Management of COVID positive medical staff: A medical college and public hospital experience with steam therapy

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Accepted 6th August, 2020

ABSTRACT

A serious and highly infectious disease caused by newly discovered severe acute respiratory syndrome coronavirus 2 (SAR-CoV-2) was reported in late December 2019 in Wuhan, China (Chan et al., 2020). On 11th February 2020 World Health Organization (WHO) announced “COVID-19” as the official name of this new disease. The COVID-19 started in China and spread worldwide and declared a pandemic by WHO. This pandemic has strongly affected the communities, countries, and businesses in the exponential manner that humanity has witnessed in these times.

Key words: COVID-19, medical staff, management, WHO.

INTRODUCTION

Global and domestic health agencies, governments, doctors and paramedical are fighting all together to limit community spread. They are putting efforts to develop rapid test kits for early detection, and all positive rapid test cases are to be further diagnosed of COVID-19 by RT PCR test. This infection can be asymptomatic or can result in mild to severe illness. Common symptoms such as fever, dry cough, difficulty in breathing and in more severe cases, infection can cause pneumonia, kidney failure and death. The development of vaccines needs several trials, and it will take long time to become successfully and available in the market. However, there are various vaccines that are under clinical development for the prevention of COVID-19 (Mukundan, 2020). There are no approved drugs for the treatment of COVID-19. Though, certain drugs such as lopinavir/ritonavir and remdesivir have exhibited some efficacy in isolated case reports and small studies. Further randomized controlled trials are required to determine the efficacy of these drugs. Furthermore, a comprehensive measure has been applied to alleviate the spread, which include entire lockdown, travel, social distancing such as closing school/colleges, local markets, corporate offices etc. (Wu et al., 2020).

Structure and pathophysiology of coronavirus

Coronaviruses belong to the Coronaviridae family in the Nidovirales order. The Corona indicates crown like spikes on the outer surface of the virus which are minute in size and surrounded with single stranded RNA. Coronaviruses contain Spike (S) protein, envelope (E) protein, membrane (M) protein, and nucleocapsid (N) protein. The life cycle of SAR-CoV-2 in host cells starts when S protein attaches to the cellular receptor angiotensin converting enzyme 2 (ACE2). Thereafter, the conformation change in the S protein accelerates viral envelope fusion with the cell membrane through the endosomal pathway. Then SAR-CoV-2 releases RNA as nucleic material into the host cell. Genomic RNA is translated into viral replicate polyproteins pp1a and 1ab, which are then split into small products by viral proteinases. The polymerase makes a sub genomic mRNAs by discontinuous transcription and finally translated into relevant viral proteins. Viral proteins and genome RNA are consequently gathered into virions in the endoplasmic reticulum and Golgi and then transported via vesicles and released out of the cell (Shereen et al., 2020).

Febrile temperature that activates cellular responses
involves a complex reciprocal regulation between immune system activation, inflammation, and heat shock response pathway by making their cell membrane more fluid and enables more rapid and effective response to viral infections. Acute heat stress has been demonstrated to increase TNF-alpha response, enhance activity of Natural Killer (NK) cells, and increase 10-fold production of interferon-γ by T-lymphocytes. This may render greater resistance to viral infections.

Heat also gives many psychological advantages as fight against viral infection of COVID-19. Sauna bathing or heat therapy provide active relaxation, enhance sleep which further boost immunity. Conventional and emerging studies suggest that sauna bathing enhances respiratory viral infection, immunity as well as develops mood and quality of life. In addition, it associates with reduced risk of pneumonia. Recently, a far infrared (FIR) sauna uses infrared emitters without water and humidity and run at low temperature than traditional saunas. FIR infrared has been reported to deactivate single stranded RNA virus and raise body temperature which support host defense (Cohen, 2020).

Steam mechanism affects to coronavirus

Virus can remain biologically active in a wide range of environments. Envelope virus such as Coronavirus is most active in cool dry conditions and associated with increased incidence of COVID-19. The mechanism of heat overcoming viral infections depends on the setting, source, temperature, humidity, location, and time course of application. In first line of defence of respiratory viruses, the nasal cavity and sinuses provides protective barrier that allows viruses to be blocked, detected by immune system, and swept away. Inhalation of steam directly inhibits and deactivates virions in the upper airways by providing support to first line of defence of the immune system. Heat applied to whole body further provides second line of defence of immune system by inducing heat stress that mimics the effect of fever. Heat stress enhances cardiac output, plasma volume and peripheral blood flow and induces detoxification through kidney, liver, and skin which some toxic elements eliminates. Heat stress may alter the blood pH as providing action against respiratory infections. Hyperthermia creates alkaline conditions which are more favourable to host defence. The transient alkaline condition is able to inhibit viral replication and decrease infection of coronavirus. There are available evidence that supports the application of heat and humidity for the inhibition and treatment of viral infections. Randomized controlled trials further suggest that steam and humidifier can be used to treat respiratory viral infection at temperature above 43°C for 20 to 30 min to reduce viral shedding and immediate relief of symptoms of common cold (Cohen, 2020).

