

Respiratory Care in Corona

Mustafa Amdani¹, Dr. Swaroopa Chakole²

¹Intern, Dept. of Community Medicine, Jawaharlal Nehru Medical College, DattaMeghe Institute of Medical Sciences (Deemed to be University), Sawangi (Meghe), Wardha-442001, Maharashtra, India

²Professor, Dept. of Community Medicine, Jawaharlal Nehru Medical College, DattaMeghe Institute of Medical Sciences (Deemed to be University), Sawangi (Meghe), Wardha-442001, Maharashtra, India

Email: ¹amdani.mustafa@gmail.com, ²drswaroopachakole@gmail.com

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ABSTRACT

BACKGROUND

The expanse of the coronavirus disease 2019 or COVID-19 is huge. The impact is multispectral and affected almost all aspects of human life.

SUMMARY

Respiratory impact of the COVID-19 is the most felt and widely reported impact. As the novel coronavirus maintained its history of affecting lungs as seen previously in severe acute respiratory syndrome (SARS) outbreak. Ventilators and oxygen support system are required mostly in comorbid patients particularly among patients bearing illnesses like asthma, bronchial impairment and so on.

CONCLUSION

More study needs to be done in order to assess the impact on the respiratory functioning of the body. Respiratory care must be including proper instruments so that more efficient result can be obtained. Research is needed to promote the invention of specific therapy for targeted action for respiratory functioning improvement.

KEYWORDS: COVID-19, RESPIRATORY FUNCTION, CORONAVIRUS, LONG COVID-19.

INTRODUCTION

The coronavirus disease 2019 or COVID-19 is wreaking havoc all across the world. The unprecedented nature of the pandemic was seen from closure of almost all activities except some essential services.(1) Industrial and economic activities which generated wealth and in turns sustain many lives were disrupted and extremely adverse impact was seen people as they lost their jobs and livelihood creating question of sustenance for them. The highly virulent nature and lethal capabilities of the novel coronavirus or SARS-COV-2 which is the advance version of the virus SARS-COV which had caused the severe acute respiratory syndrome in past. Both the virus belongs to the same coronaviridae family discovered in late 1960's. Since then, many outbreaks were experienced by the human civilization but the expanded and level of COVID-19 pandemic was not

seen. As of January 20, 2021, 96,144,818 people has been infected so far by the COVID-19 infection from across 200 regions and territories and 2,056,300 case fatalities has been reported from the world(2). Although the case fatality rate is quite low as compared to its previous counterpart but the converted number is quite huge. United States of America, India, Brazil, Russian federation, United Kingdom and France are the top six countries that are experiencing maximum caseloads(3). In fact, these countries alone accounts for more than half of the case infection and fatalities around the world. The comorbid patients are one of the highest affected vulnerable groups and are more prone to developing severe clinical outcomes(4). Impact of the COVID-19 infection has been prominently seen on the primarily affected system that is respiratory system. Multi spectral impact can be seen from pneumonia and ARDS

which are prone to develop more severe clinical outcomes. Respiratory care is the essential care and is the most rendered device in course of COVID-19 treatment(5). Health care workers are also given proper treatment in order to safeguard themselves. Various preventive measures have been registered so as to mitigate the viral spread. In this article, we are going to take the comprehensive overview about the related aspects.

IMPACT OF COVID-19 ON RESPIRATORY SYSTEM

Coronavirus disease 2019 or COVID-19 mainly affects through few entry points that are ears, nose and mouth. These entry points then take the viral load first to upper respiratory tract. The COVID-19 basically affects the lungs and associated respiratory organs first and then expands its reach in few days if not treated in time. The mucous secretion can be tested and find out that a person is harboring the coronavirus or not. Nasal swab is taken by competent health care professionals and reverse transcripts polymerase chain reaction (RT-PCR) can be done to reveal the infection. The COVID-19 and its previous outbreaks of severe acute respiratory syndrome (SARS) and Middle Eastern respiratory syndrome (MERS) is caused by the virus of same family that is coronaviridae family which mainly shows cold and flu(6). SARS is the predecessor of COVID-19 and both are closely related to each other. It can be seen from the fact that both starts to affect the human from respiratory tract. Both of them starts with mild or no symptoms and starts to show more varied symptoms on the course of infection. The COVID-19 mostly and firstly affects the functioning of lungs and it can be developed into pneumonia and acute respiratory distress syndrome. The ARDS and pneumonia related deaths holds major share in total case fatalities happened due to COVID-19. Although not all cases have reported to develop ARDS

