[12]K.Jaton[1]G.Greub[12]Clinical Microbiology and InfectionAvailable online 25 June 2020
4. ref cdc https://www.cdc.gov/coronavirus/2019-nCoV/lab/guidelines-clinical-specimens.html
5. PACKAGE INSERT – Cepheid genexpert
6. PACKAGE INSERT - TRUENAT
7. https://www.who.int/diagnostics_laboratory

Dr. Viji Mohan
Senior Registrar
Microbiology
Dept. of Laboratory Medicine

Dr. Ratheesh R S
Senior Registrar
Microbiology
Dept. of Laboratory Medicine

Dr. Muhammed Niyas
Associate Consultant
Dept. of Infectious Diseases

# Counselling of Patients and Contacts

Dr. Nisha Nair N U

Department of Paediatrics

If there is one event in modern history that has literally joltedhuman behaviour, it is the COVID-19 pandemic. The most intelligent animal on this planet is being forced to stay indoors confined to themselves by a 0.3 micron sized virus which in scientific terms doesn't qualify itself to be called a living organism. As media gets filled with corona stories, the scientific insights, public health impacts and facts about this virus is being lost in the shuffle.

Scientific data so far proves that over 80% covid patients are either asymptomatic or has mild symptoms, 10-15% have moderate symptoms needing hospitalisation and become better in a few days. Only 5% of the total will require ICU admission and mortality is even less around 1-2%. So chance of anyone being extremely sick is less than 5 per 100.Then why should we take precautions?

Medical fraternity has realised that the major health systems in the world toppled because of the large number of patients requiring healthcare at the same time and as this is a new virus, the entire human race is vulnerable.One covid patient infects between 2-3 new people compared to the common flu which infects only 1.4 new persons. Hence follow advice of health authorities to slow down the spread of this highly infectious virus so that our healthcare systems are not stretched beyond their capacity.

The main route of spread of virus is via droplets (while coughing/sneezing) but even normal talking can cause a spray of our saliva to a few metres. Hence the importance of wearing mask at all times when outdoor. Even properly worn multi-layered cloth masks will prevent the spread of virus by more than 85% as per WHO. And maintain a distance of 6 feet with anyone else while at work, travelling, shopping, within elevators as most droplets settle down to ground within this distance Prudence is required and not fear!

In the last 6 months, researchers have learned so much more about the complex dynamics of this virus outbreak that a person infected now with COVID-19 has a significantly higher chance of survival than in February 2020. WHO and health organisations in all countries have outlined treatment guidelines based on current evidence, ensured availability of PPE kits, developed hospital infrastructure, covid testing facilities & timing of testing for covid etc are scientifically analysed and finalised time to time, hence please follow the advice of local health authorities. Let us be confident in these steps and not be anxious listening to news media.

**Quick 10 point checklist**

1. Healthcare workers(HCW)-The exposure risk assessment is significantly lower if both the patient and the HCW are wearing appropriate masks, maintain 6 feet distance and the time of interaction is reduced to a few minutes in close contact. Ensure this as far as possible on a regular basis.
2. Take extra precaution in cleaning things taken to work like mobile phones, bags, especially in hospital settings.
3. Confine to your own areas of work and have lunch alone, as that is the time you may be exposed to your colleague without a mask.
4. There is a moral responsibility to report any illness to your authorities or about any of your family members being unwell with covid.

5. Any outdoor activity- follow policies like using face masks, social distancing, hand hygiene with soap and water for 20 sec at least on returning, never touch front of mask or your face without washing hands.
6. Use online payments/shopping.
7. Avoiding touching things unnecessarily, combining multiple outdoor errands so as to reduce chance of exposure.
8. Clean high touch surfaces at home or work more frequently with an appropriate disinfectant. Adviced disinfectants include 70% alcohol, hypochlorite solution(made by dissolving 3 tsp of bleaching powder in 1 litre water).Change and wash cloth masks daily/if wet.
9. Care of a relative who is covid positive/ in quarantine by a healthy adult- following the above general rules meticulously. Also ensure dedicated utensils for the patient washed with soap and water, clothes washed after dipping in hypochlorite solution for 10minutes, not handling fomites like newspaper used by patient and the carer wearing mask.
10. Also it is equally important that the required medical care for existing non covid illness or any new illnesses is sought and not postponed.

Fear and anxiety about COVID-19 and what could happen is a major stress along with income loss,child care, social isolation. Consider these time tested steps as stressbusters-facilitate positive interaction between family members and share your worries, spend quality family time, plan as a family to effectively utilise available resources, read books with your children, play board games as a family, encourage children to participate in house hold chores and teach them skills needed for daily life. It is definitely even more worrisome for parents of children with special needs, a lot of online resources are available currently to be utilised by such parents themselves. Also senior citizens need support in terms of shopping, stocking regular medicines, follow up for chronic illnesses and talking to them atleast over phone daily. One cannot change the pandemic but you definitely can change the way you look at it.

Official websites of WHO, CDC-USA and all governments have provided lot of information onlineintended for general public awareness, if any doubt please check in reliable official sites rather than following social media alone for information which can sometimes be counter productive and increase anxiety.

Man has fought many an odds in his journey from the tree dwelling ape to the modern homosapiens, human race will overcome this pandemic as well.

**Suggested further reading for public awareness**

1. World Health Organization website www.who.int
2. Centre for disease control USA www.cdc.gov
3. Ministry of health and family welfare,India www.mohfw.gov.in
4. Resources for special needs children-googlesearch for occupational therapy, behavioural therapy tips and activities for autism, ADHD
5. Stress relieving ideas- gardening(videos in youtube), yoga & meditation self-study videos in youtube, indoor exercises like aerobics

Dr. Nisha Nair N U
MBBS DCH (UK) MRCP CH (UK)
Associate Consultant
Paediatric ICU and ER

# Self sacrifice – a timeless theme for HCW

Dr. Jacob John Theophilus

Department of Anaesthesiology

The COVID-19 era will neither be the first nor likely the last time that doctors, nurses and other HCW will risk their own lives to save the lives of humans. It was only three years back that a person fondly remembered (Lini Puthussery) succumed to Nipah virus while tending to patients infected with the virus.

The timeless theme of self sacrifice of HCW is exemplified by the two stories narrated below that occured during World War II.

Irena Sendler, a nurse by profession, was born in Otwock, Poland. Her father Stanisław was a doctor and most of his patiens were jews living in the city and their family had many jewish friends. Soon after the outbreak of WW II in 1939, Sendler joined the activities to aid jews which included distribution of food, care of orphans and financial

assistance to people whose property was confiscated by Nazi Germany. She joined "Zegota" a polish resistance organization in order to help jews in Nazi occupied Poland. Sendler managed to get forged documents in which she gave Christian names to jewish chidren and even obtained certificates stating the chidren were sufering from contagious disease to deter the Nazis from being interested in them. Sendler also began to smuggle jewish children out of the ghetto. Some of the children were hidden under the passenger seats of the tram that crossed the ghetto. Others were concealed in private cars that also had a dog trained to bark when the chidren cried, in order to hide the sounds of the crying from the Nazi guards. Sendler made sure that the names of the children she smuggled from the ghetto were accurately recorded so that they could be identified at the end of the war and returned to their parents. She hid the lists in glass jars buried in her garden. In total, she saved the lives of 2500 jewish children risking her life.

The second story is of Drs. Eugene Lazowski & Starok Matulewicz, both physicians, working in two small polish villages under Nazi occupation during WW II. At that time, the Nazis would round up polish people opposing them to use them as forced labor in mines, quarries & ammunition factories under horrific conditions. Many of them succumbed to malnutrition, tuberculosis, typhoid and typhus.

The Nazis were pertified about typhus, a rickettsial disease that was endemic in Poland at that time. They knew that typhus epidemic could wipe out their army strength. Typhus was diagnosed by the Weil-Felix test, which was performed by mixing a patients blood sample with proteus bacteria. Dr. Matulewicz discovered that the

WF test will yield a false positive for typhus if a patient was first injected with dead proteus bacteria. The two doctors knew that documentation of typhus would prevent Nazis from recruiting these citizens to forced labor. They created a mock epidemic of typhus by immunizing people with killed proteus bacteria. This went on for two years and about 8000 polish citizens were saved from deportation to those horrific labour camps & thus outwitting the Nazis scientifically!

Oskar Schindler (Schindlers List – the movie) Sir Nicholas Winston (British Banker who saved 669 Jewis children from Czechoslovakia), James Korczah, Itzhah Stern are the names of few of the valiant humanitarians who rescused thousands of jews from the Nazis.

Dr. Jacob John Theophilius
Group Co-ordinator & Senior Consultant
Dept. of Anaesthesiology

# SARS CoV 2 : Status of current vaccine trials

Dr. Sharon Joseph
Dr. Ambily R Nair
Dr. Anish Kumar R P

Department of Internal Medicine
Department of Health

Researchers around the globe are in pursuit of developing a successful vaccine against SARS CoV2.Most of our vaccines which are being currently used in our immunization programs were developed by determining the component that stimulated antibody response in infected population. The strategy against SARS CoV 2 is not different as researchers are looking for a viral particle, a protein or a genetic material from the virus to develop an effective immune response in the vaccinated population. More than 160 attempts at developing a successful vaccine are currently going on in different countries. As this article is being written, 27 vaccines have been approved for human trials. This article therefore intends to examine the different types of vaccine trials that are ongoing.

The scientific publications to date have various formats for classifying vaccine platforms against SARS CoV 2.The platforms to produce vaccines against SARS CoV2 , can be classified broadly into four main groups. There are sub groups such as “tobacco based” platforms, “molecular clamp” platform etc. As a detailed description is beyond the scope of this article, we are trying to make it simple for the easy understanding.

I. Whole virus vaccines

II. Genetic vaccines

III. Viral vector vaccines

IV.Protein based vaccines

**I. Whole virus vaccines**

Here an inactivated version of corona virus is used to provide an immune response

a. Bharat biotech/ ICMR in collaboration with National institute of virology designed a vaccine named as Covaxin based on inactivated form of corona virus. Phase I/II trials were launched and entering phase III trials and the vaccine is expected by the beginning of 2021.

Other whole virus vaccines currently being developed are:

b. Sinovac - Sinovac is promising and developed in China and entered phase III trials in Brazil in July. Phase I/II trials were promising.

c. Sinopharm – Sinopharm is also vaccine using inactivated virus which is entering phase III trials has begun July in UAE.

d. Institute of Medical biology at the Chinese Academy of medical sciences is developing an inactivated viral vaccine- started phase II trials in June.

**II. Genetic Vaccines**

Genetic vaccines can be either RNA based or DNA based.

**A. RNA based vaccines**

The two promising vaccines currently under trials belonging to this group are the following.

a. Moderna/NIH

Moderna is an American based biotechnology company focusing on drug and vaccine development. A vaccine based on mRNA to produce viral protein in the body is being developed by the National Institute of Health(NIH). In partnership with NIH Moderna has launched trials from March 2020.The vaccine has currently entered phase III

trial with its plans to enrol around 30,000 healthy people as phase I/II trials have given promising results

b.BioNTech ,Pfizer and Fosum pharma have teamed up and has developed another promising vaccine. ( currently under phase II and III combined phases): Pfizer based in New York collaborating with the German company BioNTech and Chinese company Fosun pharma is another example of transcontinental partnership to deal with this global pandemic. This is an mRNA vaccine and has successfully completed preliminary phase I/II trials. The Volunteers produced antibodies against the virus as well as adequate T cell response. The company began launching combined phase II/III trials with nearly 30,000 volunteers from July 27, 2020 onwards.

Other RNA based vaccines in Phase I/II Combined phases are the following-

1. Imperial College of London in collaboration with Morningside Ventures developed a self amplifying RNA Vaccine-entered combined phase I/II trials on June 15.
2. Arcturus Therapeutics and Duke –NUS Medical school has developed an m RNA based "self replicating" vaccine. They have been granted approval for phase I/II human trials on July 21, 2020.
3. CUREVac is developing an mRNA based vaccine and is currently under phase I trial and planning to make hundereds of millions of doses from its German facility.
4. Academy of Military Medical sciences in China in collaboration with Walvax biotechnology is developing an mRNA based vaccine called 'ARCoV', which is entering phase I trials.
5. Sanofi in partnership with translets bio is developing an mRNA based on vaccine and entered on clinical trials on June 23,2020.
6. Genexine- a Korean company has started safety trials on mRNA based vaccines in June.

**B.DNA based vaccines**

1. **INOVIO** from US has completed phase I trials with a DNA based vaccine which showed a good immune response in 34 out of 36 volunteers.
2. **Japanese company AnGes** had started safety trials on DNA based vaccine in collaboration with Osaka University and TaKaRa Bio.
3. **Indian Vaccine maker Zydus Cadila** has developed a DNA based vaccine which was approved on July 3 for human trials. Phase I and II trials will be conducted in next three months and they are hoping that the vaccine will be ready in about 7 months, by the beginning of 2021.

**III.Viral vector vaccines**

Here a virus is used to deliver corona virus genes into cells and provoke an immune response.

Important Viral Vector Vaccines are the following

a. Oxford University in collaboration with Astra Zeneca, has already published the result of phaseI/II trial in July 20 in Lancet. It raised antibody levels and immune responses.

   They used chimpanzee adenovirus to deliver Corona virus genes and named as ChAdOX1.

b. Johnson and Johnson- Here adenovirus 26 is used to delever corona virus gene. Currently started on phase I/II in July.

c. Gamaleya research Institute, Russia – uses adenovirus 5 and 26 combination engineered with alpha corona virus gene.

d. Merck and Thermis (Austria) –planning measles virus to carry the genetic material.

e. Merck and IAVI- Announced in May regarding a vaccine using vesicular stomatitis to carry corona virus gene.

f. Novartis- planning trials using a virus called adeno-associated virus to deliver genes.

**IV. Protein based vaccines**

Here a protein fragment of corona virus is used which would provoke an immune response and the following vaccines are examples.

a. Novovax- By sticking viral protein fragments into microscopic particles and delivering it to evoke an immune response. The vaccine is expected to be ready by the first quarter of 2021.

b. Institute of Medical Biology/Chinese academy of Medical science partnering with Anhui Zhifei Longcom/Changging Zhifei biological product – is entering phase II trials- which aims at a vaccine that uses a combination of viral proteins and an adjuvant producing an immune response.

c. Canada based Medicago begins human trials on a plant based COVID-19 vaccine.

d. Vaxine, a company from Australia (tobacco based viral protein) is expecting to start phase II trials soon.

e. Kentucky bio-processing is developing a vaccine from tobacco based viral antigen after infecting tobacco plants with a genetically modified SARS CoV 2.

f. University of Queensland from Australia is developing a vaccine with a rapid response "molecular clamp" vaccine platform and is entering clinical trials.

g. Baylor College of Medicine is developing a vaccine which uses SARS CoV 2 RBD protein to develop an immune response.

h. University of Pittsburgh is developing a protein based vaccine and with the use of a microneedle array spike protein pieces are delivered into the skin.

i. Sanofi is also producing a vaccine using the spike protein to develop an immune response.

These are some of the major current trials which are either going on or being planned at present. All of them have not been included as the purpose of this article is to get an overall idea about the types of vaccines and major attempts. Inclusion of all individual vaccines against COVID-19 is beyond the scope of this article.

As the economies around the world are reeling with the effects of corona virus pandemic, discovering a vaccine that would provide adequate immunity is the need of the hour.

The various trials that are on going around the world give hope to the notion that an effective vaccine can be delivered in the near future. Human society has often risen up to challenges it had faced and the response to this pandemic is no exception. Tales of previous vaccine discoveries are proof to this. With the untiring efforts of global medical community, governments and various partners, it is hoped that a safe and effective vaccine will soon be delivered.

Dr. Anish Kumar R P
Consultant
Dept. of Internal Medicine

Dr. Ambily R Nair
Assistant Surgeon
Dept. of Health

Dr. Sharon Joseph
1st Year IMT Resident
Dept. of Internal Medicine

# Nursing challenges in the management of COVID-19

Accamma Abraham

Department of Nursing

Human race has faced and fought numerous outbreaks before, but COVID 19 has been the deadliest recently faced by the world dueto the exponential mortality rise and its easy transmissibility. This invisible enemy has endangered the health and life of humanity beyond imagination and has brought out scare and uncertainty worldwide.

This pandemic has forced man to see the world and adapt in unforeseen ways. We have begun to think, introspect and alter the perspective of the world by prioritizing and protecting the true value of “life”. As the virus is on a rampage and wipe out lives, the saviors are only the healthcare professionals who lay their life on the line of duty to protect the world from this deceptive adversary.

As the fatalities spike up, the front line warriors, and strongest pillars of health care system, the nurses have to make the extreme difficult professional and personal decisions.

Even though the challenges are innumerable,we, the brave hearts are ready for the brutal battle ahead against this nemesis.Personal safety, life of the patient, manpower constraints, resource allocation, social stigma and safety of the family were just a few.

To support our nurses, we came up with numerous training sessions to address most of their concerns. What is the mode of transmission? What all can be done to cut down the spread? How can we protect ourselves, our patients, and our hospital?

Credible and accurate knowledge, education and clinical skill in handling crisis,were the major challenges, so that they can confidently render patient care. Multiple webinar sessions and online classes were conducted. All nurses especially those posted in Screening Clinic, Emergency Medical Department and all isolation areas were trained on donning and doffing of PPE. When the unexpected cases started turning positive, indication of PPE usage was broadened to various nursing areas and it required much effort and training for the appropriate usage and zero wastage of the resources.

When nurses were educated on mask etiquette and related training, the next challenge was tutoring the non-clinical internal and external customers on safe usage, reuse and disposal of masks. This was done through numerous formal and informal sessions and spot corrections.