Aim

Public hospitals all over the world are grappling with the ever present and pernicious problem of MHC (Medical Health Care) workers turning Covid positive in spite of all the standard precautions such as PPE (Personal protection Equipment) kits and N95 masks.

The public hospitals and medical institutes have a perennial problem of overcrowding in the hostels for postgraduate students. This makes them highly susceptible to any respiratory illness outbreak. Concerns for this problem have been voiced all over the world (Low and Wilder-Smith, 2005).

In the scenario of present Covid-19 outbreak, an uncontrolled outbreak in severely affected hospitals will result in the entire operations coming to a grinding halt.

Steam has been used since generations in any flu outbreak to bring the illness under control. The aim of this trial was to test the efficacy of steam in the treatment of Medical Health care (MHC) workers in LTM Medical college and General hospital, Mumbai, on a larger scale and note the time taken for them to be asymptomatic.

MATERIALS AND METHODS

Standard cup steam vapourisers were used in this study. The time for the treatment was 5 min 3 times daily for each affected and non-affected workers. All Medical Health Care workers selected have been on preventive doses of Hydroxychloroquine and have been using standard approved PPE kits. They were working for an 8 h shift in Covid wards for an average of 1 month. The subjects were divided into 2 groups:

- Group 1 included asymptomatic Health care workers who had not been tested for covid-19.
- Group 2 included symptomatic Health care workers who had been tested positive on standard covid-19 throat swab kit.

The group 1 workers were followed up for compliance of steam therapy by the hospital warden. The group 2 subjects were subjected to isolation in the hospital premises. The numbers are given in Table 1.

The expected result considering the present infectivity rate of 2.5 for covid-19 was a 300% increase in the Group 1 unaffected workers over the next 3 weeks. All the subjects were administered steam therapy for a period of 3 weeks and then continued afterwards. Steam was taken about 8 to 10 inches away from the spout so as not to cause any nasal burns. The idea was to feel the heat at the nostrils but not a burn. The subjects were all mild to moderate symptoms ranging from nasal discharge, throat pain and cough. Fifty four subjects had fever which was being managed using Paracetamol tablets initially but not resolving.
Table 1: Numbers of workers in each group.

<table>
<thead>
<tr>
<th>Group</th>
<th>Nos</th>
<th>Doctors</th>
<th>Nurses</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>900</td>
<td>850</td>
<td>50</td>
</tr>
<tr>
<td>2</td>
<td>300</td>
<td>248</td>
<td>52</td>
</tr>
</tbody>
</table>

Table 2: The results over next 3 weeks.

<table>
<thead>
<tr>
<th>Group</th>
<th>Nos</th>
<th>Average recovery time</th>
<th>Symptomatic</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>800</td>
<td>NA</td>
<td>45</td>
</tr>
<tr>
<td>2</td>
<td>300</td>
<td>5 days</td>
<td>32</td>
</tr>
</tbody>
</table>

RESULTS

The results were remarkable over the next 1 week. Most of the subjects stated that within 24 h, they had a feeling of wellbeing and their breathing was better. This was attributed to clearance of nasal passages which is a standard effect of steam on Nasal passages.

No subject had any burns on the nasal passages and there was no incidence of any tracheal burns. All the subjects had a recovery of their symptoms over a period of next 1 week. The results over next 3 weeks are shown in Table 2.

The symptomatic patients were followed up for compliance of steam therapy and it was discovered that there was a Noncompliance rate of 8% among each group. There was a 90% drop in infectivity rate among the group 2 subjects. The symptomatic patients were enquired as to use of steam treatment in adequate dose and it was established that most of the subjects who were symptomatic were non-compliant in the administration of steam therapy in the dose recommended. The symptomatic subjects though had only mild symptoms and only one Doctor had moderate symptoms. There was no casualty during this period.

DISCUSSION

Steam has been used since ancient times for alleviation of Flu symptoms. This trial was conducted with the aim of discovering whether there is a connection between alleviation of symptoms and attenuation of virus on a large scale.

 Numerous studies have discussed the in vitro heat inactivation of Coronavirus and Influenza virus (Lowen and Steel, 2014; Lowen et al., 2007; Chan et al., 2011). The consensus of these studies states that coronavirus is inactivated at around 56°C after exposure for 5 min.

Recent studies on inactivation virus of current coronavirus prevention accessories also state the effectiveness of heat on coronavirus. Steam in a safe setting has a temperature of about 70 to 80°C which is well above the instability temperature of Coronavirus.

Conclusion

The present study shows the viability of steam therapy on a wider scale in the effective management of an outbreak of coronavirus in a community setting. This is an observational study and will require a Random Control study on a wider scale to confirm the benefits of the steam treatment on Covid-19.

REFERENCES

Mukundan MK (2020). Towards a Tangible Defence Against the Covid 19 Infection.