and pneumonia but patients having severe symptoms are mostly found to be having these disorders. Breathing issues on various scale can be experienced by the infected patients. Coronary and malignant impairment and persons having diabetes are more prone to expressing more prominent symptoms than otherwise. As the infection or viral load travels from your nose to lungs via trachea, body starts to recognize external invasion and produces innate immune response which then induce inflammation in inner parts of lungs which is the indicator of body function in action. This inflammation can act as roadblock to the healthy functioning of the respiratory system which one of the crucial organ systems in the human body. In the meantime, spread of the infection can expand and cover more parts. Four out of five patients experience mild to moderate symptoms which includes cold like common cold and sore throat. More severe patients may develop life threatening pneumonia. The inflammation in alveoli is prominently seen. Computed tomography (CT) scan and X-ray of chest can reveal the inflammation and over all affected functioning due to infection. The informal ground glass opacity test and identifies can be put in place to analyze the test results. The physiological process takes its course and medicine cannot accurately determine it without having margin of error as anything could go wrong against the patient. There are several phases of the COVID-19 infection while infecting and manifesting the lungs or the respiratory system. The first phase includes the entry of the coronavirus which is also known as SARS-COV-2 through various entry points. The infection of cells also happens at this stage. Novel coronavirus basically has spike proteins and crown shape which helps in infesting the cell. The angiotensin enzyme 2 (ACE 2) receptors are present at various organs outer layer like heart and lungs(7). The ACE 2 receptors acts as gateway to facilitate the

entry of the novel coronavirus and control of the cell. Major task of protein synthesis is done by the cells. But after the infestation of the novel coronavirus that task is disturbed and essential proteins are not made properly. Second phase comes with some mild symptoms. It is this phase where replication of the virus speeds up and innate immune system of the human body is given alert of the invasion of external pathogen. Third stage comes if the treatment is not adequately done till second stage or the person infected has multiple underlying diseases which is making it difficult to treat. This phase invites pneumonia and the functioning of the lung is severely affected. Phase four is the most dangerous phase as various events can happen in the body at this stage. The cytokine storm is kicked in and ARDS might result into fatal consequences if the person is not given the adequate care or the infected person's body is not responding to the treatment. Through lungs the infection can reach to various parts of the human body and can result into multi organ failure especially in comorbid patients(8).

RESPIRATORY CARE FOR COVID-19

The respiratory care is needed mostly in severely ill patients due to coronavirus disease 2019 infection. The COVID-19 attacks the functioning of lung and can develop to pneumonia and acute respiratory distress syndrome which is commonly seen in comorbid patients of higher age. Extracorporeal membrane oxygenation (ECMO) can be used as potential therapy for treating the patients of severe ARDS. The ECMO therapy should be delivered by well trained staff to ensure its maximum efficacy. News from health care facilities specially designed for COVID-19 showed lack of facilities and equipment's which must be resolved as the ARDS is now becoming common occurrence. Coordination is the key as the demand of the ECMO therapy might

increase in coming days. The uncertainty attached to the COVID-19 has been successful in proving wrong every prediction so far. When there are chances of peak coming in then the case load increases more rapidly and continues to grow. So far, no stop sign is placed and cases are outnumbering the predictions. All the geographic regions are equally affected and need all the state of the art facilities(9).