Even though, counselling session were given by the blue volunteers for all nurses, when we started receiving suspected/ positive cases, the nurses were still panicky and anxious.

The major concern, however was not their personal safety but their families getting affected especially, the vulnerable members. To address this, when nurses were given an option to move-in to hostels, they had serious separation anxiety leaving their kids behind. The nursing leaders identified these signs and ensured ample psychological support.

Utmost care was taken to ensure the safety of staff posted in the isolation areas and were provided with full PPE. Adequate number of PPEs have been made available in the required areas and their judicious use is ensured by adequate training.Shifts were revised as 6 hours

per day for seven days and a rest period of 7 days. All vulnerable staff were excluded from isolation duty. Hostel accommodation, food, and other facilities were ensured for staff commuting from distant places.

Quarantine facilities at hostel for nurses suspected of having contracted the infection were arranged for both male and female nurses ensuring strict compliance of the quarantine protocol. They were provided with nutritious food. In the meantime, psychological support was ensured at all times. For the unaffected nurses, common dining areas were closed to reduce the risk of exposure. Staff are not permitted to go out and any purchase needs are assisted by the warden and security. The responsibility of daily monitoring of temperature and symptoms were entrusted with hostel wardens. Any staff reporting even with mild symptoms were shifted immediately to an earmarked sick room and were brought to hospital and managed as per the instruction of Infection Control Department.

To ensure the communication chain in these testing times, all meetings were converted to online platforms. This huge task was facilitated by the volunteering nurses with assistance from IT team.

As there were no existing guidelines regarding the current pandemic management, with the available data and international updates and contribution from in-house experts in Infection Control and other disciplines, standard operating procedures and infection control policies were formulated and made readily available to all staff including nurses for reference in the intranet edge.

To avoid confusions and for ease of management in reference to the admission, transfer/ reference and patient movements inside the hospital, flow charts were prepared by the nursing team and circulated. This also helped to ward off unwanted exposures. The role of security staff, housekeeping and ambulance during patient transfers were also mentioned in detail.

The next challenge came in the form of transportation of staff when the lockdown started, to tackle this, transportation facilities to and fro the hospital was ensured. The duty timings in the rest of areas were also revised as 12 hour shifts to ensure nursing staff gets 3 days rest after 4 days of duty. Special care was taken and only limited staff were assigned in the intensive care units, isolation wards, and screening clinic to reduce exposure to suspected/positive COVID patients.Though doctors were performing swab sampling initially, nursing department shouldered this responsibility. Management supported the nurses by providing of health insurance to all nurses in addition to the KIMS employee insurance facility.

Even in the midst of all these challenges, our battle with COVID has presented us with various opportunities and different perspectives. We are determined to win this war and we will. The contributions of nurses to fight this pandemic are immense and their sacrifices will be remembered forever.

Accamma Abraham
General Manager-Nursing Services

# Chest imaging findings in COVID -19

Dr. A Sony Mol
Dr. Vineeth P
Dr. Pradeep S
Dr. Zunimol P K M
Dr. Madhavan Unni

Department of Imaging and Interventional Radiology

**Abstract**

The utility of radiological imaging in assessment of chest findings in COVID-19 is significant. Multiple radiological organizations and learned societies have stated that CT should not be relied upon as a diagnostic/screening tool for COVID-19. However, CT findings have been used controversially as a surrogate diagnostic test by some

We hereby present two cases with chest imaging findings suggesting the possibility of COVID-19 infection. One of the case was RT-PCR positive and the other negative,which later showed serological positivity.These cases suggest that in patients with high index of clinical suspicion, CT findings may precede RT-PCR and serological positivity.

Keywords: SARS:Severe acute respiratory syndrome, COVID-19: Corona virus disease, DR:Digital radiography, RT-PCR: Reverse transcriptase polymerase chain reaction,CB-NAAT: Catridge based neuclic acid amplification test, HRCT: High resolution computed tomography, CO-RADS: Covid-19 reporting and data system.

## Introduction

COVID -19 (Corona virus disease 2019) is an infectious disease caused by severe acute respiratory syndrome corona virus 2 (SARS-CoV-2). The current outbreak was officially recognized as a pandemic by WHO on 11 March 2020.

## Case report-1

A male patient in his late 60's presented to the emergency department with complaints of increased frequency of urination, dysuria, tiredness and altered sensorium. The patient is a known case of diabetes mellitus, hypertension, dyslipidemia with past history of coronary artery disease.

Physical examination findings were within normal limits. SpO2 in room air = 91%.

Laboratory analysis demonstrated increased total leukocyte count with a relatively increased neutrophil count, increased pus cells in urine routine examination, elevated ESR and CRP.

Screening test (RT-PCR) for SARS corona virus was found negative. Confirmatory test (gene expert - CBNAAT) done one day later detected SARS corona virus in the nasopharyngeal swab.

Chest radiograph was performed by observing the hospital protocol guidelines using a CARESTREAM (DR machine), revealed bilateral multifocal ill-defined peripheral subsegmental consolidations, more in lower zones.( Fig. 1)

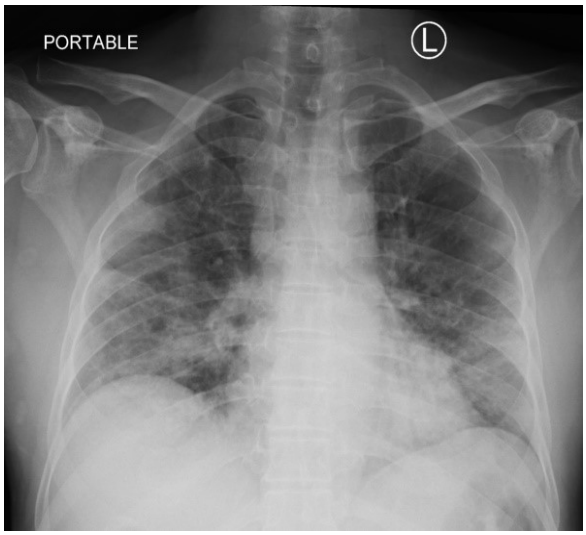



Fig.1-Chest radiograph showing bilateral multifocal peripheral subsegmental consolidations.

Chest X-Ray imaging are suspicious of atypical pneumonia.

HRCT Chest was performed using a 128 Slice CT machine (GE Revolution), revealed bilateral multifocal areas of patchy consolidation and ground glass opacities, predominantly in subpleural location distributed in both lungs, predominantly involving the basal segments. A few ground glass opacities also noted in the peribronchovascular regions of bilateral upper lobes. (Fig. 2).

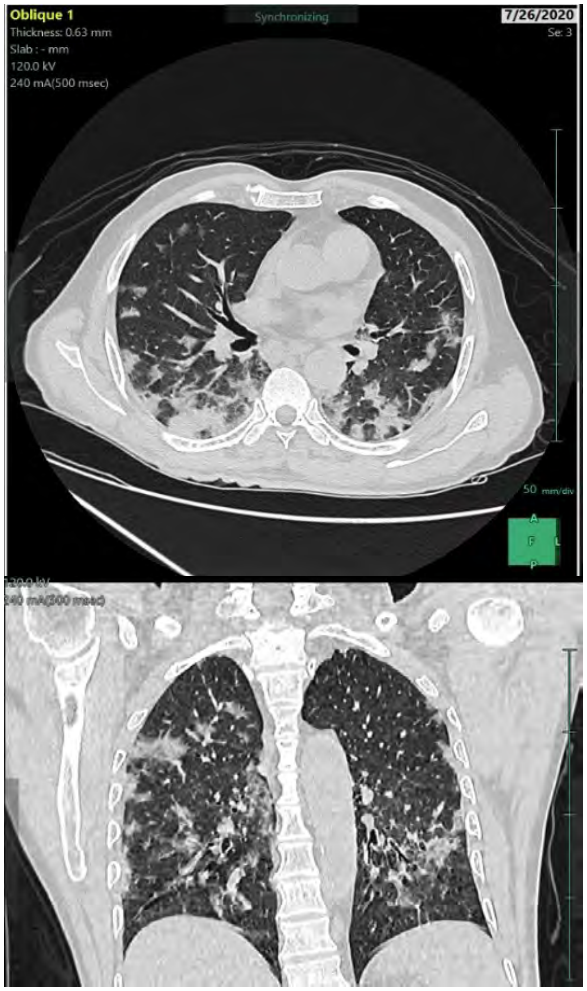



Fig.2 - HRCT lung window,axial and coronal sections showing bilateral multifocal scattered ground glass opacities and consolidations.

From the above imaging findings with a positive PCR for COVID-19, a CO-RAD's score of 6 was assigned.

The patient was treated with cephalosporin, Remdesivir, methylprednisolone and Clexane.

**Case Report- 2**

A young-male patient, who is a doctor by profession in his early 30's, presented to the fever clinic with complaints of fever, cough and sore throat. The patient gave history of exposure to sick COVID positive patient's.

Physical examination findings were within normal limits. SpO2 in room air = 96%-97%.

Laboratory analysis demonstrated increased total leukocyte count and lymphocyte count, elevated ferritin.

Screening test (RT-PCR) and confirmatory test (gene expert-CBNAAT) for SARS corona virus from the nasopharyngeal swab was negative.

Chest radiograph was performed by following hospital COVID protocol using a CARESTREAM (DR machine), revealed multifocal bilateral ill-defined patchy subsegmental consolidations in both lungs.( Fig.3).

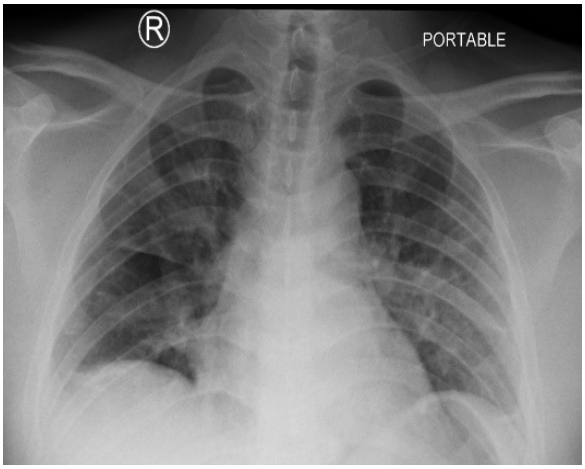



Fig.3 - Chest radiograph demonstrating ill defined subsegmental consolidations in both lungs, predominantly in right upper and left mid zone.

HRCT Chest was performed using a 128 Slice CT machine (GE Revolution), revealed bilateral predominantly peripheral ground glass opacification with consolidations in the lower lobes. Multifocal ground glass opacification with rounded morphology also noted in bilateral lungs. (Fig. 4)

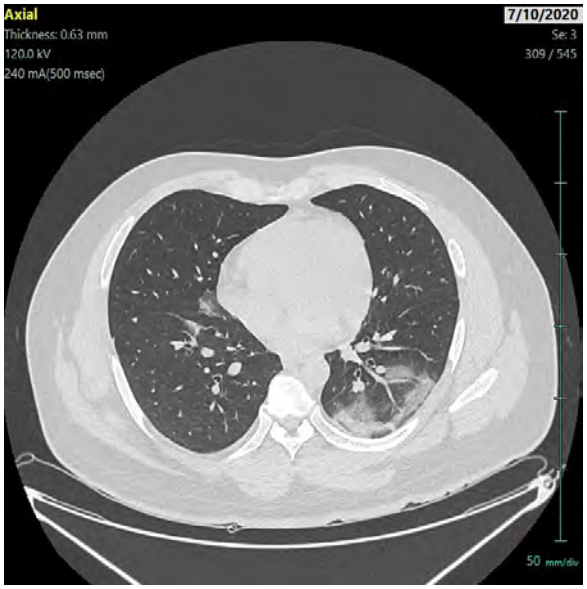



Fig.4 - HRCT chest axial and coronal images showing bilateral predominantly peripheral ground glass opacification with consolidations in the lower lobes.

Imaging findings are highly suspicious for COVID-19, CO-RAD's score - 4.

Serological testing was done 9 days later, which showed IgM and IgG positivity for SARS corona virus.

The patient was treated with cephalosporin, methylprednisolone, Remdesivir and Tocilizumab.

Repeat chest radiograph after 7 days demonstrated significant clearing of bilateral consolidations and opacities. (Fig. 5)

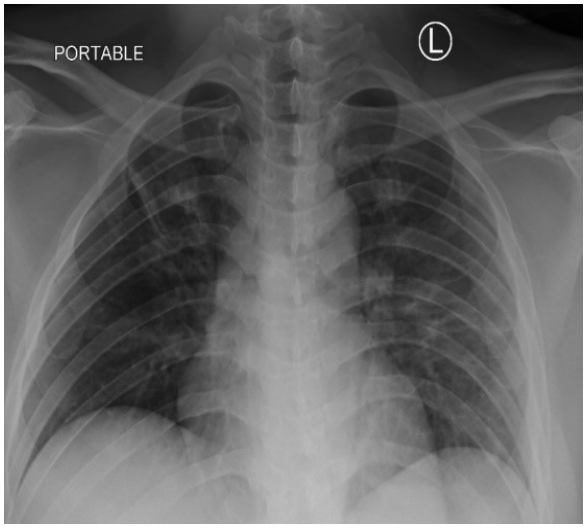



Fig.5 - Chest radiograph 7 days post treatment showing significant clearing of bilateral lung consolidations.

**Chest Radiographs in COVID 19[1]**

Typical findings:

- Multifocal peripheral consolidations.
- Multifocal rounded opacities and nodules.

Indeterminate findings

- Multifocal non peripheral consolidations

Atypical findings include focal lobar consolidations, pleural effusions, perihilar interstitial opacities, bronchial wall thickening, atelectasis, lymphadenopathy.

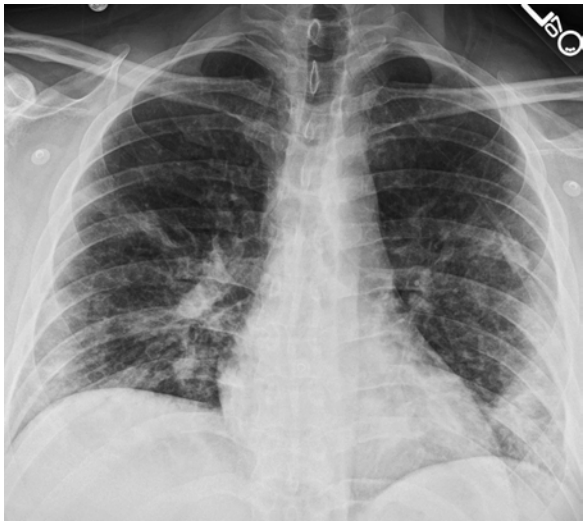



Fig.6 - Peripheral lower lobe predominant ground glass densities in a known case of COVID-19

**CT findings in COVID-19[2]**

**Obligatory features**

Ground glass opacities, with or without consolidations in lung regions close to visceral pleural surfaces including fissures, and multifocal bilateral distribution.

**Confirmatory features**

Ground glass regions

Unsharp demarcation, (half) rounded shape

Sharp demarcation outlining the shape of multiple adjacent secondary pulmonary lobules.

Crazy paving pattern

Pattern compatible with organizing pneumonia

Thickened vessels within parenchymal abnormalities found in all confirmatory patterns.

**CO-RADS- The COVID-19 Reporting and Data System[2]**

CO-RADS provides a level of suspicion for pulmonary involvement of COVID-19 based on the features seen on a non-enhanced chest CT. Findings are categorized as CO-RADS 1-5 in the increasing suspicion of COVID-19.

