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Combating COVID-19 crisis and exploring heat-based simple solutions

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ABSTRACT

Covid-19 pandemic affected whole of the world taking many lives and impacting the economy and mental health severely. Exit pathways via vaccination though ignited optimism initially but attenuated by the emergence of several new variants which are less sensitive to vaccines. Considering emergency situations, some urgent, simple heat-based solutions for the initial stages of the disease were also proposed at the beginning of pandemic and further elaborated here. Solutions were proposed based on science as follows: exploring results of statistical analyses on the global transmission of COVID-19; observed temperature-dependent behaviours of similar category viruses; temperature-based clinical trial experiments with similar category viruses; successful clinical trial experiments with heat-based intervention for COVID-19 patients; and finally, biological mechanism/response in human bodies to heat-based solution for COVID-19 from medical doctor's perspective. Solutions proposed are practically without side effects, can be even practised in own home and there is no vested interest involved.

1. Background

The COVID-19 pandemic first originated in the Wuhan Province of China in December 2019 and spread all over the globe at a very rapid rate (Worldometers and https, 2022). The disease is highly contagious and hence at the beginning of the outbreak, most countries worldwide imposed strict lockdown (Ourworldindata and https). Rapid regulatory approval of vaccines took place though alerts were triggered raising concerns (Doshi, 2020a, 2020b) and mass vaccination roll out started from December 2020 (Ourworldindata and https).

Adverse effects on people after the vaccine and how those are monitored, scrutinized and attended by respective authorities are some of the most crucial areas before the launch of any mass vaccination programme. Some adverse effects of COVID-19 vaccination were reported by CDC, US and other government regulatory bodies around the globe e.g., anaphylaxis, thrombosis with thrombocytopenia syndrome (TTS), Guillain-Barré Syndrome (GBS), myocarditis and pericarditis among others (CDC[1] (Centers for Disease Control and Prevention), 2019). A recent review sufficiently discussed the scientific basis of many adverse reactions to the COVID-19 vaccine (Seneff and Nigh, 2021; Seneff et al., 2022). Knowing that the effect of vaccines wanes in 3–10 weeks' time (Shrotri et al., 2021) and percentage of COVID-19 deaths among children are very low [WHO], **c**hild vaccination was still initiated. Apart from direct side effects, indirect effects after mass vaccination which were often overlooked also need attention. In this regard, questions were raised on the indirect effect of mass vaccination (Roy, 2021a). Few points raised are as follows: i) After initiation of the vaccine programme, almost all countries experienced a sudden surge and most countries had to impose strict lockdown measures. ii) Even for UK/Israel, where massive vaccination started first, total deaths in three months after vaccination reached overall deaths of the past 10 months before vaccination. iii) A highly populated country India was having a steady decrease for five months. Vaccination started on 16 January 2021 and from around 16th February 2021, India started showing a rise in cases and thereafter deaths. iv) For Brazil, vaccination started in mid-January 2021 and a sharp rise in cases is observed since mid-February 2021. Such a steep rise in deaths in Brazil that happened after that never happened in the whole period of the pandemic. Those are also discussed in later works (Roy, 2021b). One proposition in this regard is made by Professor Bieniasz, Rockefeller University, USA who mentioned COVID-19 vaccines can add fuel to the evolution of mutation of virus as vaccines themselves can drive viral mutations (Website: npj, 2021). The time between the initial vaccine dose and the next shot to boost the immune response might act a kind of breeding ground to acquire new mutations of the virus. It may give one plausible explanation for why there is a surge in mutated variants after the start of mass vaccination programme, so as the increase in cases of transmission worldwide.

To develop useful timely urgent insights, the resemblance between Influenza (Flu) and COVID-19 needs attention too. Every winter, tens of thousands of people die in the UK, Europe and northern America from Flu, a virus-borne respiratory disease. In spite of many differences, there

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are striking similarities between COVID-19 and Flu as discussed by the American Society for Microbiology (ASM (American Society for Microbiology), 2020) [ASM, 2021]. People mainly from old and vulnerable groups are vaccinated against Flu viruses at the beginning of every winter in affected countries, but still, it is not yet been possible to eradicate Flu. On the contrary, it became more destructive and powerful in later years. The main reason is that the virus is mutating over space and time, in spite of several new vaccines that were developed over time. We are noting similar situations for COVID-19 too.

