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Knowledge and Attitude About COVID-19 Pathogenesis Among Oral Pathologists in Chennai

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ABSTRACT

Background: Coronavirus is a kind of viral pneumonia that is caused by SARS-COV 2. The emergence of SARS-COV 2 has been marked as the third introduction of a highly pathogenic Coronavirus into the human population after SARS-COV and MERS-COV in the 21st century.

Aim: This survey was done to assess the knowledge and awareness of COVID-19 pathogenesis among oral pathologists in Chennai.

Materials and Methods: Nearly 84 participants took part in the survey. 21 close-ended questions were presented in the online survey which was circulated among the oral pathologists through Google forms. The results were tabulated and analyzed using SPSS.

Results and Conclusion: 67% of the oral pathologists were aware of the exact pathogenesis of COVID-19 in Chennai. Practicing oral pathologists were found to have better knowledge than the postgraduates. Within the limits of the study, we can conclude that there is good awareness regarding the pathogenesis of COVID19 among practicing pathologists.

Conclusion: In today's scenario it is extremely important for oral pathologists to assess the risk of transmission and clinical outcomes based on the pathological course of the disease. An in-depth understanding of the pathogenesis will also help in developing novel treatment protocols to combat the pandemic.

Key Words: COVID-19; Pathogenesis; Chennai; Oral Pathologist, Post-graduates, Treatment.

INTRODUCTION

Novel coronavirus induced pneumonia was named as coronavirus disease 2019 (COVID-19) by WHO on February 11, 2020^{1,2}. On the same day, the international virus classification commission announced that a novel coronavirus was named as severe acute respiratory syndrome Coronavirus-2 (SARS-COV-2). COVID-19 is not the first respiratory disease outbreak caused by the coronavirus. In the past two decades, coronavirus has caused three epidemic diseases, COVID-19, SARS, Middle East respiratory syndrome (MERS)². At present, the cases of COVID-19 have been found in many countries around the world³. Nearly 50,00,00 people have

been affected to date because of COVID-19 with 3,50,000 deaths and 20,34,790 cases cured worldwide³.

COVID-19 spreads by the human to human transmission through aerosol droplets, and direct contact⁴. It has an incubation period of 2 to 14 days⁴. To date, no antiviral treatment or vaccine has been explicitly recommended for COVID-19⁴⁵. Therefore it is necessary to apply preventive measures to control COVID-19 infection. Healthcare workers are the primary sector in contact with patients and are an important source of exposure to infected cases in healthcare settings; hence healthcare workers are expected to be at high risk of infections⁴⁶.

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Various surveys have been conducted among a varied population in order to assess the awareness of certain conditions which motivated us to conduct a survey among the Oral pathologists regarding the knowledge of COVID-19 pathogenesis⁷⁻⁹. This survey was conducted among oral pathologists in Chennai to assess the awareness of COVID-19 pathogenesis. It is necessary as a healthcare professional to know about the novel coronavirus and its pathogenesis which in turn helps to create awareness among the general public and other patients visiting dental colleges. It is also the responsibility of a healthcare professional to motivate the general public in order to follow the preventive measures enforced by the government by making them aware of the disease progression. Thus the aim of the survey was to assess the awareness and knowledge about COVID-19 pathogenesis among oral pathologists in Chennai.

MATERIALS AND METHODS

Study population

The cross-sectional questionnaire survey was conducted among postgraduates and Practising oral pathologists in the Chennai population. Ethical clearance was obtained from the Institutional review board of Saveetha Dental College. (no. SRB/SDC/MDS/003/01).

The survey questions were validated and an online form(<https://docs.google.com/forms/d/1o9kQemEct2d1FEBsoq1VEuaOn9NLjHUGIbO5o3XuUPk/edit?chromeless=1>) of the questionnaire was sent to 84 potential responders who were students and practicing oral pathologists at various institutions in Chennai. The period of the survey was from April 28, 2020 to May 20, 2020. Nearly 84 respondents completed the survey with a response rate of 100%.