CO-RADS 0 scans are incomplete or of insufficient quality. E.g. artifacts due to coughing or breathing. CO-RADS 6 indicate proven COVID-19 as signified by a positive RT-PCR test for virus-specific nucleic acid.

| Category | Level of suspicion | Findings |
|---|---|---|
| **CORADS 1** | Very low level of suspicion | Normal CT results or CT findings of unequivocal noninfectious origin. E.g. Emphysema, peri fissural nodules, Tumours, Fibrosis. |
| **CORADS 2** | Low level of suspicion | CT findings in the lungs typical of infectious origin that are considered not compatible with COVID-19. E.g. bronchitis, infectious bronchiolitis, bronchopneumonia, lobar pneumonia, and pulmonary abscess. |
| **CORADS 3** | Equivocal findings | CT features that can also be found in other viral pneumonias or noninfectious causes. Findings include perihilar ground-glass opacity, homogenous extensive ground-glass opacity with or without sparing of some secondary pulmonary lobules, or ground-glass opacity together with smooth interlobular septal thickening with or without pleural effusion. |
| **CORADS 4** | High level of suspicion | CT findings that are typical for COVID-19 but also show some overlap with other viral pneumonias.They are not in contact with the visceral pleura, nor are they located strictly unilaterally in a predominant peri Broncho vascular distribution or superimposed on severe diffuse preexisting pulmonary abnormalities. |
| **CORADS 5** | Very high level of suspicion | Based on typical CT findings. Mandatory features are ground-glass opacities with or without consolidations in lung regions close to visceral pleural surfaces, including the fissures, and a multifocal bilateral distribution. |

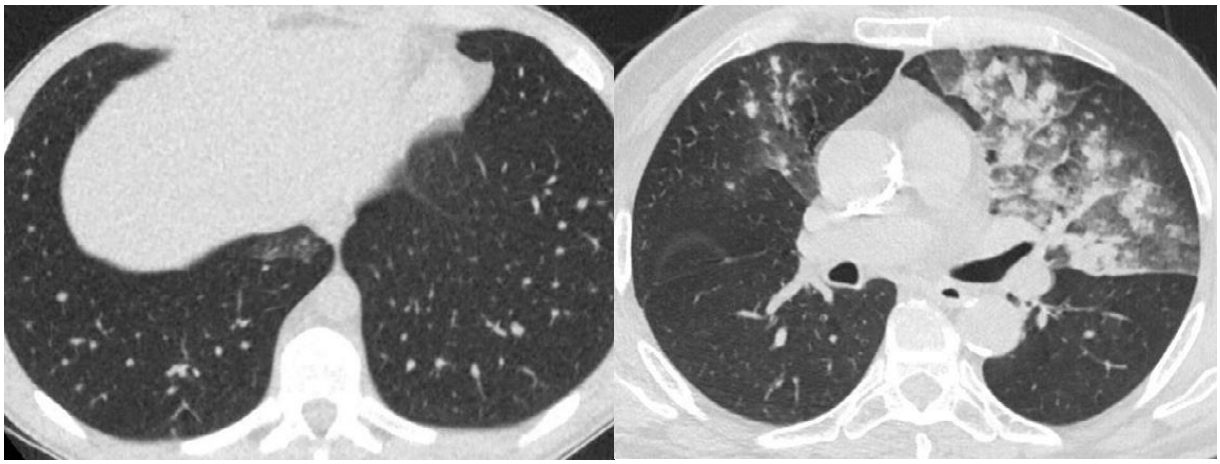


Fig.7 - CORADS 3: a) Single focus of ground-glass opacity in a COVID-19 RT-PCR positive patient. b) Ground-glass with superimposed consolidations in a centrilobular pattern in a COVID-19 RT-PCR negative patient

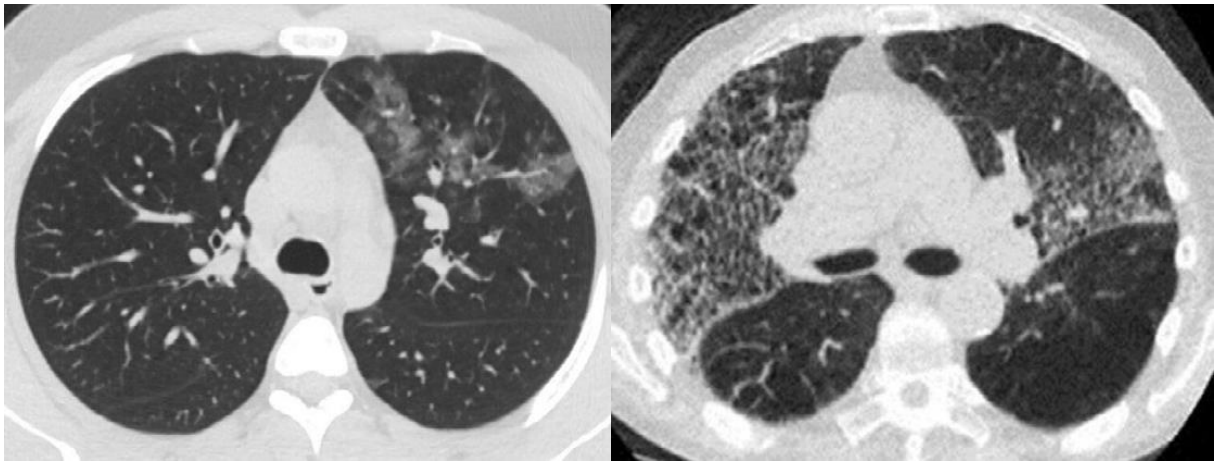


Fig. 8 CORADS category 4: (a) Unilateral multifocal ground-glass opacities with pleural contact (b) Ground glass superimposed on severe centrilobular emphysema, visceral pleural contact.

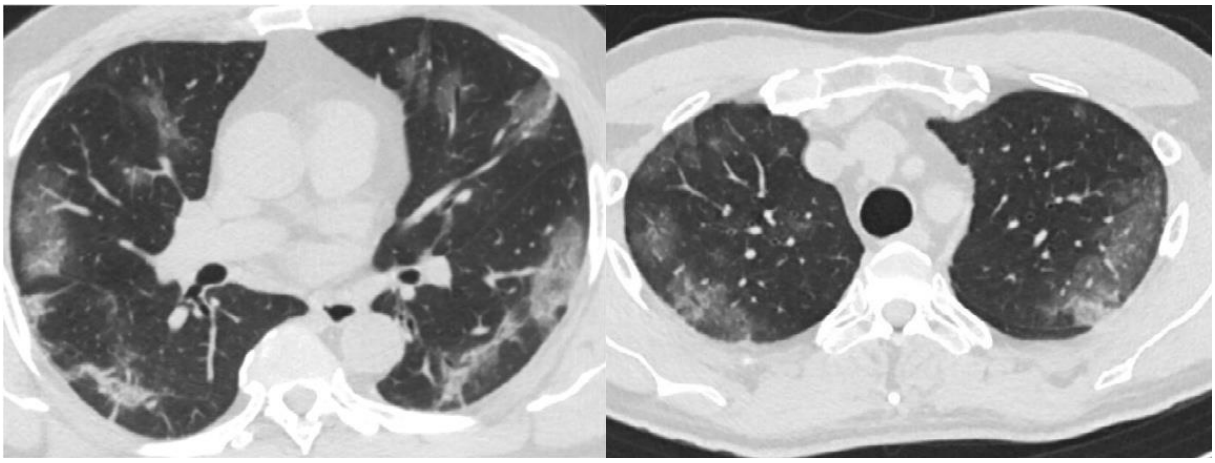


Fig. 9 - CORADS category 5: (a)Multifocal bilateral subpleural ground-glass opacities, some with minimal subpleural sparing. (b) Multifocal bilateral subpleural ground-glass opacities with curvilinear bands.

## Conclusion

In patients with high index of clinical suspicion for COVID -19, CT findings may precede RT-PCR and serological positivity. Patients with typical radiological features of COVID 19 should be managed in dedicated wards and repeat serological testing should be done. However imaging findings should not beused as a primary diagnostic modality for COVID -19 infection.

### References

1. Hammer MM, Zhao AH, Hunsaker AR, Mendicuti AD, Sodickson AD, Boland GW, et al Radiologist Reporting and Operational Management for Patients with Suspected COVID-19. Journal of the American College of Radiology. 2020 Jun 11
2. Wong HY, Lam HY, Fong AH, Leung ST, Chin TW, Lo CS et al. Frequency and distribution of chest radiographic findings in COVID-19 positive patients. Radiology. 2020 Mar 27:201160.

Dr. Sony Mol, DNB Resident
Dept. of Imaging and Interventional Radiology

Dr. Vineeth P, Resident
Dept. of Imaging and Interventional Radiology

Dr. Pradeep S, Consultant
Dept. of Imaging and Interventional Radiology

Dr. Zunimol P K M, Consultant
Dept. of Imaging and Interventional Radiology

Dr. Madhavan Unni, Chief Coordinator and Senior Consultant
Dept. of Imaging and Interventional Radiology

Address for Correspondence

Dr. Sony Mol
DNB Resident
email: sonymol100@gmail.com

# An unusual presentation of COVID-19 - a case report

Dr. Ganesh B
Dr. Arjun P
Dr. Ameer K A
Dr. Vinod Kumar Kesavan
Dr. Rajalakshmi A
Dr. Muhammad Niyas
Dr. Muralidharan R
Dr. Deepak V

Department of Respiratory Medicine
Department of Infectious Diseases
Department of Critical Care Medicine

## Abstract

We report the case of 34-year-old medical professional, who presented with classical clinical and radiological features suggestive of COVID-19 but five sequential rRT-PCR (real time Reverse Transcription Polymerase chain reaction) tests were negative. At admission, he was febrile and very soon he started developing hypoxia. He had clinical worsening and laboratory parameters were suggestive of an impending cytokine storm and he was appropriately managed as per institution protocol. Meanwhile, his antibody test for COVID-19 came positive for both Ig G and Ig M with high IgM level. He had a dramatic recovery and was discharged within 10 days. It is difficult to distinguish COVID-19 pneumonia from other viral pneumonia based on RT-PCR and CT findings alone and many need additional investigations. This case report is being published to highlight this fact.

Keywords: False negative RT-PCR, COVID-19 antibody test, CO-RADS.

## Key Messages

1. We emphasize the utility of chest HRCT in the evaluation of patients suspected of having COVID-19 infection.
2. Antibody testing is invaluable to diagnose COVID-19 pneumonia in special situations especially in those with a high clinical suspicion but negative RT-PCR test.

## Introduction

The definite diagnosis of corona virus disease 2019 (COVID-19) is by viral isolation or by detection of nucleic acid/ viral antigen by polymerase chain reaction from nasal swab or throat swab or lower respiratory tract sample. However, the sensitivity to detect COVID-19 by real time rRT-PCR is reported to be low and hence they have a low negative predictive value.[1]

## Case report

A 34-year-old gentleman, known hypertensive, medical professional, presented to us with symptoms of sore throat, myalgia, and fever of 1 week duration. His complaints started as sore throat next day, he developed fever and myalgia. Fever lasted for two days and there after he became asymptomatic. Five days prior to onset of symptoms, he had high risk contact with many patients diagnosed to have COVID-19 infection. Before presenting to us, COVID-19 rRT- PCR was done thrice (one conventional rRT-PCR and two chip based rRT-PCR) elsewhere in which COVID-19 was not detected. He was started on treatment with Favipiravir, Piperacillin-Tazobactum, Azithromycin and Methylprednisolone. HRCT chest was done elsewhere which showed patchy areas of Ground Glass Opacities (GGOs) in left lower lobe. One week later, he started developing a recurrence of fever and hence came to us for further management. He was admitted in isolation room, repeat RT-PCR tests were done (both chip based and conventional rRT-PCR) but were negative. Laboratory investigations revealed elevated Neutrophil Lymphocyte Ratio (NLR)(7.27), normal total count 6100 cells/cu.mm (4000-11000 cells/cu.mm), CRP 5.7 mg/L (<5mg/L), D-dimer376ng/ml (<500ng/ml), Pro-calcitonin0.07ng/ml (<0.1 ng/

ml). His Liver and renal function tests were within normal limits. His Ferritin level was elevated 475 ng/ml (30-400ng/ml). He was hemodynamically stable, with SpO2 95% in Room air. HRCT chest was repeated and on comparison with previous HRCT chest, there was increase in GGOs bilaterally. HRCT chest showed bilateral peripheral predominant rounded GGOs, reverse halo sign with consolidation in left lower lobe (Fig. 1). CT findings were suggestive of CO- RADS 5.

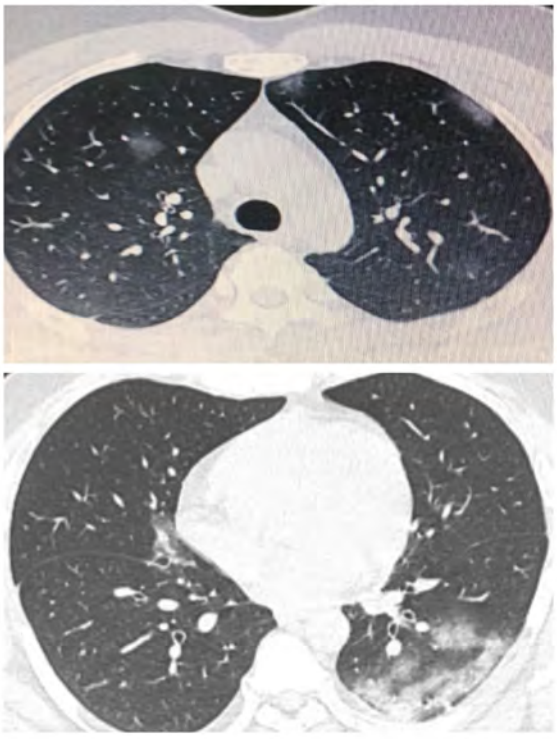


Fig.1 - HRCT chest, axial section, lung window showing multifocal bilateral peripheral predominant rounded GGO with consolidation on the left lower lobe, consistent with CO-RADS 5.

Hence, the patient was managed with Dexamethasone, Enoxaparin prophylaxis, broad spectrum antibiotics. Nasopharyngeal swab for Multiplex PCR-respiratory panel was sent which did not detect any pathogen. His blood culture did not show any organism. Despite repetitive negative rRT-PCR for COVID-19, in view of strong clinical and radiological suspicion, the patient was managed in isolation room. He had ongoing fever spikes. After two days of admission, he developed shortness of breath and desaturation. Oxygen supplementation was initated. Chest x ray revealed increase in infiltrates bilaterally. (Fig. 2). Bronchial lavage was contemplated but deferred because

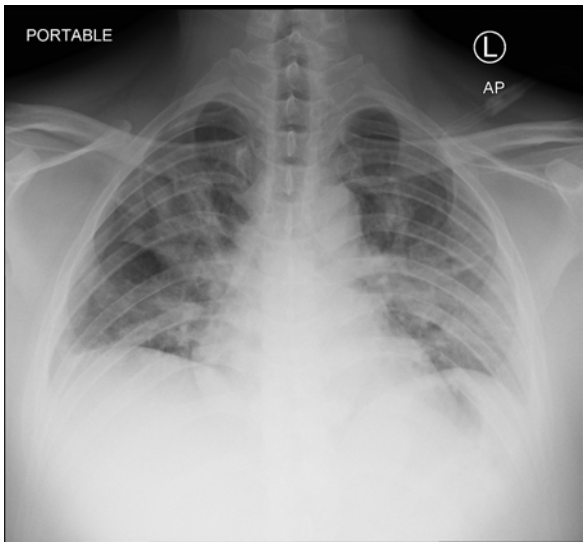



Fig.2 - Portable chest x ray- AP film showing bilateral infiltrates.

patient was hypoxic. It was decided to do lavage if he progresses to invasive mechanical ventilation. Favipiravir was stopped and he was initiated on Remdesivir after a multidisciplinary discussion and as per advice of state medical board, after obtaining a detailed informed consent for the same. Enoxaparin was switched to therapeutic dosage. His CRP (50.6mg/L), D-Dimer (524ng/ml), Ferritin(1382ng/ml) were increasing. His LDH was very high 309 U/L (133-225 U/L), IL-6 was 34pg/ml (<7pg/ml). Echocardiography was done, it showed good biventricular function. He was initiated on oxygen via High Flow Nasal Cannula (HFNC) with 40 L/min flow and 50% $FiO_2$. In view of clinical, radiological, biochemical worsening, elevated IL-6 levels, possibility of cytokine storm was considered, and patient was initiated on Tocilizumab. He responded well, there was no further fever spike and there was partial radiological clearance in chest x ray. His IL-6 levels were repeated the next day and it was 313pg/ml but he was improving clinically. Two days after the first dose of Tocilizumab, patient had shortness of breath & radiological worsening in chest x ray and hence a second dose of Tocilizumab was given. His repeat IL-6 value was 136.4pg/ml.

Despite repetitive negative RT-PCR for COVID-19, in view of high clinical & radiological suspicion of COVID -19, antibody test for COVID-19 (CLIA method, Target

antigen: Spike S1 and Nucleocapsid protein) was sent on the 14th day of illness and it came positive for both Ig M 2391.46 AU/ml (<10 AU/ml) and Ig G 34.96 AU/ml (<10 AU/ml) thus finally confirming COVID-19. Remdesivir, Methyl Prednisolone and Enoxaparin were continued. The patient showed gradual clinical improvement, and there was good radiological clearance in chest x ray (Fig.3), his NLR became less than 3, Ferritin, D-dimer, LDH, CRP

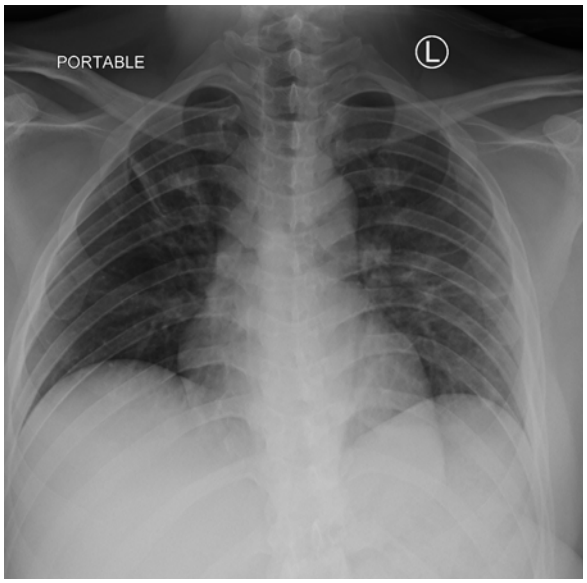



Fig. 3 - Portable chest x ray – AP film follow up image taken five days later showing significant clearance of infiltrates.

decreased. HFNC support was gradually tapered and stopped. He continued to be hemodynamically stable, he was mobilized. He became clinically stable, he was off oxygen support for more than 3 days, and he was discharged with Apixaban (5mg twice daily, planned for 2 weeks duration).