Between the COVID-19 vaccine and other known vaccines (polio, smallpox, etc.) there are dissimilarities too. Unlike other vaccines, if people are vaccinated for COVID-19, they can still be infected and

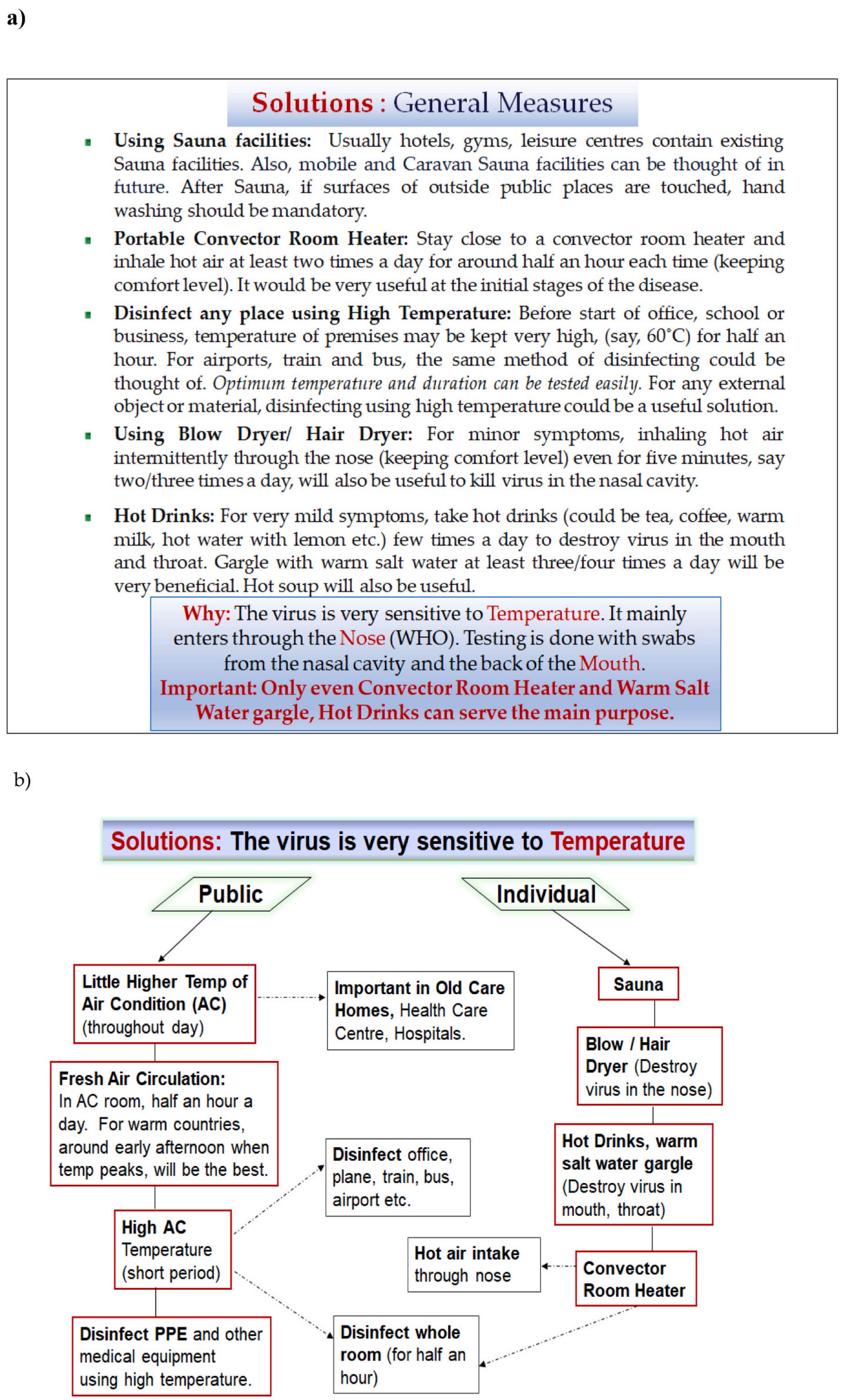

Fig. 1. Heat-based simple solutions to combat COVID-19: a) general measures at the initial stages of the disease, b) an overview in the form of a schematic, depicting actions towards solutions at an individual level (right) and public level (left).
(Source: (Roy, 2020c; Roy, 2020d; Roy and AGU (American Geophysical Union), 2020e; Roy, 2021b))

transmit the disease and even can die (CDC 2 (Centers for Disease Control and Prevention), 2019). Cases and deaths among the vaccinated are observed to be a very high percentage in all countries (Keehner et al., 2021; PHS; UHSA). It is also worth mentioning that vaccines have not yet been invented for many virus-borne diseases like, AIDS, MERS and H1N1 etc. Hence attention to varied research and exploration of alternate solutions for COVID-19 other than the vaccine is equally necessary. If any simple home-based solution is possible that does not have any vested interest that could be worth a try. It would be more important especially when UK, Europe and northern America are approaching third winter of the pandemic.