Data collection

The self-administered questionnaire consisted of social demographic questions (3 questions) and 16 questions were based on the knowledge and awareness of COVID-19 pathogenesis. Consent was obtained by all participants in the study. Ethical approval was given by the scientific review board of Saveetha Dental College and Hospital. The convenience sampling method was used for data collection and the distribution of responses was presented as frequency and percentages. Subgroups were classified based on gender, age, and type of practice from dental colleges and hospitals.

Statistical analysis

Results were tabulated in Excel and descriptive statistics were done using SPSS-20. Individual pair-wise comparison was done using percentages or frequency. A Chi-square test was used. $p < 0.05$ was considered to be statistically significant.

RESULTS AND DISCUSSION

Of the total 84 participants in the survey, 63 percent were practicing oral pathologists and 34 percent were oral pathology post-graduate residents (Figure 1). 68.5 percent were female respondents. Nearly 79 percentage of the people stated that the S-protein is the protein that attaches to the receptors on the host cell (Figure 2). 53.5 percent of the respondents stated that the antigen-presenting cells (APC), macrophages, and neutrophils were affected by SARS-COV-2 virus (Figure 3). 74 percent of participants stated that there was an associated seen between HLA polymorphism and increased susceptibility for SARS-COV2 infection (Figure 4). 59 percent stated that COVID 19 spreads via all modes of transmission mentioned in the questionnaire (Figure 5). 86 percent stated that SARS-COV-2 attaches to the ACE2 receptor (Figure 6). 99 percent stated that stage-1 of COVID-19 is asymptomatic (Figure 7). 97% of the participants answered that the incubation period of the SARS-COV-2 virus is 2-14 days (Figure 8). 76% of the participants answered that the lower respiratory tract is affected in stage-2 of COVID 19 (Figure 9). 82% of the participants stated that type-2 pneumocyte is affected by the SARS-COV-2 virus (Figure 10). 86 percent of the respondents stated that hypoxia and ARDS are seen in stage-3 of COVID-19 (Figure 11). 84 percent of respondents answered that alveoli of the lungs are affected in stage 3 of the disease (Figure 12). 75 percent of the participants stated that the release of inflammatory mediators is triggered by the SARS-COV-2 virus (Figure 13). 50 percent of the oral pathologists were not aware of the radiographic appearance of SARS-COV2 infection (Figure 14). 96 percent answered that plasma therapy was useful in treating the patients affected by SARS-COV-2 infection (Figure 15). On the association between the various parameters and knowledge among the respondents, we observed that practicing oral pathologists had better knowledge regarding the viral protein component that attaches to the cell surface receptor, HLA polymorphisms, and SARS-COV-2 susceptibility, mode of spread, and the part of the airway affected in stage 2 and the part of the lung affected in Stage-3, compared to the PG oral pathologist residents ($p < 0.05$ was considered to be statistically significant) (Figure 16, 17, 18, 19,20).

The respondents in the study had 100 percent awareness about the existence of coronavirus pandemic in India. Nearly 68.5 percentage of the participants of the survey were females and 31.5 percent of the participants were males. We noted that 51.9 percent of the female participants had better awareness of COVID-19 pathogenesis than males. Most of the participants were between the age group of 24 to 30 years (41.3 percent). Nearly 64.8 percent of the participants were practicing oral pathologists. 61.3 percent of the practicing oral pathologists had better awareness and knowledge regarding COVID-19 pathogenesis than PG pathologists.