**Discussion**

The diagnosis of COVID-19 is made primarily by direct detection of SARS-CoV-2 RNA by nucleic acid amplification tests (NAATs), most commonly reverse-transcription polymerase chain reaction (RT-PCR) from the upper respiratory tract specimen. Various RT-PCR assays are used around the world and different assays amplify and detect different regions of the SARS-CoV-2 genome. Some target two or more genes, including the nucleocapsid (N), envelope (E), and spike (S) genes, and regions in the first open reading frame, including the RNA-dependent RNA polymerase (RdRp) gene.(2) The overall sensitivity of rRT-PCR for COVID-19 is about 71%.[3]

In most individuals with symptomatic COVID-19 infection, viral RNA in the nasopharyngeal swab as measured by the cycle threshold (Ct) becomes detectable as early as day 1 of symptoms and peaks within the first week of symptom onset. The Ct is the number of replication cycles required to produce a fluorescent signal, with lower Ct values representing higher viral RNA loads. A Ct value less than 40 is clinically reported as PCR positive. This positivity starts to decline by week 3 and subsequently becomes undetectable. However, in severe hospitalized cases, PCR positivity may persist beyond 3 weeks after illness onset but a "positive" PCR result reflects only the detection of viral RNA and does not necessarily indicate presence of viable virus.[3] The timeline of PCR positivity is different in specimens other than nasopharyngeal swab. PCR positivity declines more slowly in sputum and may still be positive after nasopharyngeal swabs are negative.[3] The accuracy and predictive values of SARS-CoV-2 NAATs have not been systematically evaluated. Their clinical performance is more variable. Sensitivity of these tests depends on the following:

1. Type and quality of the specimen obtained (BAL-95%, sputum-72%, oropharyngeal swab – 32%, nasopharyngeal swab – 66%)(4)
2. Duration of illness at the time of testing
3. Specific assay (Point Of Care NAAT assays have lesser sensitivity)

Possible causes of false negative RT-PCR include:

1. Analytical causes
2. Pre analytical causes

Analytical causes include intrinsic limitations and presence of inhibitory substances.

Pre analytical causes includes faulty sample collection or transportation, inadequacy of the sample, inappropriate

site of sampling for the stage of the disease. In a systematic analysis, pooled estimation of false negative RT-PCR was found to be 8.5%.[5]. In this case, patient had started Favipiravir on day 1 of illness, perhaps that may be the reason for repeated negative rRT-PCR.

Serological markers also have an important role in certain cases. The most sensitive and earliest serological marker are the total antibodies, which begin to increase from the second week of symptom onset. Although IgM and IgG ELISA have been found to be positive even as early as the fourth day after symptom onset, higher levels occur in the second and third week of illness. IgM and IgG seroconversion occur between the third and fourth week of clinical illness onset. Thereafter, IgM begins to decline and reaches lower levels by week 5 and almost disappears by week 7 whereas IgG persists beyond 7 weeks.[6]

Combined sensitivity of PCR and IgM ELISA directed at nucleocapsid (NC) antigen is 98.6% vs 51.9% with a single PCR test. IgM ELISA has a higher positivity rate after day 5.5 of illness.[3]

CT chest has higher sensitivity than RT-PCR in COVID-19 diagnosis.[7] The 7th Chinese Novel Coronavirus Pneumonia Diagnosis and Treatment Plan incorporates CT imaging into the clinical definition criteria of COVID-19.[8] The Fleischner Society suggests a role for CT scanning, as a major tool if symptoms worsen. Hence, CT chest is critical for early detection and improvement of diagnostic confidence for patient with COVID-19 amid possible negative RT-PCR.

Typical CT findings include Ground-glass regions with unsharp demarcation (half) rounded shape or sharp demarcation outlining the shape of multiple adjacent secondary pulmonary lobules, Crazy paving Patterns compatible with organizing pneumonia, thickened vessels within parenchymal abnormalities, spider web sign and reverse halo sign.[8] The pooled sensitivity and specificity is 94% and 37% respectively, for chest CT.[7] CO-RADS (COVID-19 Reporting And Data System) scoring is used to determine the level of suspicion of COVID-19 in CT chest.[8]

| CO-RADS | Clinical suspicion | CT Findings |
|---|---|---|
| 1 | No | Normal/ noninfectious abnormalities |
| 2 | Low | Consistent with infection other than COVID-19 |
| 3 | Indeterminate | Unclear whether COVID-19 is present |
| 4 | High | Abnormalities suspicious of COVID-19 |
| 5 | Very High | Typical COVID-19 findings |
| 6 | PCR+ | |

After the first week of infection, the immunological response starts. Two types of responses have been described in COVID-19 infection. In some patients, the Th2 pathway is activated and in these subjects, the recovery is complete and unremarkable. However in another subgroup, the Th1 pathway is activated and these patients go on to develop an exaggerated immune response, which is called Cytokine Release Syndrome (CRS) or cytokine storm.

Cytokine profile resembling sHLH (secondary Hemophagocytic Lympho Histiocytosis) is associated with COVID-19 disease severity, characterized by increased level of interleukins. Other common markers of CRS include d-dimer, Ferritin, LDH and CRP. High concentrations of cytokines(especially IL-6) have been detected in plasma of critically ill patients infected with 2019-nCoV.[9] Tocilizumab (an Interleukin-6 receptor antagonist) has shown to effectively improve clinical symptoms and repress the deterioration of severe COVID-19 patients.[10] Therefore, tocilizumab is an effective treatment in severe patients of COVID-19, which provided a new therapeutic strategy for this fatal infectious disease.[10] The rise in IL-6 levels following Tocilizumab is an expected entity and it is due to effective IL-6 receptor blockade by Tocilizumab. Such rise in IL-6 alone, does not warrant additional dosage of Tocilizumab and has always

to be considered in conjunction with clinical parameters. In this case, there was clinical worsening too, which responded to the second dose of Tocilizumab.

The role of CT chest in COVID-19 is constantly evolving with modest scientific evidence but there are substantial differences in opinion on when and how the technique should be used for clinical workup or treatment decisions. A non contrast HRCT is preferred as covid infection is notorious to involve the lung parenchyma alone. Hence, patients with severe COVID-19 should be screened for hyperinflammation using laboratory trends (e.g., increasing ferritin, decreasing platelet counts, LDH, or erythrocyte sedimentation rate) to identify the subgroup of patients for whom immunosuppression could improve mortality.[9] Also, rising lab parameters alone should not be the sole reason to initiate immunosuppression. They should always be correlated with clinical assessment for decision making.

This case is being published because of its uniqueness in terms of the atypical presentation, diagnostic challenges it posed and the timely and appropriate therapeutic decision making which was the turning point in the course of the disease.

**References**

1. Cheng MP, Papenburg J, Desjardins M, Kanjilal S, Quach C, Libman M, et al. Diagnostic Testing for Severe Acute Respiratory Syndrome–Related Coronavirus 2: A Narrative Review. Ann Intern Med. 2020 Jun 2;172(11):726–34.
2. 20200121-sitrep-1-2019-ncov.pdf [Internet]. [cited 2020 Jul 23]. Available from: https://www.who.int/docs/default-source/coronaviruse/situation-reports/20200121-sitrep-1-2019-ncov.pdf?sfvrsn=20a99c10_4
3. Sethuraman N, Jeremiah SS, Ryo A. Interpreting Diagnostic Tests for SARS-CoV-2. JAMA. 2020 Jun 9;323(22):2249.
4. Wang W, Xu Y, Gao R, Lu R, Han K, Wu G, et al. Detection of SARS-CoV-2 in Different Types of Clinical Specimens. JAMA. 2020 Mar 11;
5. Arevalo-Rodriguez I, Buitrago-Garcia D, Simancas-Racines D, Zambrano-Achig P, del Campo R, Ciapponi A, et al. False-negative results of initial rt-pcr assays for covid-19: a systematic review [Internet]. Infectious Diseases (except HIV/AIDS); 2020 Apr [cited 2020 Jul 22]. Available from: http://medrxiv.org/lookup/doi/10.1101/2020.04.16.20066787
6. Xiao AT, Gao C, Zhang S. Profile of specific antibodies to SARS-CoV-2: The first report. J Infect. 2020;81(1):147–78.
7. Long C, Xu H, Shen Q, Zhang X, Fan B, Wang C, et al. Diagnosis of the Coronavirus disease (COVID-19): rRT-PCR or CT? Eur J Radiol. 2020 May;126:108961.
8. Prokop M, van Everdingen W, van Rees Vellinga T, Quarles van Ufford H, Stöger L, Beenen L, et al. CO-RADS: A Categorical CT Assessment Scheme for Patients Suspected of Having COVID-19—Definition and Evaluation. Radiology. 2020 Aug;296(2):E97–104.
9. Mehta P, McAuley DF, Brown M, Sanchez E, Tattersall RS, Manson JJ. COVID-19: consider cytokine storm syndromes and immunosuppression. The Lancet. 2020 Mar;395(10229):1033–4.
10. Xu X, Han M, Li T, Sun W, Wang D, Fu B, et al. Effective treatment of severe COVID-19 patients with tocilizumab. Proc Natl Acad Sci. 2020 May 19;117(20):10970–5.

Dr. Ganesh B, Junior Resident,
Dept. of Respiratory Medicine

Dr. Arjun P, Senior Consultant,
Department of Respiratory Medicine

Dr. Ameer KA, Senior Consultant,
Dept. of Respiratory Medicine

Dr. Vinodkumar Kesavan, Senior Consultant,
Dept. of Respiratory Medicine

Dr. Rajalakshmi A, Senior Consultant,
Dept. of Infectious Diseases

Dr. Muhammad Niyas, Associate Consultant,
Department of Infectious Diseases

Dr. Muralidharan R, Senior Consultant,
Dept. of Critical Care Medicine

Dr. Deepak V, Senior Consultant,
Dept. of Critical Care Medicine

**Time line of COVID**

| | |
|---|---|
| Day 0: | Patient gets infected |
| Days 0 - 5: | Onset of symptoms |
| Day 7: | IgM positive (D7- D 21) |
| Day 14: | IgG positive |
| Days 1-28: | SARS CoV2 RNA & Antigens will be positive |
| Day 21: | IgM disappears |
| Day 28: | SARS CoV2 RNA & Antigens disappear |
| D0 - D5: | Asymptomatic phase |
| D0 - D7: | Window period (only PCR and antigen tests are positive in this phase) |
| D 14- D21: | Phase of decline (but still infective) |
| D 21- D28: | Convalescence phase (PCR may be positive, but patient is not infective) |

Dr. Arjun P, Senior Consultant
Dr. Ameer K A, Senior Consultant
Department of Respiratory Medicine

Address for Correspondence
Dr. Arjun P, Senior Consultant
email : dr.p.arjun@gmail.com

# Ultraviolet Keratitis

Dr. Asgar Abbas
Dr. Sarath Ravi
Dr. Suseela B Nair

Department of Ophthalmology

## Abstract

We report a case which presented to the ER at night with symptoms similar to viral conjuctivitis. Patients with conjunctivitis usually do not report as an emergency. The patient was exposed to UV light in the biomedical dept in the morning. Examination revealed a case of b/l UV keratitis. Patient was treated with lubricants, antiinflammatory e/d and resolved after 3 days.

Keywords: Ultraviolet (UV), Superficial Punctate Keratitis (SPK)

## Introduction

Ultraviolet (UV) light is the most common cause of radiation injury to the eye. The cornea absorbs most UV radiation. UV radiation damage to the corneal epithelium is cumulative, similar to the effects with dermal epithelium (sunburn). Ozone in the atmosphere effectively filters most of the harmful UV radiation of wavelengths shorter than 290 nm; natural UV sources, such as the sun, rarely cause injury after short exposures. However, unprotected exposures to the sun or solar eclipses or exposure to the sun on highly reflective snow fields at high elevation can lead to direct corneal epithelial injury. The latter clinical scenario is known as snow blindness.

Artificial sources of UV radiation also cause corneal damage. Injury from a welder's arc commonly is known as flash burn, welder's flash, or arc eye. Other sources of UV radiation injury include sun tanning beds, carbon arcs, photographic flood lamps, lightning, electric sparks, and halogen desk lamps. Several outbreaks of ultraviolet keratitis have been observed after installation of improper lighting resulting in high levels of UV radiation.[1]

Now because of the COVID-19 pandemic there is an increase in demand for UV-sterilization equipments and staff involved in manufacturing them are exposed to uv light especially UV-c. Most of the staff who work in this area do not use any eye protection Prolonged exposures to UV radiation can lead to chronic solar toxicity, which is associated with several ocular surface disorders (eg, pinguecula, pterygium, climatic droplet keratopathy, squamous metaplasia, carcinoma). The only ocular cancer associated with UV radiation is epidermoid carcinoma of the bulbar conjunctiva, which occurs with increased frequency in the tropics and subtropics and has been experimentally replicated in animal models using UV radiation. Rarely, retinal absorption of visible to near-infrared (400-1400 nm) radiation from welding arcs can lead to permanent, sight-threatening injury.

## Case report

A 26 yr old male presented with complaints of pain, redness, photophobia, watering in both eyes to the emergency department in the night. Patient gives h/o working in the biomedical derpartment with UV related equipment and was exposed intermitently to UV light especially UV-c light in the morning. Examination revealed lid edma, diffuse conjunctival congestion, superficial punctate picture of the cornea which was confirmed with fluoresceine staining. Although it was similar to other causes for conjunctivitis history of UV exposure confirmed the diagnosis. He was put on lubricants, antinflammatory and cycloplegics eye drops. The keratitis subsided after 3 days.

**Discussion**

The cornea transmits most of the visible light spectrum, including the UV spectrum, with absorption by the corneal epithelium.[3] The cornea absorbs 10%-20% of UV-A and close to 100% of UV-C.[4] UV rays irritate the superficial corneal epithelium, causing inhibition of mitosis, production of nuclear fragmentation, and loosening of the epithelial layer. Under experimental conditions in animals, phototoxic effects have been demonstrated at all levels of the cornea, including the stroma and endothelium.[5]

An inflammatory response occurs, which includes edema and congestion of the conjunctiva and a stippling of the corneal epithelium known as superficial punctate keratitis (SPK). SPK is a nonspecific corneal condition associated with multiple ocular disorders. It is characterized by small pinpoint defects in the superficial corneal epithelium, which stain with fluorescein. If SPK is severe, it may be followed by total epithelial desquamation, with conjunctival chemosis, lacrimation, and blepharospasm. Reepithelialization usually occurs within 36-72 hours, and long-term sequelae are rare.

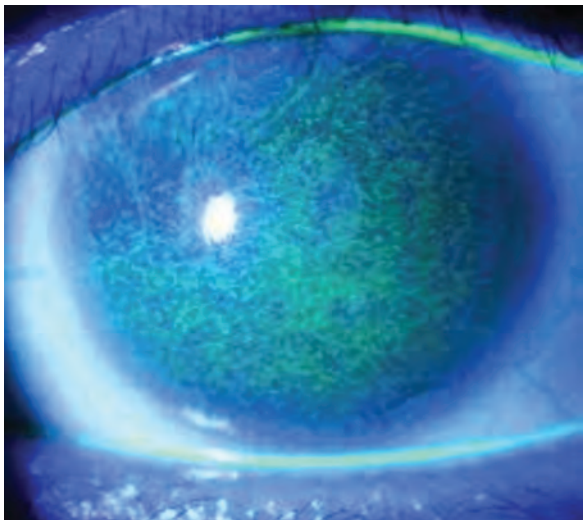


Fig. 1

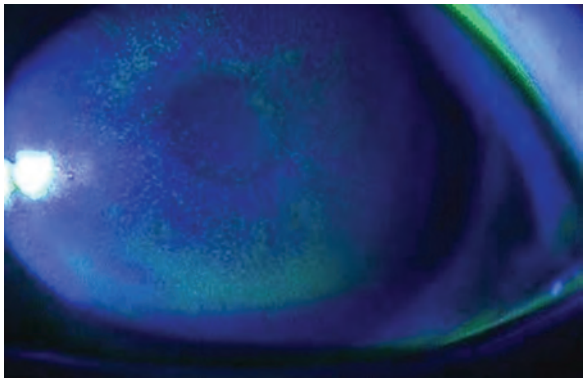


Fig. 2

Diffuse uptake of fluorescein stain as seen in ultraviolet keratitis.

In general, ocular pain, photophobia, redness, and decreased visual acuity occur 6-12 hours after the injury. This lag time involves an unexplained pattern of corneal sensory loss and return and is thought to indicate a probable photochemical injury rather than a thermal injury to the cornea.

**Mortality/Morbidity**

No reported mortality occurs. Morbidity results from UV radiation damage to the superficial corneal epithelium, which usually heals spontaneously within 48-72 hours of the exposure. Long-term sequelae, which may result from superinfection, are rare.

**Sex**

No difference in incidence is observed between males and females.

Prognosis

The prognosis is excellent with full recovery within 24-76 hours.

**Patient education**

Educate patients about proper eye precautions, such as the use of UV-filtering lenses or limiting exposure to the sun. The condition is preventable with the appropriate precautions.

**References**

1. Finn LE, Gutowski J, Alles S, Mirowitz N, Johnson C, Osterhoudt KC, et al. Photokeratitis Linked to Metal Halide Bulbs in Two Gymnasiums - Philadelphia, Pennsylvania, 2011 and 2013. *MMWR Morb Mortal Wkly Rep*. 2016 Mar 25. 65 (11):282-5. [Medline].

2. Contín MA, Benedetto MM, Quinteros-Quintana ML, Guido ME. Light pollution: the possible consequences of excessive illumination on retina *Eye (Lond)*. 2015 Nov 6. [Medline].

3. Podskochy A. Protective role of corneal epithelium against ultraviolet radiation damage. *Acta Ophthalmol Scand*. 2004 Dec. 82 (6):714-7. [Medline].

4. Parrish CM, Chandler JW. Corneal trauma. Kaufman HE, et al, eds. *The Cornea*. New York: Churchill Livingstone; 1988.

5. Schein OD. Phototoxicity and the cornea. *J Natl Med Assoc*. 1992 Jul. 84(7):579-83. [Medline].

6. Collier SA, Gronostaj MP, MacGurn AK, Cope JR, Awsumb KL, Yoder JS, et al. Estimated burden of keratitis--United States, 2010. *MMWR Morb Mortal Wkly Rep*. 2014 Nov 14. 63 (45):1027-30. [Medline].

7. Daxecker F, Blumthaler M, Ambach W. Ultraviolet exposure of cornea from sunbeds. *Lancet*. 1994 Sep 24. 344(8926):886. [Medline].