2. Rationale of heat-based solution

Considering emergency situations some urgent, simple heat-based solutions for the initial stages of the disease were also proposed as early as 17th March 2020 (Roy, 2020a) and a series of research afterwards has since been completed (Roy, 2020b; Roy, 2020c; Roy, 2020d; Roy and AGU (American Geophysical Union), 2020e; Roy, 2021b) purely based on science. Those solutions were proposed (and supported by) based on science as follows: i) exploring results of **statistical analyses on the global transmission of COVID-19** as numerous studies showed seasonal temperature played a profound role in the transmission (Roy, 2020c; Roy, 2020d; Roy and AGU (American Geophysical Union), 2020e; Scafetta, 2020); ii) **observed temperature-dependent behaviours** of similar category viruses (Van Doremalen et al., 2013; Casanova et al., 2010; Chan et al., 2011; Lowen et al., 2007; Seung et al., 2007); iii) temperature-based **clinical trial experiments** with similar category viruses (Casanova et al., 2010; Lowen et al., 2007); iv) successful **clinical trial experiments** with heat-based intervention **for COVID-19 patients** (Marca et al., 2021) and v) **biological mechanism/response** in human bodies to heat-based solution for COVID-19 from a medical doctor's perspective (Cohen, 2020). Those solutions [Fig. 1] are practically without side effects, can be even practised in own home and there is no vested interest involved.

Here further elaborations on the rationales for proposing heat-based solutions are attempted. Studies explored the role of global temperature in the spread and vulnerability to COVID-19 (Roy, 2020a; Roy, 2020b; Roy, 2020c; Roy, 2020d; Roy and AGU (American Geophysical Union), 2020e; Scafetta, 2020) and indicated that global temperature played an important role. Correlation study before the period of vaccination suggested that the lethality due to COVID-19 significantly aggravates (on an average 4 times) when weather temperature lies between 4 °C and 12 °C (Scafetta, 2020). Possible co-factors e.g., air pollution and median population age were also explored but suggested the important contribution from the former than the latter. Based on temperature, it further made prediction for many countries (e.g., United Kingdom, East Europe, Germany, North America and Russia) in different seasons. The risk from the virus was reduced significantly in warm places and countries; whereas, a moderately cool environment was the most susceptible to the spread of the virus (Roy, 2020c; Roy, 2020d; Roy and AGU, 2020e). The dependency of temperature is true for similar Coronavirus MERS and SARS (Van Doremalen et al., 2013; Chan et al., 2011) and also correct for similar seasonal air-borne Flu viruses (Lowen et al., 2007). In low temperatures, the virus remains active for a long time (Van Doremalen et al., 2013) and low temperatures significantly contributes to their transmission and survival (Casanova et al., 2010; Chan et al., 2011; Seung et al., 2007). Study suggested MERS-CoV virus could still be recovered after 48 h at the temperature of 20 °C with 40% relative humidity condition. On the other hand, for two different conditions the virus remained viable for only 24 h (temperature 30 °C with relative humidity 30%) and 8 h (temperature 30 °C, with relative humidity 80%) respectively (Van Doremalen et al., 2013). Clinical trials were also conducted to study the effect of temperature using seasonally dependent endemic virus (Lowen et al., 2007). It noted that when the temperature was 5 °C and relative humidity between 35% and 50%, the infection rate was as high as 75–100%. If the temperature was increased to 30 °C, keeping relative humidity at 35%, surprisingly, the infection rate decreased to zero. A laboratory experiment, using a variable temperature, with the SARS-CoV (Casanova et al., 2010) indicated that inactivation of the virus was faster at all humidity levels if the temperature was simply raised to 20 °C from 4 °C. The inactivation was much faster if the temperature was further increased from 20 °C to 40 °C.

