Knowledge and awareness about airborne pathogens and its prevention among the general public

Ashritha M\textsuperscript{1}, Geetha R V\textsuperscript{*2}, Jayalakshmi Somasundaram\textsuperscript{3}

\textsuperscript{1}Saveetha Dental College, Saveetha Institute of Medical and Technical Sciences (SIMATS), Saveetha University, Chennai, Tamil Nadu, India
\textsuperscript{2}Department of Microbiology, Saveetha Dental College and Hospitals, Saveetha Institute of Medical and Technical Sciences, Chennai, Tamil Nadu, India
\textsuperscript{3}White lab, Material Research Centre, Saveetha Dental College and Hospitals, Saveetha Institute of Medical and Technical Sciences (SIMATS), Saveetha University, Chennai, Tamil Nadu, India

\textbf{ABSTRACT}

The airborne disease is mainly caused by the pathogens, which spread through respiratory droplets while coughing, sneezing or talking. Infection protection and control measures are taken to prevent the possible spread of coronavirus, which also spreads through respiratory droplets. Discharged microbes are suspended in the air as dust particles and even in the form of droplets. The Middle East respiratory syndrome is caused by coronavirus wherein the health workers are at a higher risk. Hence, awareness must be created in order to reduce a number of cases. The preventive measures are mainly taken in health care as patients are susceptible to diseases. It is essential for all the people to become aware and take steps accordingly. The survey was distributed online to around 100 participants of various places of Tamil Nadu regarding the awareness of airborne pathogens. From this above study, it could be noticed that around 85% of the people are aware of the airborne pathogen whereas 15% of the people are not aware of. 64% of people have a good knowledge of the symptoms of any type of airborne disease. Regarding the protective measures that must be taken, about 65% of the people are conscious of doing it. The study concludes that there is awareness of airborne pathogens and its prevention among the general public.

\textbf{INTRODUCTION}

Airborne diseases are caused by pathogenic microbes small enough to be discharged from an infected person via coughing, sneezing, close personal contact or aerosolization of the microbe. The discharged microbes remain suspended in the air on dust particles, respiratory and water droplets. These airborne pathogens are responsible for causing these types of diseases. Any type of airborne disease is caused by the pathogen that would get transmitted through air at a particular time over a distance (\textit{Prevention and Korean Society of Infectious Diseases and Korea Centers for Disease Control and Prevention, 2020}). These pathogens could be viruses, bacteria, or fungi which can spread through breathing, talking, coughing, sneezing, dust particles, spraying of liquids that promote aerosol particles or droplets (\textit{Ai \textit{et al.} , 2019}). The airborne transmission mainly occurs through droplet nuclei.
which are usually of size greater than 5 micrometres. New pathogens are emerging every day, which pose a significant threat in treating hospitalised patients (Ashwin and Muralidharan, 2015; Renuka and Muralidharan, 2017). Recent researches have revealed that inhaling any kind of airborne antibiotic resistance gene can cause severe lung problems and damage to our immune system (Girija et al., 2019a). The airborne particles are generally dry. Air pollution plays a significant role in promoting airborne diseases which increases the risk of asthma in people (Rosa et al., 2012).

Some of the common airborne diseases are measles, morbillivirus, chickenpox, influenza virus, enterovirus etc. (Sabariego et al., 2000) The spread of the pathogens are mainly associated with total precipitation during rainfall and even under unfavourable conditions like storms, monsoons etc. (Duguid, 1946). COVID-19 is a pandemic disease which spreads through droplets. The asymptomatic carriers of COVID are developed by these speech droplets suspended in air (Wells, 1948). These small droplet nuclei can remain airborne for an extended duration of time (Stadnytskyi et al., 2020). The light scattering method has been demonstrated to observe the size of droplets suspended in air Olsen et al. (2003); Peiris et al. (2004). The pattern of spread of SARS is associated with the airborne transmission (Bourouiba et al., 2014).

The airborne disease mainly focuses on violent expiratory events (Pan et al., 2017). Aerosol transmission of COVID is plausible because the virus can be viable and infectious in aerosol for hours and even on the surfaces for an extended period of time (Nicas et al., 2005). In general, it could be noticed that these viral infections mostly spread by direct contact such as touching an infected person or surface which is being contaminated. (Booth et al., 2005). The procedure which happens during transmission where the transport of infection loaded particles are present in the air (Marickar et al., 2014). When the droplets are expired, the liquid contents present slowly start to evaporate, wherein these droplets become so small that transport by air current affects them more than gravitation (Twu et al., 2003). These small droplets are free to travel as they contain viral content, spread along meters over meters from where they originated (Morawska et al., 2009).
Figure 5: 52% of the people are aware of the previous airborne outbreak, while 48% of them are not aware.