7. [Guideline] Eye. Elk Grove Village: American College of Occupational and Environmental Medicine (ACOEM); 2004. 77 p. [Full Text].

8. Brown MD, Cordell WH, Gee AS. Do ophthalmic nonsteroidal anti-inflammatory drugs reduce the pain associated with simple corneal abrasion without delaying healing?. *Ann Emerg Med*. 1999 Oct. 34(4 Pt 1):526-34. [Medline].

9. Karai I, Matsumura S, Takise S, Horiguchi S, Matsuda M. Morphological change in the corneal endothelium due to ultraviolet radiation in welders. *Br J Ophthalmol*. 1984 Aug. 68 (8):544-8. [Medline]

Dr. Asgar Abbas
Consultant
Dept. of Ophthalmology

Dr. Sarath Ravi
Retina Consultant
Dept. of Ophthalmology

Dr. Suseela B Nair
Hon. Senior Consultant
Dept. of Ophthalmology

Address for Correspondence
Dr. Asgar Abbas
Consultant
Dept. of Ophthalmology
email: drasgar.abbas@kimsglobal.com

# COVID-19 management - Innovations in Clinical Engineering

Renjith R

Department of Clinical Engineering

## Basic ventilator for mass causality environments

### Introduction

Respiratory failure constitute a major health problem due to the outbreak of the COVID-19 pandemic. Patients developing respiratory failure can be supported by mechanical ventilation. While the ventilators used in modern hospitals are functionally and technologically sophisticated, their production time and acquisition costs are correspondingly high. There are enough ventilators for regular use, but there is a lack of preparedness for cases of mass casualty situations. The costs of stockpiling and deployment of state-of-the-art mechanical ventilators for mass casualty settings are prohibitive and hence the need for an inexpensive basic ventilator.

Compressing a conventional Ambu bag with a pivoting arm, eliminating the need for a human operator was the solution provided by most of the new players to this segment. Its simplicity comes with a compromise as the exhalation depends on the elasticity of the ambubag, flow/ tidal volume, I-time & E-time cannot be precisely adjusted by the user, making it inappropriate for many patients. Apart from this, it cannot be operated for long period of time as the bag crumples under compression, loses its elasticity, preventing an accurate and repeatable tidal volume delivery.

### Device design

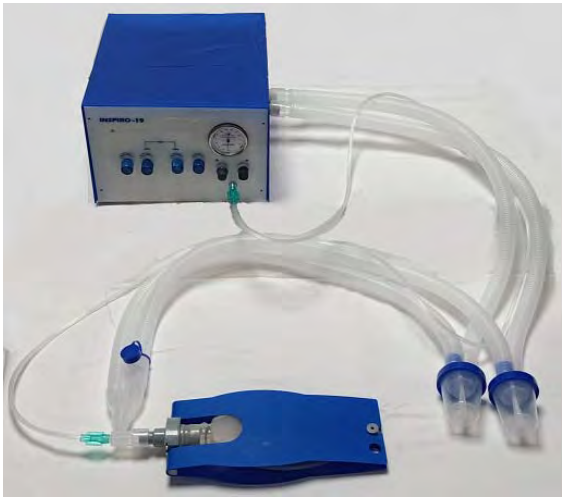
The design and fabrication of this prototype was to provide a viable concept to the industry to meet the urgent increase in demand for ventilators arising due to the COVID-19 pandemic. In light of the aforementioned requirements, a set of clinical, mechanical, user interface requirements were studied and summarized.

The device uses a constant oxygen & air pressure source to intermittently deliver breaths with the help of an electronically operated solenoid valve. A technology which is the simplest embodiment of a volume controlled ventilator and they inherently provide the basic needs required for a ventilated patient. This design reduces power requirements and reduces the need for expensive electronic and pneumatic components. Hence the productions in large volume are possible as these components are readily available across the world.

A bench level experiment was conducted on the first prototype to determine performance characteristics. The square wave pulses was fixed to 1.5sec ON & 1.5sec OFF time. A pressure gauge in the range of 0.0cm $H_2O$ to + 120cm $H_2O$ was used to measure patient circuit pressure and tidal volume measured with the flow analyzer.The measured volume was between 100 ml to 750 ml based on the flow being set. Ways to minimize dead space was explored, including the option of using a bag valve mask placed at the proximal end of the patient circuit. The results showed pressure pulsation at the beginning of each breath, prompting further design modifications.

A second prototype was built with additional features in which variable Inspiratory Time, Expiratory Time, FiO2 and PEEP control were incorporated. The I-Time ranged from 0.2sec to 3.0sec and E-Time ranged 0.2sec to 3.0sec. All the components were moved inside the enclosure. Additional visual indicators were provided for Power 'ON' status, Inspiratory & Expiratory phases. A bag valve used

as exhalation assembly and placed within the enclosure, distal to the patient end, with counter flow for dampening of pulsations and smooth rise to peak pressure during inspiratory phase. With the range of pulse time provided for I-Time and E-time, variable flow from 1 to 30lpm, the minute volume achievable was from 0.2L to above 12.0L which is adequate for most clinical situations.



**Parameters and User Interfaces**

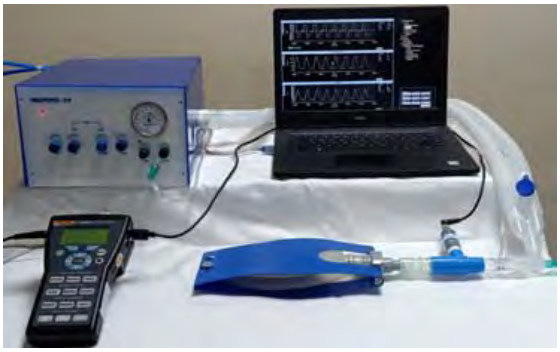
The operator can select the Inspiratory time and Flow rate to determine the Tidal volume appropriate to the patient thereby ensuring a minimum assured minute ventilation. The user inputs I-Time & E-Time are set via potentiometer knobs. Required oxygen % can be set with combination of Oxygen & Air flow controls knobs, and PEEP levels varying from 2.0cm$H_2O$ to 15.0cm$H_2O$ can be set using the designated control knob. The control ranges on the final design will be determined to allow for the broadest range of safe settings.

**Safety features**

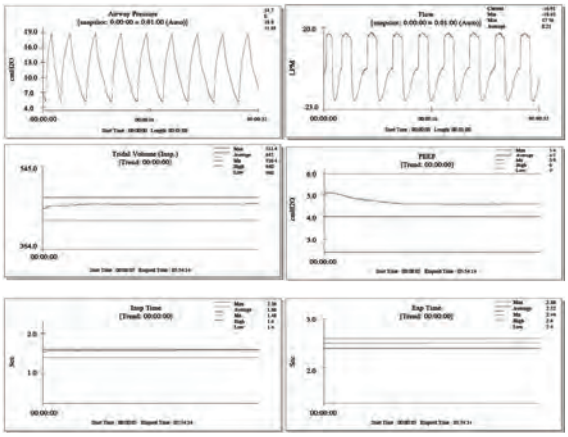
Inspiratory and Expiratory phases are indicated with red and green LED. The airway pressure is monitored with a pressure gauge connected to the proximal end of the patient circuit. As a further safety measure to prevent over-inflation, the device includes a mechanical over pressure relief valve set at 40.0cm$H_2O$.

**Analysis and testing**

The ventilation parameter performance data was collected using Fluke VT-Mobile flow analyzer and accuracy of the electronic pulses was verified using a CRO, Tektronix model TDS1002. Both the master test equipment holding valid NABL traceable calibration certificates.



Extensive testing of the ventilator's performance and repeatability tests was conducted for a period of 6 hours each, on two successive days.



The performance test data was collected and recorded with the Fluke Ansur Software ver.3.1.4, and details reviewed and analyzed. The performance of the unit was steady and within acceptable limits throughout the duration of testing, however further refinement of PEEP control mechanism are prompted by the results.

**Conclusions**

A working prototype, named INSPIRO-19, that can be operated on a test lung has been developed.


The prototype has user-controlled Inspiratory time, Expiratory time, Flow rate, PEEP & FiO2. It also features an over-pressure relief mechanism. It has low power requirements, portable, measuring 14 cm x 16cm x 28 cm, weighs 3.6 kg. The prototype can display Power 'ON' status, Inspiratory and Expiratory phases. Further development of this concept is planned. Future iterations will incorporate changes prompted by the results of our prototype testing.

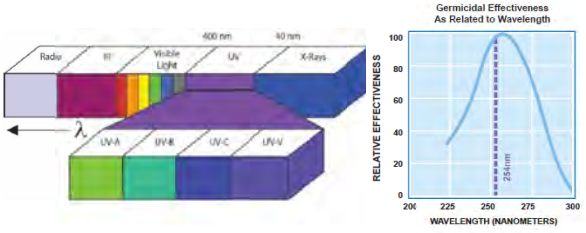
**Portable ultraviolet light disinfection unit**

UV has been used for disinfection since the mid-19th century, when sunlight was investigated for bactericidal effects. UV technology has advanced in recent years to become more reliable and is widely used in research facilities in biological safety cabinets.

The ongoing pandemic of COVID-19 has severely stressed the worldwide healthcare system and has demanded the use of UV to provide disinfection of room surfaces in addition to existing cleaning methods. In an effort to provide a cost effective solution, we developed a surface decontamination unit-**Spectra-MUV** involving the delivery of ultraviolet germicidal irradiation (UVGI) which is mobile & easy to use.

**Principle of operation**

Ultraviolet light exists within the spectrum of light between 40 and 400 nm.The germicidal range of UV is within the 100-280nm wavelengths, known as UV-C, with the peak wavelength for germicidal activity being 265 nm.




This range of UV light is absorbed by the DNA and RNA of microorganisms, which causes changes in the DNA and RNA structure, rendering the microorganisms incapable of replicating. A cell that can't reproduce is considered dead; since it is unable to multiply to infectious numbers within a host. This is why UV disinfection is sometimes called ultraviolet germicidal irradiation (UVGI)

**What is UV effective against?**

UV has been proven effective against a broad spectrum of microorganisms. Viruses contain RNA or DNA and are thus susceptible to irradiation. Bacteria and fungi both contain DNA and are similarly vulnerable to UV light. Spores are also susceptible to UV. Bacteria are generally easier to inactivate than viruses, with fungi and spores being even harder to inactivate with UV.

UV operates in a "line-of-sight" fashion, only irradiating surfaces within its sightlines. Surfaces can be blocked from the light if objects are in the way. These areas that become blocked from the UV light are commonly referred to as shadow areas. Surfaces in these shadow areas do not receive adequate disinfection as UV light does not have the ability to reflect well off surfaces. Shadow areas are typically dealt with by moving the UV light source to a second position to accommodate disinfection of the surfaces blocked from UV disinfection the first time.

Distance also plays a factor into the efficacy of UV light. The strength of the UV-C light decreases the further away it gets from the light source, following the inverse square law. This means that at twice the distance, the UV-C will have ¼ of its power that was present at the original reference point. This relationship limits how far a single

source of UV light is effective before it is too weak to provide adequate disinfection.

UV light does not penetrate well into organic materials, so for best results UV-C should be used after a standard cleaning of the room to remove any organic materials from surfaces.

UV light is blocked by a number of materials, including glass, acrylic and most clear plastics.

**Safety**

As UV-C provides radiation, it is not safe to be in the room while UV-C disinfection is taking place. UV-C is classified as "reasonably anticipated to be a human carcinogen" and presents a hazard to skin and eyes, so direct exposure to UV-C is always to be avoided. UV-C provides residue free disinfection. The process is environmentally friendly in that there are no dangerous or toxic chemicals that require specialized storage or handling. Since no chemicals are added to the air/water, there are no process byproducts to be concerned with. The UV bulbs do not require special handling or disposal either, making the system a green alternative to chemical disinfectants.

**Benefits**

While there are definite limitations to UV-C disinfection technologies, there are many benefits as well. Disinfection times are fast, with a typical disinfection cycle lasting about 15-30 minutes. This allows for extremely fast turnover times for rooms or other spaces being disinfected. All surfaces within a certain distance will observe an assured level of disinfection in a certain amount of time as long as the light is not blocked from shining on that surface. The cost to run UV systems is very low, as systems are powered by regular wall outlets. UV systems also require little maintenance and upkeep due to their simplistic nature. UV bulbs last thousands of hours at their peak output, limiting the need for routine consumable change out and maintenance.

**Spectra-MUV: design**

The Spectra MUV-Ultraviolet Portable units have been carefully envisaged to provide germicidal UV disinfection for purifying air and exposed surfaces in an unoccupied area by means of germicidal ultraviolet lamps. These special lamps generate high levels of germicidal ultraviolet radiation lethal to infectious microorganisms.

**Features**

- The Spectra MUV utilizes three numbers of PL Type high-output UV-C bulbs to achieve efficient disinfection.
- The UV-C bulbs are angled to increase the dosage applied to the surfaces and floors.
- Ceilings usually do not receive the same level of cleaning that floors get, so angling the bulbs allows the room to get a more complete disinfection.
- The center of the Spectra is open so that each of the UV-C bulbs can radiate its light to maximum degrees.

**Ease of use**

- The Spectra MUV draws only 6 amps of power, allowing it to be plugged into any outlet.

- No special room preparation is required.
- Clearly labeled remote control for operation / Mobile app with timer and remote operation via Bluetooth is also available for home / office purpose usage.
- Mounted on castors with soft rubber for easy mobilization.
- No chemicals to store and handle.

**Safety features**

- Each Spectra MUV comes with a remote / mobile app to allow the user to start, stop, and reset the unit from a safe location.
- The Spectra MUV system must be manually reset if safety device is tripped. This prevents inadvertent restart of UV exposure as a further safety precaution.
- Protective Cover – heavy duty acrylic cover is provided toprotect the lamps from damage when moving it / storage.

**Analysis and Testing**

The effectiveness of Spectra MUV was assessed by the Department of Microbiology, KIMS. Active bacterial culture was exposed to UV. Multiple level of testing with different time span and distances was done and the system was found to be effective. The performance of the unit was found to be steady and meets the criteria.

**Conclusion**

A working prototype-Spectra MUV-Portable UV-C disinfection unit was developed. The prototype has safety and user friendly features and provides a cost effective solution for providing disinfection of room surfaces in addition to existing cleaning methods.

R Renjith
Group Manager-Clinical Engineering
renjith.r@kimsglobal.com

# Practice of preventive measures in COVID-19 among patients with cardiac disorders attending cardiac OPD

Dr. Susan Jose
Stalin Lyse
Sari S Karun
Mahima P S
Ragee Rajeevan
Ambily S
Soumya M S
Anjali K

Department of Medical-Surgical Nursing
KIMS College of Nursing

## Abstract

The present study was conducted to assess the practice of preventive measures in COVID-19 among patients with cardiac disorders attending cardiac OPD in a tertiary care hospital, Thiruvananthapuram. The objectives of the study were to assess the practice of preventive measures in COVID-19 among patients with cardiac disorders and find out the association between the practice of preventive measures in COVID-19 among patients with cardiac disorders and selected socio-personal variables. Non experimental descriptive research design was used for the study. Hundred patients with cardiac disorders attending cardiac OPD who satisfied the inclusion criteria were participated in the study by non-probability purposive sampling technique. Questionnaire to assess socio-personal variables and Semi–structured practice questionnaire consisting of 30 questions to assess the practice of preventive measures in COVID-19 were given through interview schedule and data was collected. The findings showed that 97% of cardiac patients had good level of practice of preventive measures in COVID-19 and 3% had satisfactory level of practice of preventive measures in COVID-19. There was no significant association between the level of practice of preventive measures in COVID-19 with selected socio-personal variables. This may be due to consistent messaging from the health authorities and government regarding the preventive measures to combat the disease.

Keywords: Level of practice; Preventive measures; COVID-19.

## Introduction

"What the world needs now is the solidarity. With solidarity we can defeat the virus and build a better world"

Coronavirus disease (COVID-19) is an infectious disease caused by a newly discovered corona virus. In December 2019, a pneumonia outbreak was reported in Wuhan, China. On 31$^{st}$December 2019, the outbreak was traced to a novel strain of corona virus. The outbreak was declared a public health emergency of international concern on 30$^{th}$January 2020. On 11$^{th}$March 2020, the World Health Organization declared a pandemic of COVID-19.[1]

## Background

A person with pre-existing heart disease, diabetes, hypertension who becomes ill with COVID-19 may suffer a heart attack or develop congestive heart failure. This is due to the combination of severe viral illness and its increased demand on the heart. It is compounded by low oxygen levels due to pneumonia and increased propensity for blood clot formation. In addition to this myocarditis has also been observed in COVID-19 patients as complication.[2]

Emerging data suggests that CoV-2 infection may culminate in serious cardiovascular injury or worsening of existing cardiovascular disease.[3]

A comparative study was conducted in Italy among 99 patients to compare demographic characteristics, clinical presentation, and outcomes of patients with and without cardiac disease. 53 patients with a history of cardiac disease were compared with 46 without cardiac disease. Among cardiac patients, 40% had a history of heart

failure, 36% had atrial fibrillation, and 30% had coronary artery disease.During hospitalization, among 99 patients, mortality was higher in patients with cardiac disease compared with the non cardiac patients. (36% vs. 15%). The rate of thrombo-embolic events and septic shock during the hospitalization was also higher in cardiac patients (23% vs. 6% and 11% vs. 0%, respectively). The study concluded that hospitalized patients with concomitant cardiac disease and COVID-19 have an extremely poor prognosis and high mortality compared with subjects without a history of cardiac disease.[4]

**Need and significance**

An article published in JAMA Cardiology demonstrated factors associated with outcomes in 187 patients with COVID-19. The findings showed that 35% had underlying CVD (hypertension, coronary heart disease, or cardiomyopathy), and 28% showed evidence of acute myocardial injury. Mortality was significantly higher in individuals with high troponin T levels than in those with normal troponin T levels. In addition, patients with high troponin T levels were older and had more co morbidities, including hypertension, coronary heart disease, cardiomyopathy, and chronic kidney disease.[5]

A systematic review of 172 observational studies across 16 countries and six continents on COVID-19 was conducted to investigate the optimum distance for avoiding person-to person virus transmission and to assess the use of face masks and eye protection to prevent transmission of viruses. The study finding suggested that the transmission of viruses was lower with physical distancing of 1 m or more, compared with a distance of less than 1m. The study also revealed that use of face mask could result in a large reduction in risk of infection, with stronger associations with N95 or similar respirators compared with disposable surgical masks or similar. Eye protection also was associated with less infection. The study concluded that optimum use of face masks, respirators, and eye protection in public and health-care settings, should be informed by these findings.[6]

A cross-sectional study conducted in Saudi Arabia among 3388 participants to assess the differences in mean scores, and identify factors associated with knowledge, attitudes, and practices toward COVID-19 revealed high level of knowledge (mean score 17.96, SD = 2.24, range: 3–22) optimistic attitude (mean score28.23, SD = 2.76, range: 6–30) & good practices (mean score4.34,SD = 0.87, range: 0–5). The study also found that older adults are likely to have better knowledge and practices, than younger people. **The study also** suggests that targeted health education interventions should be directed to particular vulnerable population, who may be at increased risk of contracting COVID-19.[7]

The future course of this virus is unknown. Pre-existing cardiovascular disease and hypertension in addition to age and diabetes have emerged as fairly strong associates of a poor outcome in patients with this disease. All cardiac patients should follow basic preventive measures such as hand washing, use of mask, respiratory etiquette and social distancing to prevent contracting the disease and avoiding any adverse outcome.[8]

From the above facts and study findings it is clear that there is a need for assessing the practice of preventive measures in COVID-19 among cardiac patients.