Hundred percent of the participants stated that SARS-COV-2 is the type of RNA virus. SARS-COV-2 is a member of the family corona viridae, the enveloped virus that possesses extraordinarily large single-stranded RNA that ranges from 26 to 52KB in length, unlike cytomegalovirus which is a DNA virus^{10,11}. The virion of SARS-COV-2 looks like a solar corona by TEM imaging. The virus particles are spherical in shape with some pleomorphism, the diameter of the virus particle ranges from 60 to 140 nm with distinctive spikes of about 8 nm to 12 nm in length¹¹. The viral genome of SARS-COV-2 is around 29.8 KB with a glycoprotein constituent of 38 percent in total consisting of six major open reading frames common to coronaviruses and a number of other accessory genes^{5,12}. The COVID-19 is seen to more commonly affect immunocompromised individuals. Various diseases such as diabetes, hypertension, and cancer are known to affect the immunity of the individual. In the oral cavity, oral squamous cell carcinoma is one such condition where the immunity of the individual is compromised¹³⁻¹⁸. There are various serological and salivary markers to detect OSCC at an early stage¹⁹⁻²¹.

79 percent of the respondents stated that the S protein is the virulent factor of the SARS-COV to the virus which attaches to the receptor of the host cell. Various studies have proven that glycoprotein trimers which are found on the human coronavirus appear to exist in an open state^{22,23}. These structural changes are necessary for the receptor engagement of these viruses and lead to the initiation of few so genic conformational changes^{24,25}.

53.5 percent of the respondents have stated that macrophages, neutrophils, and APC are affected by the SARS-COV-2 virus. When the virus enters the cells, its antigen is present to the APC which are later recognized by the lymphocytes through the HLA complex²⁵. The SARS-COV-2 also attaches to the receptors over the surface of the neutrophils and macrophages which mediate the cellular immune response of the host²⁶.

74 percent of the total participants think that HLA polymorphism could be a factor in making a person susceptible to SARS-COV-2 infection. As discussed earlier, the HLA polymorphism is vital to the T lymphocytes specifically cytotoxic T cells²⁷. Previous research have shown that polymorphisms related to SARS-CV to susceptibility include HLA B*401, HLA B*0703, HLA-DRB1*1202, and HLA-A*01^{28,29}. Various immunohistochemical studies are done to assess the HLA expression in various oral lesions such as tuberculous granuloma³⁰. These could give us an idea about the prevention, treatment, and mechanism of COVID-19.

86 percent of the oral pathologists agreed that ACE2 receptors are susceptible to the entry of SARS-COV2. The SARS-COV2 glycoprotein-S shares 76 percent of the amino acid sequence similar to SARS-COV urban and 80 percent iden-

tity with bat SARS-COV ZC21S and ZC 45 is a glycoprotein. These are noted in the bat species²⁹. Studies done have shown that SARS-COV viruses glycoprotein get attached to the ACE to the receptor due to its 50 percent identity within the receptor-binding motifs^{29,31}. The ACE-2 receptor was blocked in a monkey, it was noted that these viruses did not infect the cell³¹.

82 percent of the participants state that type two pneumocyte is affected by SARS-COV-2 virus. ACE-2 is expressed in type-2 pneumocyte, enterocytes of the small intestine, brush border of the kidney, endothelial cells of arteries & veins, and arterial smooth muscle in several organs³¹.

75% stated that SARS-COV to infection causes inflammation with the release of inflammatory mediators like IL-1, IL-6, and TNF-alpha, along with the multiplication of viral particles in pneumocytes causing alveolar edema. ARDS is the most common pathological event of SARS-COV to infection^{32,33}. One of the mean mechanism of ARDS is the cytokine storm, the deadly and controlled SIRS result in the release of Pro-inflammatory cytokines such as IFN-alpha, IFN-gamma, IL-1B, IL-6, IL-12, IL-18, IL-33, TNF-alpha, TGF-beta, etc. and chemokines such as CCL2, CCL3, CCL5, CXCL8, CXCL9, CXCL10, etc by the immune effector cells in SARS-COV affected individuals^{32,33}. This will trigger a vibrant attack by the immune system to the body and cause ARDS and MODS and finally lead to death in severe cases of SARS-COV to infections³². Nearly 94.4% of the participants answer the complications of SARS-COV-2 correctly.

