

Research Article

Apprehending Air Conditioning Systems in Context to COVID-19 and Human Health: A Brief Communication

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DOI: <https://doi.org/10.24321/2455.9199.202004>

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How to cite this article:

Akhai S, Mala S, Jerin AA. Apprehending Air Conditioning Systems in Context to COVID-19 and Human Health: A Brief Communication. *Int J HealthCare Edu & Med Inform* 2020; 7(1&2): 28-30.

Date of Submission: 2020-11-25

Date of Acceptance: 2020-12-05

A B S T R A C T

Nowadays human race which is strongest of all creatures on the planet is frightened to move out without precautions because of coronavirus. In the current article, a brief overview of the use of air-conditioners available in different designs is addressed in context to COVID-19. Since this virus is often transmitted by exhalations from infected airways, so Heating, Ventilation and Air-Conditioning (HVAC) systems may be important to enhance or mitigate the spread of the infection in indoor dwellings. The design of the building is directly related to the airflow through the structure of the building. One of the biggest problems that is mushrooming out of this crisis is the use of air-conditioners. The air-conditioners produce artificial built environment, which in some cases may not be good for human beings. But at home for attaining thermal comfort, it remains a question mark, whether building architecture using air-conditioner is safe or not. The paper herein tries to co-relate the literature available for providing a brief communication to these questions.

Keywords: Air Conditioning, COVID-19, Human Comfort, Transmission

Introduction

There is a wide knowledge base which says that the medical condition of any person is directly linked to his surrounding environment. In countries like India, during the summer season, people use air-conditioners because the temperature goes up beyond 45 degree Celsius. But for thermal comfort, the range is between 24 and 27 degree Celsius.¹ There are some universal laws which can be applied to humans. When the temperature increases, our efficiency decreases. This is because of fatigue. For this reason, we use air-conditioners, which provide us with comfort so that we may continue with our work. So for maintaining thermal comfort, air-conditioners are

widely used.² Nowadays there is a question arising about the influence of air-conditioners in context to COVID-19. When we look at the business and the economic impact on various air-conditioning industries and other related organizations, there are numerous possibilities that there may be a lot of cover up when it comes to the exposure of problems related to COVID because of air-conditioner. There is a high possibility of cover ups when we talk about the influence of the air-conditioner in the spread of the COVID-19.

Air-conditioners are always governed by a set of universal laws.³ These laws control the working of the air-conditioner. The primary of them is the recirculation of indoor air. All

International Journal of Healthcare Education & Medical Informatics (ISSN: 2455-9199)

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air-conditioning systems, suck air from the room, cool it and then distribute the air evenly to all parts of the room. In the present situation, there are high chances of the various organisations making guidelines for the HVAC usage to be influenced by the manufacturing industries. This is because these organizations are directly or indirectly funded by them. A dip in the sales and the fall of profit for the air-conditioning industries may have an impact on the other organizations as well. So there are not many companies or organizations which would ask the customers not to use air-conditioners. However, when it comes to the matters about life, it is highly recommended not to take any risks. The entry of COVID particles to the room can be restricted by barring the entry of outsiders in a home air-conditioning system. But there are chances of an asymptomatic person moving around the house. The particles can enter the air when this asymptomatic person sneezes, coughs or even talks.⁴ In such situations, prevention and public health are essential to minimise the spread of disease to people within such dwellings.⁵

Literature Review

There have been various discussion and studies conducted by various researches which talk about the influence of various air-conditioner systems in the indoor environment.

Central Air-Conditioning System

These air conditioners are mostly used in wide enclosed spaces. They are mostly used in hospitals, malls, and large bungalows. The filters used in such systems vary as per the application. There is a fresh air intake and ventilation process in such system. Figure 1, shows the random example of a centralized system.