Figure 6: 64% of the people have responded that cold, fever, running nose are the symptoms of any airborne diseases while 21% of them feel that common cold is the only symptom seen.

Figure 7: 84% of the participants have opted for airborne being the riskier mode of transmission when compared to the modes while 16% of the people disagreed.

Figure 8: 64% of the people are aware enough to cover their mouth with face masks and also maintain distance from people having those symptoms.

Few of the precautions that could be taken against these airborne diseases include increased ventilation rate, using natural ventilation, avoiding air recirculation, staying away from another person’s direct airflow and minimizing the number of people sharing the same environment (Qian and Zheng, 2018). There is a general lack of awareness on vaccine among the general public towards the airborne pathogens (Pratha and Geetha, 2017). The precautionary measures that are generally taken in the health care department in order to eliminate the airborne pathogens through expiratory aerosols, dispersion, heat and mass transfer, modelling to airflow, modelling aerosol dispersion, viability and infectivity measurements (Aliabadi et al., 2011). Preventive measures need to be taken by washing hands properly, maintaining health during any type of pandemic (Shahana and Muralidharan, 2016). The aim of this study is to assess the knowledge on airborne pathogens and its prevention among the general public.

MATERIALS AND METHODS

A cross-sectional study survey research approach using the electronic distribution of a questionnaire was made, and the sample size was taken to be 100. This study was approved by the scientific board of Saveetha University. This was the best approach to do the collection of the data as a large number of people were involved, and the questionnaire contained questions regarding the awareness of COVID-19, any kind of airborne disease, awareness on airborne pathogens and its transmission, preventive measures taken by them. The survey included around 20 questions, and it was distributed among the general public of Tamil Nadu and data was collected and analysed using SPSS software in which chi-square test and Pearson correlation analysis were also used, with a p-value less than 0.05 to be statistically significant.
RESULTS AND DISCUSSION

The study produces the data which are represented through pie charts. The following pie charts are the results produced from the survey questions based on the participants’ understanding. These produce the actual percentage in which people have responded, and that could help in deriving at results. The study discusses awareness of airborne pathogens and the diseases caused by it.

Figure 1 reveals that about 85% of the participants have enough knowledge, whereas 15% of the people lack knowledge towards airborne pathogens.

As we know, airborne diseases are illnesses that spread by tiny pathogens that are present in the air (Vaishali and Geetha, 2018). This is a high rate of awareness of airborne pathogens due to the corona pandemic. It has made people able to face any such situation in the future while a small proportion of people yet to gain knowledge.

Figure 2 of this study shows that 31% of the people feel that airborne diseases could be bronchitis, pneumonia, COVID whereas 26% of them believe entirely that COVID is the only airborne disease among the options that were available.

Around 13% of them are not aware of airborne diseases. Some of the airborne diseases are influenza, bronchitis, pneumonia, common cold, varicella-zoster, mumps, measles, whooping cough (pertussis) etc. (M et al., 2019; Girija et al., 2019b). These particles are small enough, which have the capacity to cling to the air. It hangs on the dust particles, moisture droplets or picked up through breathing. There is also a possibility of these pathogens to be spread through mucus or phlegm. (Girija et al., 2019a; Priyadharsini et al., 2018a).

Figure 3 represents the role of air pollution, and around 85% of them agreed while 7% of them disagreed, and 8% of people are not aware. Air pollution plays an effective in causing airborne disease like asthma which is most common among people.

Various sources of these particulate matter result in the low quality of human health. The effect of air pollution that leads to pneumonia kills many people every year (Paramasivam et al., 2020).

This control of air pollution is required to decrease the number of cases affected by the airborne disease. Adverse effects of these air pollutants have resulted in multiple respiratory diseases like chronic obstructive pulmonary disease, etc. (Gordon et al., 2014). Figure 4 depicts sources of airborne diseases where 77% of the participants have responded that it could be transmitted from person to person, 20% of them opted for contaminated objects while the rest felt that both transmissions from person to person as well as contaminated objects could be sources of a type of airborne diseases. There are eight primary sources for the air-
borne diseases to get transmitted. Those include pets, plants, plumbing systems, heating, ventilation air conditioning systems, dust resuspension and outdoor environment (Kelley and Gilbert, 2013).

Figure 4 where, 77% of the participants have responded that it could be transmitted from person to person, 20% of them opted for contaminated objects.

The most common source could be an outdoor environment where people are exposed to the pathogens present in the air. Figure 5 reveals that 52% of the people are aware of the previous airborne outbreak, while 48% of them are not aware.