A new study has associated the infection and viral load in upper respiratory tract can indicate the severe risk patients. Severe comorbidity or induction or need to be admitted to critical care unit such as ICU is the signal of developing the severe symptoms. The more the viral load in the upper respiratory tract the more the chance to develop the severe clinical outcomes. 1122 patients were assessed in Greece and among them some striking results can be seen which shows the path breaking results for the treatment course. Around 309 patients which accounts for around 28 percent of the total patients were found to be harboring high viral loads. 316 patients shown moderate upper respiratory tract viral load while 336 of them showed low upper respiratory tract infection load(10). Patients with high viral load majorly includes persons with comorbidity such as hypertension, diabetes. High viral load is associated with less treatment time and needs more attention. Patients with high viral load initially shows no symptoms but then the worsening of the symptoms accelerates and in no time the patients can be needing ICU care. Along with it the intensive care unit should be well equipped with oxygen support system and ventilators of necessary specifications. The collapse of health care infrastructure has been seen worldwide as the unprecedented level of the pandemic has shown its colors. Number of patients did not even receive the treatment before dying in several European countries particularly in Italy and Spain as one saw tremendous of

casualties measuring in thousands of case fatalities per day. These countries are develop countries but these too were not able to handle the immense pressure given by huge number caseloads which overwhelmed health care infrastructure all across the globe(11).

A new therapy has been successfully shown some results for the treatment and containment of COVID-19 in mice. The results are promising and can be extrapolated for bigger purpose. The introduction of small peptide molecule has been showing promising results in mice and also in containing the severity of the symptoms. This peptide molecule successfully reduced response of cytokine storm which is attached to various other fallout effects of the body. Protecting respiratory organs like lungs, reducing high temperature and improving the functioning of the heart are also the side positive impact of the therapy. Mainly the breakthrough is containing the cytokine storm. Cytokine storm basically floods the blood stream with inflammatory proteins and other associated substances. The progression of the disease was found to be curtailed and that is the ideal result of every therapy that must be seek(12). Researcher's are confident that the issues attached to the cardiovascular and respiratory functions can be resolved through this therapy. In this the understanding of COVID-19 is really proving important. The in depth understanding creates way for proper therapy which can be easily administered on the patients of COVID-19 infection especially when they develop severe clinical symptoms. The problems with present therapies such as administration of steroids and other anti-inflammatory therapies is that it causes immune suppression(13). They are administered after the activation of cytokine storm which severely damages the functioning of the lung and in turn cardiovascular functions. This can be averted through

administration of this therapy. The peptide used is corresponding to the ACE 2 receptors. ACE 2 receptors are the host receptors and facilitate the infection to grow further. But the problem is that other immunosuppressive agents are also getting attached creating immune suppressive or more weakened immune system. The new ACE 2 interacting domain of novel coronavirus inhibits this and no immunosuppression occurs. The intra nasal treatment then produces several benefits of reducing fever and protects lungs. Inflammation attacks lungs severely and oxygen pathway is hindered resulting adverse impact on the functioning of the other organs which are dependent on the oxygen supply. This therapy fulfills the need of specific and effective therapy for respiratory failure or distress(14).

RESPIRATORY IMPACT ON HEALTH CARE WORKERS

The front-line workers of the fight against COVID-19 or coronavirus disease 2019 are law enforcement agencies and health care professionals. They are the one taking heads on with the menace of the virus. The extremely lethal nature and highly virulent novel coronavirus poses serious risks to these frontline workers especially health care professionals which includes doctors and other allied health care givers. According to the International Nurses Council, more nurses had died during COVID-19 duty and due to COVID-19 than in First World War indicating the seriousness of the novel coronavirus(15). Doctors laid their life while treating the patients sometimes even without proper gears to safeguard oneself from the infection. Such is the dedication of the medical fraternity and this needs to be recognized and can be used to rectify the faults in the system. All the state-of-the-art equipment's must be given to the COVID-19 treating doctors and other health care professionals to safeguard themselves as already the doctor or nurses

to population per unit ratio is quite low all around the world. Even in developed countries where health care infrastructure is supposed to be state of the art, the doctors are overburdened with current patient numbers and needs to supplement by more fleets of doctors. In that loss of any health care professionals will not only affects the family members of that deceased personal but also adversely affect the fight against the COVID-19 and hampers the containment effort of the same(16).