COVID-19 is highly contagious and invaded most of the globe in less than two months (WHO, 2020). However, warm countries like SAARC (South Asian Association for Regional Cooperation), SEAC (South East Asian countries) and many countries of Africa though were also affected, the scale of severity was much less in comparison, during the whole of 2020 (Roy, 2020c; Roy, 2020d; Roy and AGU (American Geophysical Union), 2020e). Such observation indicated the importance of exploring the nature of contact transmission in addition to airborne transmission. Contact transmissions in variable temperatures were studied in clinical trial experiments with guinea pigs and showed contact transmission is still possible at high temperatures, even at 30 °C (Lowen et al., 2007). When guinea pigs were kept in separate cages at 30 °C for 1 week, no recipient guinea pigs were infected indicating an increase in temperature arrested airborne transmission. However, when guinea pigs were kept in the same cage to simulate contact transmission, between 75% and 100% became infected indicating contact transmission play role in all temperatures. No role of humidity was found in those experiments.

As temperature played such an important role in transmitting COVID-19 and similar diseases, heat-based simple solutions are proposed. Fig. 1a shows general measures at the initial stages of the disease; whereas, Fig. 1b suggests an overview in a form of a schematic, depicting useful actions towards solutions at the individual level (right) and public level (left). These measures in Fig. 1a at the initial stages of the disease are proposed because the virus, which is very sensitive to temperature, mainly accumulates at high volume in the back of the mouth as well as in the nose. Testing is done with swabs from those places. It is very similar to another respiratory pathogen MERS-CoV, where high-level viral loads are detected in samples from the lower respiratory tract of infected patients (Drosten et al., 2013; Guery et al., 2013) and the virus are mainly shed during coughing and via exudates from the lower respiratory tract (Drosten et al., 2013; Guery et al., 2013). The important point here is that - the high temperature (of course keeping comfort level) at early stages of the disease can reduce viral loads in the areas where the virus largely accumulates initially, and hence the body can have time and strength to fight against the virus. However, if people already developed major symptoms, then these methods discussed will not be effective and proper medical advice need to be solicited (Roy, 2020c; Roy, 2020d; Roy and AGU (American Geophysical Union), 2020e; Roy, 2021b).

After receiving approval from the ethical committee, successful clinical trial experiments following heat-based solutions to fight against COVID-19 were also conducted and published (Marca et al., 2021). Furthermore, a thorough literature review in support of heat-based solutions for COVID-19 was published in a peer-reviewed journal too (Cohen, 2020). The author being a medical doctor, discussed different mechanisms linked to the biological processes (Cohen, 2020). Scientific rationale for such relationship is clearly discussed. Author discussed that enveloped viruses, such as coronaviruses and rhinoviruses are most active in cool dry situations, and are linked with increased cases of respiratory tract infections (Mäkinen et al., 2009). That also include infections with SARS-CoV (Chan et al., 2011) and SAR-CoV-2 (Wang et al., 2020; Sajadi et al., 2020). The lipid envelopes of enveloped viruses can remain active for long times in cold conditions, but are ruined by temperatures tolerable to humans. In vaccine, deactivation of viruses is done routinely by applying the knowledge of heat sensitivity of viruses, and the range of temperatures between 55 and 65 °C for 15–30 min are reported to deactivate a range of enveloped viruses, that also include coronaviruses (Lelie et al., 1987; Kampf et al., 2020; Hu et al., 2011; Darnell et al., 2004; Duan et al., 2003; WHO Report, 2003).

Knowing many limitations of COVID-19 vaccines, heat-based solutions those are simple, can be practiced at home, and had scientific basis, deserve attention.

3. Conclusion and outlook

This work discusses the scientific rationale for heat-based simple solutions to combat COVID-19 crisis. Some simple practices are proposed at the initial stages of the disease which can also be followed in the home environment. Few measures are proposed for personal level as well as the public level (Fig. 1). Those solutions were proposed exploring results of statistical analyses on the global transmission of COVID-19; observed temperature-dependent behaviours of similar category viruses; temperature-based clinical trial experiments with similar category viruses; successful clinical trial experiments with heat-based intervention for COVID-19 patients and finally, biological mechanism/response in human bodies to heat-based solution for COVID-19 from a medical doctor's perspective.

If at the initial stages of the disease these heat-based simple solutions become popular [Fig. 1] then long COVID, whilst further lockdown, mutated variants, losing immunity from vaccine after few months etc would be minimized. The empirical experiences which have been clinically proven are important to improve the response to this and other pandemics and provide a quick exit strategy. In this regard, a quote from a famous Physicist is worth mentioning "Education isn't about the ability to remember and repeat, in which people study to pass exams, and teach others to pass exams, but nobody knows anything. It is the ability to learn from experience, to think, solve problems, and use our knowledge to adapt to new situations" [Prof Richard Feynman].

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

No data was used for the research described in the article.

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