Effect of airborne transmission due to human movement in an aeroplane was one of the outbreaks which made the passengers under the risk to travel in an aeroplane (Mangili and Gendreau, 2005). Figure 6 reveals that about 64% of the people have responded that cold, fever, running nose are the symptoms of any airborne diseases while 21% of them feel that common cold is the only symptom seen.

Most of the common symptoms that could be seen in any type of the airborne disease are cough, sneezing, congestion and body aches. Figure 7 reveals that 84% of the participants have opted for airborne being the riskier mode of transmission when compared to the modes, while 16% of the people disagreed. The airborne diseases are considered to be a significant threat as the pathogens have an efficient route of spread and gain access to many people (Priyadharsini et al., 2018a, b; Shahzan et al., 2019). Figure 8 provides the responses obtained from people regarding the preventive measures and around 64% of the people are aware enough to cover their mouth with face masks and also maintain distance from people having those symptoms. In order to control the spread of these airborne diseases, negative pressure is employed in health (Jensen et al., 1999).

Preventive measures must be taken to control the rate of spread of these airborne diseases. In the case of flu, antiviral drugs can be given, for infants suffering from whooping cough, antibiotics are prescribed. Figure 9 reveals that 45% of the peo-
people would consult a medical professional as well as avoid contact with other people while 24% of the people responded that they would only avoid close contact with other people. And shows 24% of the people responded that they would only avoid close contact with other people.

Figure 10 represents that 85% of the people have become aware of dealing with these kinds of situations in future, whereas still, 13% of them are not aware. The general precautions that could be taken are wearing masks, maintaining hygiene and staying away from people who are showing the symptoms of any type of airborne disease.

Figure 11 shows the Red colour denotes the awareness that people have and blue colour denotes the people who are not aware of. Out of 84.15% of awareness on airborne pathogens constituted, 32.67% of people between the age group 18-25 years, 23.76% between 26-40 years, 22.77% of the people between 41-60 years and 4.95% of the people above 60 years of age. People between the age group of 18-25 years are more awareness among the rest of the age groups. However, there is a significant difference between the two groups. [p value-0.049 (p<0.05)-significant]. The X-axis represents age, and Y-axis represents the number of people.

Figure 12 shows For the sources of air pollution, a maximum number of people have opted for objects (blue colour), person to person (red colour) while others (green, yellow) have responded as it could be due to coughing, sneezing. Chi-square test was done, and the association was found not to be statistically significant. [p value-0.536 (p>0.05)-not significant]. The X-axis represents the age, and Y-axis represents sources of airborne diseases.

Figure 13 shows More people have agreed (blue colour), few disagreed (red colour), while others are not aware (green colour) that air pollution plays a role in airborne diseases. Chi-square test was done, and the association between the two groups was found to be statistically insignificant. [p value-0.420 (p>0.05)-not significant]. The X-axis represents the age, and Y-axis represents the awareness of the role of air pollution in airborne diseases.

Figure 14 shows Blue denotes the percentage they are aware of, red denotes that they disagree with such previous outbreaks and green represents that people are not aware of any previous airborne disease outbreak. Chi-square test was done, and the association was found to be statistically insignificant.[p value-0.186 (p>0.05)-not significant]. The X-axis represents the age, and Y-axis represents the awareness of the previous airborne outbreak.

Figure 15 shows More people have opted for all of these symptoms which includes common cold, fever, running nose (orange), few for the common cold (blue), others for fever (red) and running nose (green). Out of 63.36% of the people who are aware on all the symptoms of an airborne disease which constitutes 30.69% of them between age group 18-25 years, 16.83% of the people are between 26-40 years, 11.88% of the people are between the age group 41-60 years and 3.96% of them are above 60 years of age. People between the age group 18-25 years are more aware than others. Chi-square test was done, and the association was found to be statistically significant [p value-0.036 (p<0.05)-significant]. The X-axis represents the age, and Y-axis represents the awareness of the symptoms of any type of airborne diseases.

Figure 16 shows the Blue denotes that people prevent themselves from any type of airborne disease by covering their face with masks as well as social distancing, red colour represents covering only with masks, and the red colour represents maintaining social distance only. Chi-square test was done, and the association between the two groups was found to be statistically insignificant. [p value-0.298 (p>0.05)-not significant] and X-axis represents the age and Y-axis represents the preventive measures taken by the people.

CONCLUSIONS

The study concludes that awareness of airborne pathogens and its prevention among the general public after the corona pandemic is considerably higher. Participants are even aware of the symptoms that are produced by any type of airborne pathogen. Hence, they would be able to handle any kind of situation in the future if they are affected by any type of airborne disease. It is high time that people are aware and necessary to take preventive mea-
sures to prevent the further spread of any airborne disease.

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**Conflict of Interest**
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