First of all, the necessary preventive kit such as mask and face shield and especially the personals and protective equipment's are necessary to secure the health care professional as the efficacy of these products has been already tested in previous outbreaks of Ebola, severe acute respiratory syndrome and middle eastern respiratory syndrome. Sanitization of the person from in and out can be done to ensure the more ideals results. As the positivity rate and hospital of health care facility contracted COVID-19 infection rate is on higher side and hospital administration must be more aware in order to close up any loopholes that are being exploited by COVID-19 infection. Also doctors with certain age mostly old aged should barred from treating patients as they can guide their junior staff by using telemedicine and other technological advancements. Prophylactics are the best way in ensuring the body's strong innate immune response. Several proven and identified food stuffs and materials are proven to be beneficial in building immunity. Also, several supplements are known to have positive impact in building the immunity system of the human body. Immunity system plays an important role in warding off the novel coronavirus infection. The stronger the immune system the better is the innate fight against the COVID-19. The comorbid patients are more vulnerable in developing the severe clinical outcome due to weak immune

system. Therefore, it is important to be more innately stronger which can fight back the external invasion of novel coronavirus pathogen. The health care professionals can be given high quality diet mostly curated according to the health care professional's condition. Vitamin C, Vitamin D and various probiotics have intimate relationship in improving innate response to fight the novel coronavirus infection. Probiotics which influence the gut flora and fauna. The famous gut lung axis have influential role in not only improving the innate immune response but also have role in promoting the function of the lungs which in turn protects the patient from multi organ failure(17).

LONG TERM IMPLICATIONS OF COVID-19 ON RESPIRATORY SYSTEM

As the pandemic of COVID-19 progressing more and more aspects relating to it are being uncovered by time. After almost a year several cases of post COVID-19 persistence of illness have been reported. This includes variety of affected functioning of the organs which majorly include the functioning of lungs. Worsening of the condition attached to chronic obstructive pulmonary disorders and asthma. These patients need extra care. Overall the long term impacts that have been reported are particular related to reduced physical ability and other related illness(18). The functioning of the lung is closely attached to the overall physical capacity as the lungs are the oxygen provider which is essential for almost every activity that is happening in the body. A survey is done in United States of America showed that only 39 percent of the patients infected from COVID-19 were able to return to base line after checking on them after 21 days. This means that rest of the people are not able to withstand the condition till date. Also, more serious news is that there are some supposedly long-term implications which are graver

and can accompany the infected person during whole lifetime. Dyspnea and hypoxia on several occasions post discharge from the treatment of the COVID-19. The alveolus and the membranous junction where oxygen is diffused in the blood and carbon dioxide is diffused to expire out. This crucial function is affected as inflammation on the lungs particularly on the alveoli can be seen in various case even after successfully treating the patient for COVID-19 infection. Therefore there is a need of the post COVID-19 health care support of rehabilitative nature(19). Studies on different respiratory system related problems in India are available (20-22). Studies on diagnosis and treatment of different respiratory diseases were reported (23-26). Pandhareet. al detailed the effect of Covid in respiratory system (27). Some interesting studies on were reported by Ghogareet. al.(28) and Gosavi et. al. (29).

CONCLUSION

COVID-19 or coronavirus disease 2019 has its multi spectral devastating impact on the human body. Primarily its initial target is respiratory system, therefore it is essential to not develop infection at first place by following safety protocols. Survivors also have long term implications and needs extra attention especially belonging to lungs and associated organs as reduced physical capacity and fatigue is associated to the reduced functioning of the lungs. New therapies dedicated to lung infection may tried after testing so that it can be specifically used in reducing adverse impact of the novel coronavirus on respiratory function. The necessary equipment's such as ventilators and oxygen support system must be maintained as these are on high demand owing to the lethal nature and comorbid patients which needs these cares more often than their non-comorbid counterparts. More study can be done to ensure specific therapy and to reduce impact on lungs. Permanent

dysfunctions have been reported and is a serious cause of concern. Therefore, it is necessary to treat easterly and reduce the viral load from the respiratory tract from which it can travel to any part of the body resulting in multi organ failure.

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