**Statement of the problem**

A study to assess the practice of preventive measures in COVID-19 among patients with cardiac disorders attending cardiac OPD in a tertiary care hospital, Thiruvananthapuram.

**Objectives**

- Assess the practice of preventive measures in COVID-19 among patients with cardiac disorders attending cardiac OPD.
- Find out the association between the practice of preventive measures in COVID-19 among patients with cardiac disorders and selected socio-personal variables.

**Hypothesis**

- $H_1$:There is significant association between the practice of preventive measures in COVID-19 among patients with cardiac disorders attending cardiac OPD and selected socio-personal variables such as age, gender, education, **history of travelling in last 14 days,** history of contact with infected /migrant, history of quarantine, type of heart disease, duration of heart disease, presence of co-morbidities.

**Methodology**

**Research approach**: Quantitative research.

**Research design**: Non experimental descriptive research design.

**Setting:** Cardiac OPD of KIMS Hospital, Trivandrum.

**Population**

- **Target population:** Patients with cardiac disorders.
- **Accessible population:** Patients with cardiac disorders attending cardiac OPD of KIMS Hospital, Trivandrum.

**Sample:** Patients with cardiac disorders attending cardiac OPD of KIMS Hospital, Thiruvananthapuram who meet the inclusion criteria.

**Sample size:** 100

**Sampling technique:** Non-probability purposive sampling technique.

**Criteria for sample selection**

**Inclusion criteria**

- Patients with cardiac disorders who are willing to participate in the study.
- Patients with cardiac disorders who are able to understand English or Malayalam.

**Exclusion criteria**

- Patients with cardiac disorders who are critically ill.
- Patients with cardiac disorders who are mentally ill.

**Description of the tool**

The data was collected by Semi-Structured questionnaire consisting of two sections.

Section A: Questionnaire to assess socio-personal variables.

Section B: Semi-Structured practice questionnaire consisting of 30 questions to assess the practice of preventive measures in COVID-19 among patients with cardiac disorders.

**Data collection procedure**

Ethical clearance was obtained from Institutional Review Board. The data collection for the study was done from 17-06-2020 to 29-06-2020. Informed consent was obtained from the subjects and data was collected by interview method using a semi-structured practice questionnaire. After data collection a pamphlet on "Preventive measures in COVID-19"was provided.

**Analysis and Interpretation of data**

The data collected from 100 cardiac patients were tabulated and analysed using SPSS (Statistical Package for Social Sciences) software on the basis of objectives and hypothesis formulated in the study.

The data were organized and presented under the following headings.

Section A: Description of socio-personal variables of cardiac patients.

Section B: Level of practice of preventive measures in COVID-19 among patients with cardiac disorders.

Section C: Association between level of practice of preventive measures in COVID-19 among patients with cardiac disorders with selected socio personal variables.

**Section A: Description of socio-personal variables of cardiac patients.**

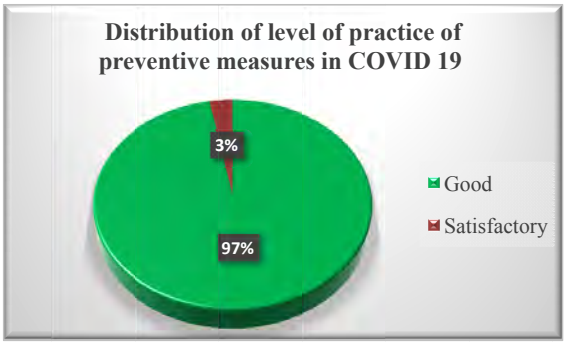
Table 1: Frequency distribution and percentage of socio-personal variables of cardiac patients

**n=100**

| Sample characteristics | Frequency | Percentage |
|---|---|---|
| **Age** | | |
| 30-39 years | 1 | 1 |
| 40-49 years | 14 | 14 |
| 50-59 years | 21 | 21 |
| >60 years | 64 | 64 |
| **Gender** | | |
| Male | 69 | 69 |
| Female | 31 | 31 |
| **Education** | | |
| Primary | 11 | 11 |
| High School | 43 | 43 |
| Graduate or diploma | 42 | 42 |
| Post graduate and above | 4 | 4 |
| **History of travel in last 14 days** | | |
| Interstate | 3 | 3 |
| Interdistrict | 15 | 15 |
| Interstate + Interdistrict | 1 | 1 |
| No history | 81 | 81 |
| **Contact history with infected / migrant** | | |
| Yes | | |
| No | 100 | 100 |
| **Quarantine history** | | |
| Yes | 1 | 1 |
| No | 99 | 99 |
| **Type of heart disease** | | |
| Congenital | 1 | 1 |
| Valvular disease | 6 | 6 |
| Coronary Artery Disease | 41 | 41 |
| Cardiomyopathies | 15 | 15 |
| Infective heart disease | 1 | 1 |
| Heart block with pacemaker | 36 | 36 |
| **Duration of heart disease** | | |
| < 10 years | 86 | 86 |
| 10.1-20 years | 12 | 12 |
| 20.1-30 years | 2 | 2 |
| **Presence of co-morbidities** | | |
| Yes | 72 | 72 |
| No | 28 | 28 |

**Section B:**

Level of practice of preventive measures in COVID-19 among patients with cardiac disorders.




**n=100**

Table 2: Practice of Hand washing among patients with cardiac disorders:

**n=100**

| Sl No | Steps | Always (%) | Sometimes (%) | Never (%) |
|---|---|---|---|---|
| 1 | Rub Palms together | 70 | 29 | 1 |
| 2 | Rub the Back of both hands | 65 | 29 | 6 |
| 3 | Interlace the Fingers | 66 | 28 | 6 |
| 4 | Interlock fingers and rub back of fingers of both hands | 58 | 33 | 9 |
| 5 | Rub Thumb in a rotating manner | 65 | 28 | 7 |
| 6 | Rub fingertips on palm for both hands | 67 | 25 | 8 |
| 7 | Rub both wrist in rotating manner | 65 | 28 | 7 |

Table 3: Use of mask among patients with cardiac disorders:

**n=100**

| Sl No | Practices | Always (%) | Sometimes (%) | Never (%) |
|---|---|---|---|---|
| 1 | Wear mask when leaving home | 99 | 1 | 0 |
| **2** | **Use N95 Mask** | 6 | 9 | 85 |
| 3 | Use Surgical mask | 28 | 23 | 49 |
| 4 | Use Cloth mask | 22 | 30 | 48 |
| 5 | Touch the outer surface of the mask | 4 | 42 | 54 |
| 6 | Pullup /put down the mask while talking or sneezing | 3 | 34 | 63 |
| 7 | Change a mask after 6 hours | 77 | 19 | 4 |

| | | | | |
|---|---|---|---|---|
| 8 | wash the used cloth mask with soap and water, disinfect it and dry in sunlight / iron it | 91 | 7 | 2 |

Table 4: Practice of Respiratory Hygiene among patients with cardiac disorders:

**n=100**

| Sl No | Practices | Always (%) | Some-times (%) | Never (%)` |
|---|---|---|---|---|
| 1 | Cover mouth and nose in any of the following manner while sneezing or coughing. | 64 | 32 | 4 |
| 2 | Dispose the used masks / tissues in a closed bin and wash hands. | 89 | 8 | 3 |
| 3 | Touch eyes, nose and mouth frequently. | 2 | 44 | 54 |
| 4 | Spit in public places. | 0 | 3 | 97 |
| 5 | Avoid contact with persons having respiratory infections. | 95 | 4 | 1 |

Table 5: Practice of Social Distancing among patients with cardiac disorders:

**n=100**

| Sl No | Practices | Always (%) | Sometimes (%) | Never (%) |
|---|---|---|---|---|
| 1 | Avoid social gatherings and crowd. | 95 | 5 | 0 |
| 2 | Maintain1 meter or 3 feet distance between self and others. | 95 | 5 | 0 |
| 3 | Leave home only for essential purposes. | 93 | 7 | 0 |

Among the seven steps in hand washing, 70 % of participants always followed the first step (practice of rub palms together) but the fourth step (practice of interlock fingers and rub back) was followed by only 58%. None of the participants were followed all the seven steps in hand washing.

Considering the use of mask, N95 mask is the preferable mask for cardiac patients, but only 6% used the N95 mask, 28% were used the surgical mask and 22 % used the cloth mask. Regarding respiratory hygiene, 95% had avoided contact with persons having respiratory infections and 100% maintained social distancing.

**Section C**

Table 6: Association between level of practice of preventive measures in COVID-19 among patients with cardiac disorders with selected socio-personal variables.

**n=100**

| Socio-personal variables | df | Chi Square | P value |
|---|---|---|---|
| Age | 3 | 1.510 | 0.841 |
| Gender | 1 | 1.839 | 0.226 |
| Education | 3 | 0.922 | 1.00 |
| History of travel in last 14 days | 1 | 0.413 | |
| Quarantine history | 1 | 0.031 | 1.00 |
| Type of heart disease | 5 | 2.551 | 0.521 |
| Duration of heart disease | 2 | 1.369 | 0.367 |
| Presence of comorbidities | 1 | 0.044 | 1.00 |

There was no significant association level of practice of preventive measures in COVID-19 among patients with cardiac disorders with selected socio-personal variables.

**Results**

**Section A**

**Sample characteristics based on socio-personal variables.**

Socio-personal data showed that 64 % of patients were within age group >60 years and 69 % were males. Among the study participants, 43% were graduates, 15% had interdistrict and 3% had interstate travel history in last 14 days. None of the cardiac patients had a history of contact with infected or migrant, 99 % of patients did not have a history of quarantine. 41% of the participants had coronary heart disease and 36% had heart block with pacemaker; 86% had < 10 yrs of duration of heart disease and 78% of the participants had comorbidities.

**Section B**

**Sample characteristics based on level of practice of preventive measures in COVID-19 among patients with cardiac disorders.**

The study result shows that 97% of participants had good level of practice regarding preventive measures in COVID-19 and 3% had satisfactory level of practice.

Among the seven steps in hand washing, 70 % of participants always followed the first step (practice of rub palms together) but the fourth step (practice of interlock fingers and rub back) was followed by only 58% of participants. None of the participants were followed all the seven steps in hand washing. Considering the use of mask, N95 mask is the preferable mask for cardiac patients, but only 6 % used the N95 mask, 28% were used the surgical mask and 22 % used the cloth mask. Regarding respiratory hygiene, 95% had avoided the contact with persons having respiratory infections and 100 % maintained social distancing.

**Section C**

**Association between level of practice of preventive measures in COVID-19 and selected socio-personal variables.**

There was no statistically significant association between level of practice of preventive measures in COVID-19 with selected socio personal variables such as age, gender, education, history of travelling in last 14 days, history of quarantine, type of heart disease, duration of heart disease and presence of co-morbidities.

**Discussion**

The present study revealed that 64 % of patients were>60 years old and 69 % of them were males;43% were graduates; 15% had interdistrict travel history and 3% had interstate travel history in last 14 days.

Considering the history of contact with infected or migrant, none of the cardiac patients had contact, 99 % of patients did not have a history of quarantine. 41% of participants had coronary heart disease and 36% had heart block with pacemaker; 86% of them had`< 10 yrs of duration of heart disease and 78% had presence of co-morbidities.

The present study revealed that 97% of participants had good level of practice of preventive measures in COVID-19 whereas only 3% had satisfactory level of practice. The present study finding is conclusive with the study conducted among the Malaysian public to assess the knowledge, attitudes and practices towards COVID-19. The result revealed that most participants were taking precautions such as avoiding crowds and practicing proper hand hygiene (87.8%). However, the wearing of face masks was less common (51.2%). The results highlighted the importance of consistent messaging from health authorities and the government as well as the need for tailored health education programs to improve levels of knowledge, attitudes and practices.[9]

The present study revealed that there was no statistically significant association between level of practice of preventive measures in COVID-19 and selected socio personal variables.

**Recommendations**

- Similar studies can be replicated on a large sample in different setting.
- A correlational study can be conducted on knowledge, attitude and practice of preventive measures in COVID-19.

**Conclusion**

The study concludes that the patients with cardiac disorders attending cardiac OPD had good level of practice regarding preventive measures in COVID-19. This may be due to consistent messaging from the health authorities and government regarding the awareness programmes to combat the disease, low incidence of disease during the period of study and trust in existing health care delivery system and governmental efforts.

**References**

1. Cennimo D J. Corona virus Disease 2019 (COVID-192020 Jun 08 ; Available from https://emedicine.medscape.com/article/2500114-overview.

2. Lee Lewis D K. How does cardiovascular disease increase the risk of severe illness and death from COVID-19? 2020 April 02; Available from https://www.health.harvard.edu/blog.

3. Ohad Oren etal .Corona virus Disease 2019 (COVID-19): Epidemiology, Clinical Spectrum and Implications for the Cardiovascular Clinician. American College of Cardiology; Apr 06, 2020

4. Inciardi M R etal . Characteristics and outcomes of patients hospitalized for COVID-19 and cardiac disease in Northern Italy. European Heart Journal, Volume 41, Issue 19, 14 May 2020, Pages 1821–1829.

5. Madjid Mohammad, Payam Safavi-Naeini, Scott D. Solomon et al.

   Potential Effects of Corona viruses on the Cardiovascular System: A systemic review.JAMA Cardiology, March 27, 2020.Availablefromhttps://jamanetwork.com/journals/jamacardiology.

6. Derek K chu, elie A akletal. Physical distancing, face masks, and eye protection to prevent person-to-person transmission of sars-cov-2 and COVID-19: a systematic review and meta-analysis. June 1, 2020 Available from https://doi.Org/10.1016/s0140-6736(20)31142-

7. Al-Hanawi MK, Angawi K, Alshareef N, Ameerah M. N, Hoda Z. Helmy, Abudawood Y, etal. Knowledge, Attitude and Practice toward COVID-19 among the Public in the Kingdom of Saudi Arabia: A Cross-Sectional Study. Public Health, 27 May 2020. Available from: https://www.frontiersin.org/articles/10.3389/fpubh.2020.00217.

8. Prof. (Dr.) MadanHemant. Concern for heart patients during corona virus. 2020 April 1: Available from https://www.Narayanahealth.Org/blog/concern-for-heart-patients-during-corona virus.

9. ArinaAnisAzlan, Mohammad RezalHamzah, Tham Jen Sern, SuffianHadiAyub, Emma Mohamad, "Public knowledge, attitudes and practices towards COVID-19: A cross-sectional study in Malaysia" PLOS ONE, Published: May 21, 2020, Available at https://doi.org/10.1371/journal.pone.0233668

Dr. Susan Jose
Principal

Stalin Lyse
Associate Professor

Sari S Karun
Associate Professor

Mahima P S
Associate Professor

Ragee Rajeevan
Assistant Professor

Ambily S
Assistant Professor

Soumya M S
Lecturer

Anjali K
Lecturer

Address for Correspondence
Sari S Karun
Associate Professor
email id: sariskarun@gmail.com

# Impact of COVID-19 lockdown on children

Jessy Thomas
Shibi V Mathew
Rashmi
Nimmy P S

Department of Child Health Nursing
KIMS College of Nursing

**Abstract**

The present study assessed the impact of COVID-19 lockdown on children. The objectives of the study were to assess the impact of COVID-19 lockdown on children and to find out the association between impact of COVID-19 lockdown on children and selected socio personal variables. Non-experimental descriptive design was used for the study. 240 children between the age group of 5-13 year were selected by non-probability snowball sampling. Self-reported questionnaire was used to assess the socio-personal variables and the impact of COVID-19 lockdown on children. The data was collected by online platform through google forms and were analyzed using descriptive and inferential statistics. The findings showed that 83.8% (201) of children had moderate level impact of covid-19 lockdown, 14.2%(34) had high impact and 2.1% (5) had low impact. There was no significant association between the impact of COVID-19 lockdown with selected socio personal variables.