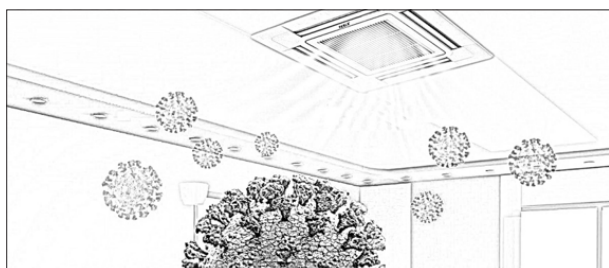


Figure 1. Central air-conditioning system

Memarzadeh and Xu⁶ in their study conducted on the central air-conditioning systems, established that the Air Changes per Hour (ACH) can be increased so as to ventilate the indoor air, and bring fresh air from the outside. This ACH facility is not available in either split or window air-conditioners. Barn et al.⁷ stated that in his study the use of High-Efficiency Particulate Air (HEPA) filters for the removal of unwanted particles in any room should be done so as to achieve better indoor environment. This filtering process removes all the germs in the air. But the problem is that these HEPA filters are not installed in domestic air-conditioners. Barn et al.⁸

tried an experimental process to install hepa filters in pre-existing air-conditioners. This process was not a success as these add-on HEPA filters were not able to filter particles of the size lower than 2.5 PM.

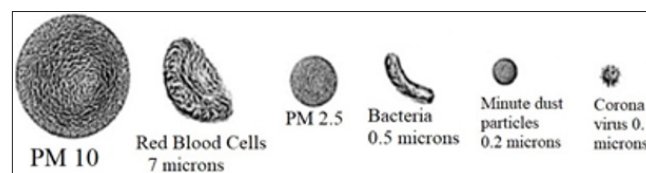


Figure 2. Schematic diagram of the size of the virus

Figure 2, provides a schematic diagram of the size of the virus relative to the other small particles.

Domestic Air-Conditioning System (Window and Split)

These air-conditioners are installed at homes, depending on the location and space availability. Window air-conditioners can be installed only in rooms which have windows. The split units however can be installed in any room. Singh⁹ in their study clearly showed that the air-conditioners re-circulate the indoor air, with no addition of outdoor air, in domestic applications. This process of recirculation of indoor air may lead to the transmission of the infectious particles from one person to another inside the room.

Yang et al.¹⁰ found that the domestic split units re-circulates the indoor air, with no suction of outdoor air. The only source of ventilation in split and window units is the manual opening of the windows or doors. So any infectious particle inside the room continues to move around the enclosed space, till the time it is manually ventilated.

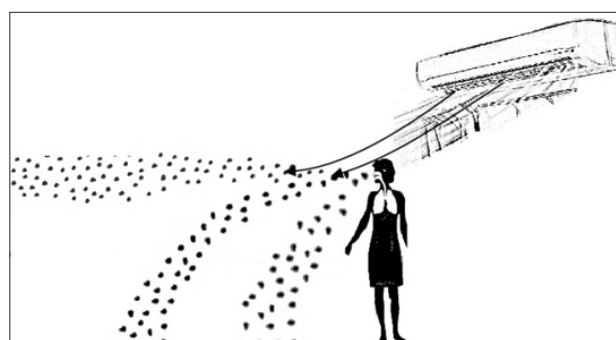


Figure 3. Air particles tend to move on the basis of the air pressure

The association between the air conditioner, air pollutants and airborne contaminants can be seen from Figure 4 and, due to the pattern of air movement the particle may tend to travel more.

Conclusion & Recommendation

There may be instances where the virus is present inside a human body but without showing symptoms. This has been shown in the literature that air-conditioner systems

re-circulate the indoor air so a carrier can spread the virus to other members in the family. Therefore, in these situations, air conditioners cannot be advised as airflow can be infected, and the virus may spread by recirculated air inside the room, as shown in figure 4. The split and window air-conditioners systems lack ventilation and virus particle of the size of 0.1 microns cannot be screened by their filters. The central air-conditioning system using HEPA filters are still better but the system which is not equipped with HEPA filters have the risk of transmitting the disease. The current literature on air-conditioning systems is not concrete to deter infection transmission. It is therefore important at this stage, to encourage people to take all suitable preventive, non-pharmaceutical measures, and the use of face masks, physical distance and hygiene can be decisive in the path of the disease that follows in any area.¹¹

Brief Communication

There is a good old wise saying - "Prevention is better than cure". At present we are living in a state of uncertainty. We are not sure what to breathe? What to eat? What to touch? and it is all because of something we cannot even see. We, the human race considered ourselves to be the strongest of the entire creature living on this planet earth. But how is it likely that we did not consider that something as tiny as a virus could bring us to our knees and scare us from even leaving our homes?

All the above-discussed statements stand true when we compare them to the use of air-conditioning in the present scenario. In such unpredictable times, it is prudent to avoid air conditioners in the event of specified circumstances or concerns, and when it comes to matters of survival, why should we even take any minor risks?

Conflict of Interest: None

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