Keywords: Impact, COVID-19 lockdown

## Introduction

Childhood is the time for children to be in school and at play, to grow strong and confident with the love and encouragement of their family and an extended community of caring adults. It is a precious time in which children should live free from fear, safe from violence and abuse.

Due to lockdown more than 91 percent of the world's students are out of school, due to school closures. During this crisis they have been restricted their activities inside the home which directly affected their play, social activities and overall wellbeing. Children have not been the face of this pandemic as they have largely been spared of the direct health effects of COVID-19. Studies indicate that they have been among its biggest victims with multiple side effects on their physical and psycho social wellbeing. This is a universal crisis and for some children the impact will be lifelong.

## Background

The COVID-19 Lockdown has a potentially far reaching, long term negative impact on children around the world. In India there are around 472 million children under the age of 18 and the number of children in Kerala is about 3.4 million.

A novel corona virus was identified in Wuhan, China in 2019 and has since spread globally, resulting in ongoing corona virus pandemic. According to union health of India, only 9 percent of those below 20 years of age have been found to be coronavirus positive. Due to lockdown more than 91 percent of the world's students are out of school, due to school closures. During this crisis they have been restricted their activities inside the home which directly affected their play, social activities and over all wellbeing.

## Need and significance

COVID-19 lockdown has struck children with a long period of isolation. Social distancing seems to be hitting children even more than the scare of the deadly virus. Children are getting highly restive and agitated in spite of social media connectivity, which can affect their play, academic activities, and overall well-being.

A study shows that social media and video games provide temporary escape from real life and offer forced

engagement during this COVID-19 lockdown. According to an analysis 99% of children lives in 186 countries are facing some form of movement restrictions due to COVID-19.

During this Lockdown period on the immediate concern of keeping ourselves and our loved ones healthy, we must also remember the millions of children who are at risk of this pandemic. What their worlds look like tomorrow, and what their future will ultimately look like, is also our responsibility today. According to UNICEF, in the face of this crisis, children are vulnerable to physical punishment which affects their total development.

From the above facts the researchers decided to assess the impact of COVID-19 lockdown in children.

**Problem statement**

A study to assess the impact of COVID-19 lockdown on children in a selected district, Kerala.

**Objectives**

- To assess the impact of COVID-19 lockdown on children.
- To find out the association between impact of COVID-19 lockdown on children and selected socio-personal variables.

**Hypothesis**

- $H_1$-There is significant association between impact of COVID-19 lockdown on children and selected socio-personal variables such as age, gender, standard of study, education of mother, education of father, place of living, type of school and number of siblings.

**Methodology**

**Research Approach-** Quantitative research.

**Research Design:** Non-experimental descriptive design.

**Setting:** Trivandrum District, Kerala.

**Population**

- **Target Population:** Children between the age group of 5-13 years.
- **Accessible Population:** Children between the age group of 5-13 years staying in Trivandrum district Kerala.

Sample: Children between the age group of 5-13 years.

Sample size: 240

Sampling technique: Non-probability Snow ball sampling.

**Criteria for sampling technique**

**Inclusion criteria**

- Children between 5-13 years of age.
- Those who are able to read and understand English.

**Exclusion criteria**

- Those who are not willing to participate.

**Research tool:** Self-reported questionnaire consists of two sections.

Section A: Socio-personal variables

Section B: Self-reported questionnaire on impact of COVID-19 in children.

**Data collection procedure**

Ethical clearance was obtained from the Institutional Review Board, data collection for the study was done from 06/05/2020 to 12/05/2020. The tool was send through email to the parents and the data was collected by using Google forms.

**Plan for data analysis:** Data was analyzed by descriptive and inferential statistics.

**Data analysis and Interpretation of data**

The data collected from 240 children between 5-13 years of age were tabulated and analyzed using SPSS (statistical package for social sciences) software, on the basis of objectives and hypothesis formulated in the study.

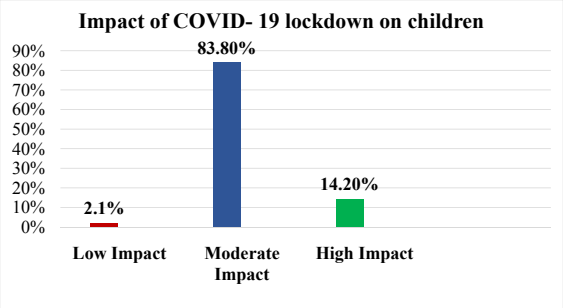
The data were organized and presented under the following headings.

- **Section A:** Description of Socio personal variables of children.
- **Section B:** Impact of COVID-19 lockdown on children.
- **Section C:**Association between impact of COVID-19 lockdown in children with selected socio-personal variables.

Table 1:Frequency distribution and percentage of Socio-personal variables of children.

**n=240**

| Sample characteristics | Frequency | Percentage |
|---|---|---|
| **Age** | | |
| 5-7 | 97 | 40.4 |
| 8-10 | 57 | 23.8 |
| 11-13 | 86 | 35.8 |
| **Gender** | | |
| Male | 117 | 48.8 |
| Female | 123 | 51.2 |
| **Standard of study** | | |
| Primary level | 142 | 59.1 |
| Upper primary | 58 | 24.2 |
| High school | 40 | 16.7 |
| Type of school | | |
| Government | 49 | 20.4 |
| Private | 191 | 79.6 |
| **Number of siblings** | | |
| 0 | 66 | 27.5 |
| 1 | 142 | 59.2 |
| 2 | 27 | 11.3 |
| 3 and above | 5 | 2.1 |
| **Place of living** | | |
| Urban | 142 | 59.2 |
| Rural | 98 | 40.8 |
| **Education of Mother** | | |
| SSLC | 11 | 4.5 |
| Higher secondary | 18 | 7.5 |
| Degree | 106 | 44.2 |
| Post-Graduation | 105 | 43.8 |
| **Education of Father** | | |
| SSLC | 13 | 5.4 |
| Higher secondary | 21 | 8.8 |
| Degree | 106 | 44.2 |
| Post-Graduation | 100 | 41.7 |




**Section B**

**Impact of COVID-19 lockdown on children**.

Bar diagram depicts that 83.80%(201) of children had moderate level of impact of COVID-19 lockdown whereas, 14.20%(34) of children had high impact and 2.1%(5) of children had low impact of COVID-19 lockdown.

**Section C**

Table 2: Association between impact of COVID-19 lockdown on children with selected socio-demographic variables.

**n=240**

| SocioPersonal variables | df | Chi Square | P value |
|---|---|---|---|
| Age | 4 | 8.015 | 0.091 |
| Gender | 2 | 1.951 | 0.377 |
| Standard of study | 4 | 3.557 | 0.469 |
| Place of living | 2 | 0.510 | 0.775 |
| Education of Mother | 6 | 4.489 | 0.611 |
| Education of Father | 6 | 6.290 | 0.392 |
| Type of school | 2 | 2.234 | 0.327 |
| Number of siblings | 6 | 2.341 | 0.886 |

There was no significant association between the impact of COVID-19 lockdown on children and selected socio-personal variables.

**Results**

- 40.4%(97) belonged to the age group 5-7 years, 35.8% (86) between 11-13 years.
- More than half of the children 51.2% (123) were females.
- 59.1% (142) of children were studying in primary level, 24.2 % (58) of children were in upper primary level.
- Majority of the children 79.6% (191) were studying in private schools.

- More than half of the children 59.3% (142) were living in urban area.
- 59.1% (142) of children have 1 sibling, 27.5%(66) of children have no siblings.
- The finding of the study reveals that 83.80%(201) of children had moderate level whereas 14.20% (34) of children had high impact and 2.1%(5) of children had low impact of COVID-19 lockdown.
- There was no significant association between the impact of COVID-19 lockdown on children and selected socio-personal variables.

**Discussion**

The present study revealed that out of 240 study participants, 40.4%(97) belonged to the age group 5-7 years, 51.2% (123) were females and 59 % (142) of children were studying in primary level. Majority of the children 79.7% (191) were studying in private schools

Considering the number of siblings 59.3% (142) of children were having 1 sibling and more than half of the children 59.3% (142) were living in urban area. Regarding the educational level of mother and father 44.2% (106) were graduate level of education.

The present study revealed that 83.80%(201) of children had moderate level impact of covid-19 lockdown. The present study finding is conclusive with the findings of the study conducted in Italy on 30th April 2020 among children in Verona. The result revealed that, children affirmed that eating, activity, and sleep behaviours changed in an unfavourable direction three weeks into their confinement during this COVID -19 lockdown.

The present study revealed that there is no significant association between the impact of COVID-19 lockdown in children and selected socio-personal variables.

**Recommendations**

- A comparative study can be done to assess the impact of COVID-19 lockdown in rural and urban sector.
- The similar study can be done to assess the impact of COVID-19 lockdown among adolescents.
- The present study can be conducted as an experimental study.
- A comparative study can be done to assess the impact of COVID-19 lockdown among boys and girls.

**Conclusion**

The tragic COVID-19 pandemic has collateral effects extending beyond those of direct viral infection. Children are struggling with the impacts placed in an unfortunate position of isolation that appears to create an unfavourable environment for maintaining healthy lifestyle behaviours. Recognition of the lockdown phenomenon is the first step in taking preventive measures.

**References**

1. PietrobelliA,Pecoraro L, FerruzziA,Heom,Faith M et.al. effects of COVID 19 lockdown on life style behaviour in children with obesity living in Verona,Italy: longitudinal study.(online).2020 April 30.availablefrom https://onlinelibrary.wiley.com/doi/10.1002/oby.22861.
2. Covid-19's Devastating impact on children. (online)2020/05/;Available from :URL:https://www.aljazeera.com/news/2020/05/children-facing-devastating-effect-coronavirus-report-200529100612364.html.
3. Policy brief; The Impact of children on covid-19 lockdown reviewunicef.Available from: URL:https://www.google .com.
4. Realizing children right in India- Humaniumhttps://www.humanium.org/en/india
5. https://the print.in,krithikasharma,UNESCO report .
6. www.unicef.org./Global insights/stories/rethinking-screen-time-time-covid-19.

Jessy Thomas
Professor, Dept. of Child Health Nursing
email: jessythomastvm@gmail.com

Shibi V Mathew
Assistant Professor, Dept. of Child Health Nursing

Rashmi
Assistant Professor, Dept. of Child Health Nursing

Nimmy P S
Assistant Professor, Dept. of Child Health Nursing

# COVID-19 related anxiety among antenatal mothers

Sherin Sara Koshy
Linu John
Shani S Rajappan
Lekshmi Lal S

KIMS College of Nursing

## Abstract

The present study aims to assess the level of COVID-19 related anxiety among antenatal mothers, to find out the association between level of COVID-19 related anxiety among antenatal mothers and selected socio-personal variables and to provide electronic self instructional module. The study design used was non experimental descriptive design. Non probability purposive sampling technique was used to select 60 antenatal mothers attending the antenatal OPD of selected hospital, Trivandrum. Data were collected using State Trait Anxiety Inventory Scale and analysed using descriptive and inferential statistics. The result showed that among 60 samples, 47(78.3%) have moderate level of anxiety, 11(18.3%) had low level of anxiety and only 2(3.3%) of samples have high level of anxiety regarding COVID-19 and age has a significant association with COVID-19 related anxiety. Result showed that antenatal mothers have moderate level of anxiety related to COVID-19 pandemic. The electronic self instructional module regarding COVID-19 stress management will enable the participants to top-up with the situation.

Keywords: COVID-19 related anxiety, Antenatal mothers

## Introduction

Pregnancy is an emotional time and anxiety is just one of many feelings that pregnant women experience.[1] Recent pandemic attack of COVID-19 has created an added stress and anxiety for pregnant women all over the world. Across the world, emerging reports suggest that anxiety and stress in pregnancy are associated with complications such as preeclampsia, depression, increased nausea and vomiting, preterm labor, low birth weight and low APGAR score[2].

Increasing mothers' awareness about the transmission of Corona virus, risk factors and red flags as well as providing telecounseling for pregnancy care and teletriage could help to reduce their anxiety and worry[3]. The risk of not attending antenatal care during this period can harm mother and fetus, hence maternity care is essential.

## Need and significance

COVID-19 is a global public health emergency and could cause devastating health issues during pregnancy. Pregnant women have a high propensity to acquire this infection due to their altered physiological and immunological function[4].

An article published in American Journal of Obstetrics and Gynecology regarding Corona virus Disease (COVID-19) and pregnancy. Article revealed that all the samples (18 pregnant women with COVID-19) were infected in the third trimester and clinical findings were similar to those in non-pregnant adults. Fetal distress and preterm delivery were reported in 9 cases and two cases ended in cesarean deliveries and there was no evidence of in-utero transmission[5]. Previous studies have indicated that SARS during gestation is linked with a high risk of spontaneous miscarriage, preterm birth and intrauterine growth restriction[4].

A survey was conducted among 71 pregnant women attending OPD of Coombe Women and Infants University Hospital, Ireland. The study revealed that over half of

women (50.7 %) worried about the health often or all the time. Pregnant women had heightened anxiety regarding the older relatives' health (83.3 %), concerned about other children (66.7 %) and unborn baby (63.4 %) [6].

The unpredictability of the pandemic, the effects of consequent restrictions, and the ensuing breeding of fear indicate that pregnant women can be affected by any aspect of the COVID-19 pandemic. As mentioned above, research on the psychological effects of the global epidemic on the general population is deficient, especially that focusing on pregnant women.[7] To fill this void, the researcher inquired into the effects of this crisis on anxiety in pregnant women.

**Statement of the problem**

A study to assess the COVID-19 related anxiety among antenatal mothers attending OPD's of a selected tertiary care hospital, Thiruvananthapuram.

**Objectives**

- To assess the level of COVID-19 related anxiety among antenatal mothers.
- To find out the association between level of COVID-19 related anxiety among antenatal mothers and selected socio personal variables.
- To provide electronic self instructional module.

**Hypothesis**

$H_1$ : There is significant association between level of COVID-19 related anxiety with selected socio-personal variables such as education, family status, parity, place of residence and monthly income.

**Materials and methods**

Non experimental descriptive research design was used in this study. Non probability purposive sampling technique was used to select 60 antenatal mothers attending the antenatal OPD of KIMS Hospital, Trivandrum.

Research tool consists of two sections:

Section A: Structured questionnaire to assess the socio-personal variable.

Section B: State Trait Anxiety Inventory Scale to assess the level of COVID-19 related anxiety during pregnancy.

**Data Analysis and interpretation**

The collected data was analysed using descriptive and inferential statistics. The data were organized and presented under the following headings.

Section A: Frequency and percentage distribution of socio-personal variables.

Section B: Level of COVID-19 related anxiety among antenatal mothers.

Section C: Association between level of COVID-19 related anxiety among antenatal mothers and selected socio-personal variables.

**Section A:**

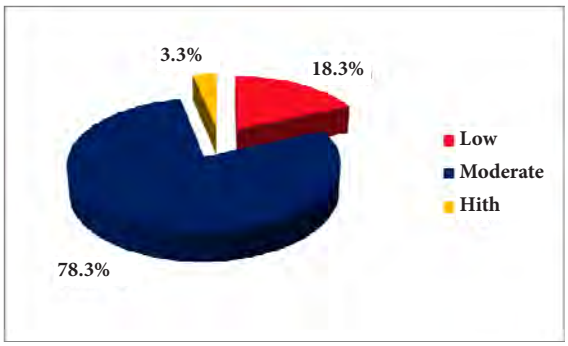
Table 1: frequency distribution and percentage of antenatal mothers based on socio-personal variables **n=60**

| Sample characteristics | Frequency | Percentage |
|---|---|---|
| **Age in years** | | |
| 20-25 | 17 | 28.3 |
| 26-30 | 28 | 46.7 |
| 31-35 | 12 | 20 |
| >35 | 3 | 5 |
| **Education** | | |
| Up to high school | 1 | 1.7 |
| Graduate | 34 | 56.7 |
| Post Graduate | 24 | 40 |
| Others | 1 | 1.7 |
| **Occupation** | | |
| House wife | 30 | 50 |
| Govt.employee | 7 | 11.7 |
| Private Sector | 18 | 30 |
| Others | 5 | 8.3 |
| **Place of residence** | | |
| Rural | 20 | 33.3 |
| Urban | 40 | 66.7 |
| **Monthly income** | | |
| <10,000 | 10 | 16.7 |
| 10,001-30,000 | 36 | 60 |

| | | |
|---|---|---|
| >30,000 | 14 | 23.3 |
| **Number of pregnancies** | | |
| Primi | 41 | 68.3 |
| Multi | 19 | 31.7 |
| **Source of information** | | |
| News paper | 5 | 8.3 |
| Internet | 18 | 30 |
| Television | 21 | 35 |
| Health Professionals | 16 | 26.7 |

**Section B**

Fig. 1: Level of COVID-19 related anxiety among antenatal mothers




**Section C**

**Table 2: Association between socio-personal variables and level of anxiety**

| Socio-personal variable | df | Chi Square | Table value | Inference |
|---|---|---|---|---|
| Age | 6 | 12.857 | 12.592 | Significant |
| Education | 6 | 6.527 | 12.592 | Not significant |
| Occupation | 6 | 7.470 | 12.592 | Not significant |
| Place of residence | 2 | 0.442 | 5.991 | Not significant |
| Monthly income | 6 | 4.455 | 12.592 | Not significant |
| Number of pregnancies | 2 | 2.292 | 5.991 | Not significant |
| Source of information | 6 | 5.582 | 12.592 | Not significant |

**Findings of the study**

Study concluded that among 60 samples, 47(78.3%) have moderate level of anxiety, 11(18.3%) had low level of anxiety and only 2(3.3%) of samples have high level of anxiety regarding COVID-19. There is a significant association between level of COVID-19 related anxiety and age.

**Discussion**

A similar study has been conducted among 360 antenatal mothers residing in China to investigate the effects of COVID-19 pandemic on depression and anxiety in pregnant women using an online survey. The study results point to an urgent need to provide psychosocial support to this population during the crisis. Otherwise, adverse events may occur during pregnancy and thus affect both mother and fetus. Only limited data have been derived regarding the psychological effects of this outbreak.

The present study revealed that there is moderate level (78.3%) of COVID-19 related anxiety among antenatal mothers.

**Conclusion**

All people are battling against the first and most powerful threat of the twenty-first century that is the COVID-19 pandemic. The entire world is focused on the global outbreak, and almost every country is affected by all aspects of this occurrence. An inevitable consequence of such a great life event is the psychological impact on vulnerable populations, such as pregnant women. Hence the necessity of psychological support for pregnant women during this crisis is a matter of great concern.

**Recommendations**

- Similar study can be conducted among more samples in another setting.
- An exploratory study can also be conducted since the current scenario really has worsened.
- An interventional study can be conducted by stress relief measures using pre-test and post-test design.
- A comparative study can also be conducted between primi and multiparous women to assess the COVID-19 related anxiety.
- A follow up study can be conducted to evaluate the effectiveness of electronic self instructional module.

**Limitations**

- Better generalization of the study would have been possible if the sample size was still larger.
- The study could have been more effective if conducted in various urban and rural sttings.

**References**

1. Côté-Arsenault D. Threat appraisal, coping, and emotions across pregnancy subsequent to perinatal loss. Nursing research. 2007 Mar 1;56(2):108-16.
2. Alder J, Fink N, Bitzer J, Hösli I, Holzgreve W. Depression and anxiety during pregnancy: a risk factor for obstetric, fetal and neonatal outcome? A critical review of the literature. The Journal of Maternal-Fetal & Neonatal Medicine. 2007 Jan 1;20(3):189-209.
3. Rasmussen SA, Smulian JC, Lednicky JA, Wen TS, Jamieson DJ. Coronavirus Disease 2019 (COVID-19) and Pregnancy: What obstetricians need to know. American journal of obstetrics and gynecology. 2020 Feb 24.
4. Omer S, Ali S, Babar ZU. Preventive measures and management of COVID-19 in pregnancy. Drugs & Therapy Perspectives. 2020 Apr 9:1-4.
5. Panahi L, Amiri M, Pouy S. Risks of novel coronavirus disease (COVID-19) in pregnancy; a narrative review. Archives of Academic Emergency Medicine. 2020;8(1).
6. Corbett GA, Milne SJ, Hehir MP, Lindow SW, O'connell MP. Health anxiety and behavioural changes of pregnant women during the COVID-19 pandemic. European Journal of Obstetrics, Gynecology, and Reproductive Biology. 2020 Apr 13.
7. Durankuş F, Aksu E. Effects of the COVID-19 pandemic on anxiety and depressive symptoms in pregnant women: a preliminary study. The Journal of Maternal-Fetal & Neonatal Medicine. 2020 May 15:1-7.

Sherin Sara Koshy
Associate Professor

Linu John
Assistant Professor

Shani S Rajappan
Assistant Professor

Lekshmi Lal S
Lecturer

Address for Correspondence
Sherin Sara Koshy
Associate Professor
KIMS College of Nursing
email: sherinskoshy@gmail.com

# COVID-19 outbreak related apprehension among general public of Kerala

Ann Mary Oommen
Joshy A N
Akhila L Prakash
Ambily S
Kavya K C

KIMS College of Nursing

## Abstract

The present study was conducted to assess COVID-19 outbreak related apprehension among general public of Kerala. The objectives of the study were to assess the level of COVID-19 outbreak related apprehension among general public and to find out the association between COVID-19 outbreak related apprehension and selected socio demographic variables. Non experimental descriptive research design was used for the study. Three hundred and seventy nine General public within the age group of 20-50 years who have accessibility to online platforms and who satisfied the inclusion criteria participated in the study by Non-probability Snowball sampling technique. Socio demographic questionnaire and Self-report questionnaire consisting of 20 statements to assess level of apprehension related to COVID-19 outbreak were distributed through google forms and data was collected. The findings showed that 49.92% of general public had low level of apprehension, 44.1 % had moderate and only 6% had high level of apprehension related to COVID-19 outbreak.The study showed a statistically significant association between COVID-19 outbreak related apprehension and education ($p < 0.005$), place of residence ($p < 0.001$) and current residential status ($p < 0.005$).The study concludes that the general public residing in Kerala had low level of apprehension related to COVID 19 outbreak. This may be due to the high recovery rate in the state, low incidence during the period of study and trust in existing health care delivery system and governmental efforts to combat the disease.

Keywords: COVID-19 outbreak related apprehension, General public.

## Introduction

In January 2020, the World Health Organization (WHO) declared the outbreak of novel coronavirus disease, COVID-19, as public health emergency of international concern. In March 2020, WHO made the assessment that COVID-19 can be characterized as a pandemic. It is a time of crisis generating stress throughout the population.[1]

The emergence of Corona Virus Disease 2019 (COVID-19) has caused confusion, changed people's living conditions, including commuting restrictions, fear of disease transmission, and closure of schools and businesses, and brought about devastating psychological impacts, like anxiety.[1]

## Background, need and significance of the study

The growing concern of the general public regarding the spread of infection from suspected COVID-19 positive individuals has created a panic mode in the community. This has also led to significant fear and anxiety related to spread of infection in the general public. Excessive fear and apprehension of spread of infection can lead to acute stress, anxiety, and subsyndromal to syndromal level of depression in vulnerable individuals.[2]

The study on the public psychological states and its related factors during the COVID-19 outbreak revealed that females' anxiety risk was 3.01 times high compared to males and there were anxiety in 6.33% and depression in 17.17% of the study participants.[3]

An article was published by American Journal of Managed Care on, how has covid-19 affected mental

health & severity of stress among employees. Nearly 7 in 10 employees indicated that the COVID-19 pandemic is the most stressful time of their entire professional career, which has aligned with stark increases in new prescriptions of antidepressant, antianxiety, and anti-insomnia medications. [4]

An article published was by Human Resource Executive on impact of the COVID-19 pandemic on employees. Workers reported experiencing moderate to extreme stress over the past 4 to 6 weeks. Among those reporting stress, 62% noted losing at least 1 hour a day in productivity and 32% lost at least 2 hours a day due to COVID-19–related stress.[5]

An online survey was conducted among 622 adult Indian population, during the COVID-19 pandemic regarding knowledge attitude, anxiety and perceived mental health care need. The responders had a moderate level of knowledge and attitude towards COVID-19 showed peoples willingness to follow government guidelines on quarantine and social distancing. Anxiety levels identified in the study were high and sleep difficulties, paranoia about acquiring COVID-19 infection and distress related to social media were reported in 12.5%, 37.8% an 36.4% participants respectively. The perceived mental health care need was seen in 80% of participants.[6]

**Statement of the problem**

An exploratory study to assess COVID-19 outbreak related apprehension among general public of Kerala.

**Objectives**

- Assess the level of COVID-19 outbreak related apprehension among general public.
- Find out the association between COVID-19 outbreak related apprehension and selected socio-demographic variables.

**Hypothesis**

$H_1$: There is statistically significant association between COVID-19 outbreak related apprehension and selected socio-personal variables such as age, gender, education, occupation and place of residence.

**Methodology**

**Research design**: Non experimental descriptive design.

**Setting:** Online platform accessible to general public residing in Kerala.

**Population**

**Target population:** General public of Kerala belonging to age group of 20-50 years.

**Accessible population:** General public of Kerala belonging to age group of 20-50 years and those who are accessing online platforms.

**Sample:** General public within the age group of 20-50 years, who have accessibility to online platforms.

**Sample size:** 379

**Sampling technique:** Non probability Snowball sampling

**Criteria for sample selection**

**Inclusion criteria**

- General public who are willing to participate in the study.
- General public who are able to read and understand English.

**Exclusion criteria**

- General public who do not have accessibility to online communication resources.
- General public who are healthcare professionals.
- General public who are students.

**Description of the tool**

The data was collected by Self-report questionnaire consisting of two sections.

Section A: Questionnaire to assess socio-personal variables.

Section B: Self-report questionnaire consisting of 20 statements to assess level of apprehension related to COVID-19 outbreak among general public.

**Data collection procedure**

Ethical clearance was obtained from Institutional Review Board. The data collection for the study was done from 05-05-2020 to 11-05-2020. An online self-report questionnaire was developed by using google forms, with a consent form appended to it. The link of the questionnaire was sent through e-mail, WhatsApp and other social media to the contact of investigators. The participants were encouraged to roll out the survey to as many people as possible. Thus the link was forwarded to people apart from first point of contact and so on.

**Results**

The data obtained was analyzed by using descriptive and inferential statistics.

Section 1: Sample characteristics based on socio-personal variables.

Socio personal data showed that 47.8 % of general public were within age group 20 to 30 years and 52 % were males. Among the study participants, 47.5 % were graduates, 54.6 % were private employees, 50.1 % were from Trivandrum, 93.7 % of were staying with their family members and 93.1 % did not had any health problems.

Section 2: Level of COVID-19 outbreak related apprehension among general public.

Pie diagram (Fig. 1) showing distribution and percentage of general public based on COVID-19 outbreak related apprehension is given below. **n=379**

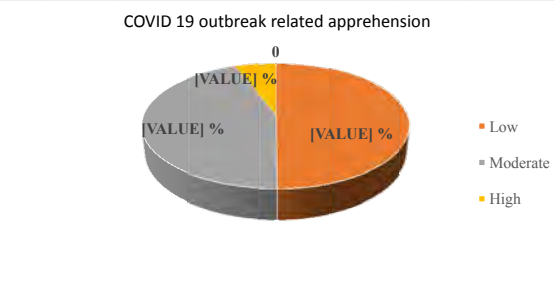



Fig. 1 shows that 49.9% of general public had low level of apprehension, 44.1 % had moderate and only 6% had high level of apprehension related to COVID-19 outbreak.

Section 3: Association between level of COVID-19 outbreak related apprehension and selected socio-personal variables

Table1: Chi square value showing association between COVID-19 outbreak related apprehension and education and current residential status.

**n=379**

| Socio-personal variable | COVID-19 outbreak related apprehension | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Low | | Moderate | | High | | | |
| | f | % | f | % | f | % | df | $\chi 2$ |
| **Education** | | | | | | | | |
| High school | 5 | 71.4 | 2 | 28.6 | 0 | 0 | | |
| Higher secondary | 13 | 40.6 | 14 | 43.8 | 5 | 15.6 | 6 | 14.2** |
| Graduate | 102 | 56.7 | 68 | 37.8 | 10 | 5.6 | | |
| Post graduate | 69 | 43.1 | 83 | 51.9 | 8 | 5 | | |
| **Current residential status** | | | | | | | | |
| Staying alone | 7 | 63.6 | 3 | 27.3 | 1 | 9.1 | | |
| Staying with family | 179 | 50.4 | 158 | 44.5 | 18 | 5.1 | 4 | 16.86** |
| Staying with friends | 3 | 23.1 | 6 | 46.2 | 4 | 30.8 | | |

** Significant at 0.005

Table 1: shows that there is statistically significant association between COVID-19 outbreak related apprehension and education and current residential status ($p < 0.005$).

Table 2: Chi square value showing association between COVID-19 outbreak related apprehension and place of residence.

**n=379**

| Place of residence | COVID-19 outbreak related apprehension | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Low | | Moderate | | High | | | |
| | f | % | f | % | f | % | df | $\chi 2$ |
| Alappuzha | 10 | 38.5 | 14 | 53.8 | 2 | 7.7 | | |
| Ernakulum | 11 | 57.9 | 8 | 42.1 | 0 | 0 | | |
| Idukki | 4 | 80 | 1 | 20 | 0 | 0 | | |
| Kannur | 1 | 33.3 | 2 | 66.7 | 0 | 0 | | |
| Kollam | 23 | 31.9 | 41 | 56.9 | 8 | 11.1 | | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Kottayam | 14 | 51.9 | 12 | 44.4 | 1 | 3.7 | 22 | 54.55*** |
| Malappuram | 0 | 0 | 0 | 0 | 1 | 100 | | |
| Palakkad | 1 | 100 | 0 | 0 | 0 | 0 | | |
| Pathanamthitta | 6 | 24 | 15 | 60 | 4 | 16 | | |
| Trivandrum | 116 | 61.1 | 67 | 35.3 | 7 | 3.7 | | |
| Thrissur | 3 | 33.3 | 6 | 66.7 | 0 | 0 | | |
| Wayanad | 0 | 0 | 1 | 100 | 0 | 0 | | |

***Significant at 0.001

Table 2 shows that there is statistically significant association between COVID-19 outbreak related apprehension and place of residence ($p < 0.001$).

There was no statistically significant association between COVID-19 outbreak related apprehension and other socio-personal variables such as age, gender, occupation and presence of health problems.

**Discussion**

A review of existing literature on impact of COVID-19 on mental health suggests that symptoms of anxiety and depression (16–28%) and self-reported stress (8%) are common psychological reactions to the COVID-19 pandemic, and may be associated with disturbed sleep. In the present study 49.92% of general public had low level of apprehension, 44.1 % had moderate level and 6% had high level of apprehension related to COVID-19 outbreak.

**Recommendations**

- A similar study can be conducted among general public residing in other states of India.
- A comparative study can be conducted among general public residing in urban and rural areas.
- The study can be replicated with a larger sample size.
- A comparative study can be conducted among male and female population.

**Conclusion**

The study concludes that the general public residing in Kerala had low level of apprehension related to COVID-19 outbreak. This may be due to the high recovery rate in the state, low incidence during the period of study and trust in existing health care delivery system and governmental efforts to combat the disease.

**References**

1. Mohammad Ali Fardin, "COVID-19 and Anxiety: A Review of Psychological Impacts of Infectious Disease Outbreaks", Archives of Clinical Infectious Diseases: 15 (COVID-19); e102779; Published Online: April 2, 2020, Available at http://archcid.com/articles/102779.html
2. Sandeep Grover, "Self-harm and COVID-19 Pandemic: An emerging concern – A report of 2 cases from India" , Asian Journal Of Psychiatry, Published online 2020 Apr 16, Available at www.ncbi.nlm.nih.gov/pmc/articles/PMC7161515
3. Yenan Wang ,Yu Di ,Junjie Ye &Wenbin Wei, "Study on the public psychological states and its related factors during the outbreak of coronavirus disease 2019 (COVID-19) in some regions of China" Received 18 Mar 2020, Accepted 20 Mar 2020, Published online: 30 Mar 2020, Available at https://www.tandfonline.com/doi/full/10.1080/13548506.2020.1746817
4. Matthew Gavidia," How has covid-19 affected mental health, severity of stress among employees?" , American Journal of managed care, Published on: April 20, 2020, Available at https://www.ajmc.com/newsroom/how-has-covid19-affected-mental-health-severity-of-stress-among-employees
5. Kathryn Mayer, Human Resource Executive April 14, 2020, Available at https://hrexecutive.com/hres-number-of-the-day-coronavirus-stress
6. Roy D, Tripathy S, Sharma N et al, "Study of knowledge, attitude, anxiety & perceived mental healthcare need in Indian population during COVID-19 pandemic" , Asian Journal of Psychiatry, 2020 Apr 8, Available at https://www.ncbi.nlm.nih.gov/pubmed/32283510

Ann Mary Oommen
Associate Professor

Joshy A N
Assistant Professor

Akhila L Prakash
Assistant Professor

Ambily S
Assistant Professor

Kavya K C
Lecturer

Address for Correspondence
Ann Mary Oommen, Associate Professor
email: annmary85@gmail.com.

# KIMSHEALTH at Manacaud

**KIMS**HEALTH Medical Centre is now at Manacaud to extend healthcare delivery closer to your homes with less waiting time & hassles. Our mission is to provide a high level of personal and friendly care to you and your family.

**Departments** : Internal Medicine | Pediatrics | Gynecology | ENT | Dental | Dermatology | Ophthalmology | Dietetics | Physical Medicine

**Services** : Laboratory | Pharmacy | Health Store | Optical Store | Physiotherapy | ECG & Ultrasound Scan | Observation Area

**Home Care Services** : Nursing | Laboratory | Pharmacy Delivery | Physiotherapy | Elderly Care | Vaccination

| OP Timing | Lab Timing | Pharmacy Timing |
|---|---|---|
| 09.00 am - 08.00 pm | 06.30 am - 08.00 pm | 07.00 am - 10.00 pm |

Appointments
**9633999224**

Homecare
**9995010649**

S M H Complex, Opp Kamaleswaram Govt HSS, Manacaud P.O.,
Trivandrum - 695009, Kerala, India | T : 0471 2453502, 2453503
E : khmc.manacaud@kimsglobal.com | www.kimshealthcare.com

**KIMS**HEALTH
Medical Centre


KIMSHEALTH

# TELEHEALTH

YOUR FAMILY DOCTOR IS JUST A CLICK AWAY !

- Teleconsultation services
- Convenient and hassle-free
- Video consultation at pre-booked time slots

Login to **https://telehealth.kimsglobal.com/**

For more details
**0471 2941000**

Concept & Design by KIMSHEALTH AUDIOVISUAL 08/2020
Akshara Offset, tvpm. #2471174

Reg. Office : P B No. 1, Anayara P.O., Trivandrum – 695 029
T : +91 471 2941000, 2941400 | E : relations@kimsglobal.com | www.kimshealthcare.com
INDIA:Trivandrum | Kollam | Kottayam | Perinthalmanna
MIDDLE EAST: Bahrain | Oman | Saudi Arabia | Qatar | UAE

KIMSHEALTH™