CONCLUSION

The practicing oral pathologists had better knowledge and understanding of COVID-19 pathogenesis than the PG residents. It is necessary that as a pathologist that we should understand the virology of SARS-COV-2 and its pathogenesis which can thereby help us to identify the possible oral changes in COVID-19 patients which may serve as a preceding sign and would also help us in the early diagnosis of the disease. Extensive research on the pathogenetic mechanisms would play a major role in the development of drugs and vaccines which can be path-breaking step in the treatment of COVID-19³⁴. This knowledge would also help us as oral pathologists to create awareness among the general population regarding the severity of the disease and the need to take necessary precautions in the control of the disease spread.

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Conflict of Interest

The authors declare no potential conflict of interest.

Funding Information

None

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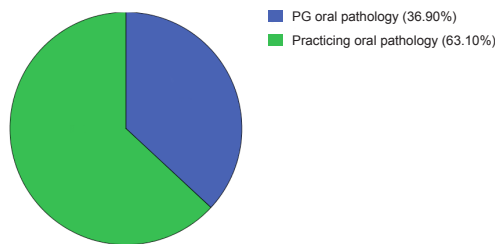


Figure 1: Pie chart depicting the frequency distribution of the participants based on whether they are a practicing oral pathologist or a postgraduate. 63% of the participants were practicing oral pathologists (green) and 37% were postgraduates (blue).

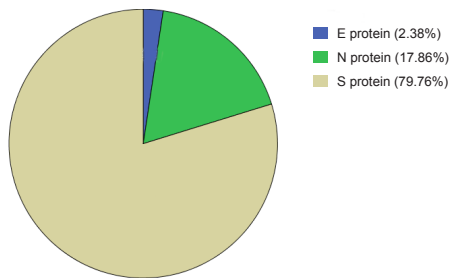


Figure 2: Pie chart depicting the answer to the question, "To which cell surface receptor does the virus attach itself to?". 79% of the participants answered S protein (grey), 17% N protein (green) and 2% answered E protein (blue).

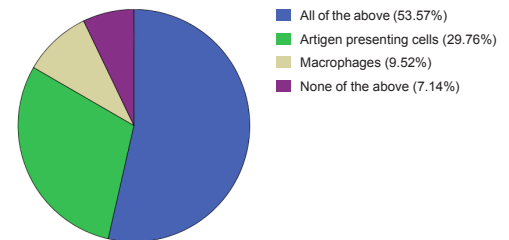


Figure 3: Pie chart depicting the answer to the question, "What are the immune cells affected by SARS-COV2?". 53% of the participants answered All of the above (blue), 30% answered antigen presenting cells (green), 9% Macrophages (Grey) and 7% answered None of the above (violet).

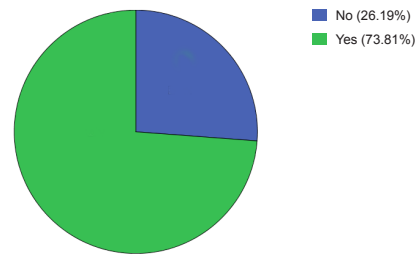


Figure 4: Pie chart depicting the answer to the question, "Is there any link between HLA polymorphism and susceptibility for SARS-COV2?". 74% of the participants answered Yes (green), whereas 26% answered no (blue).

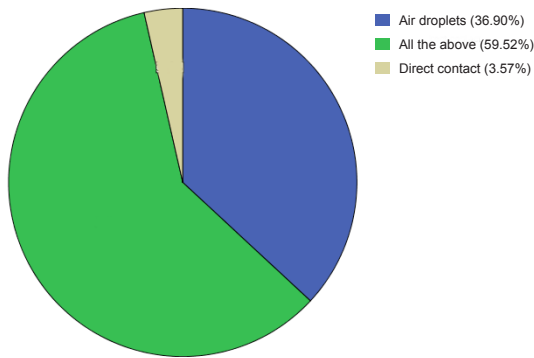


Figure 5: Pie chart depicting the answer to the question, "What is the mode of spread of COVID19?". 59% of the participants answered all of the above (green), 36% answered air droplets (blue) and 3% answered Direct contact (grey).

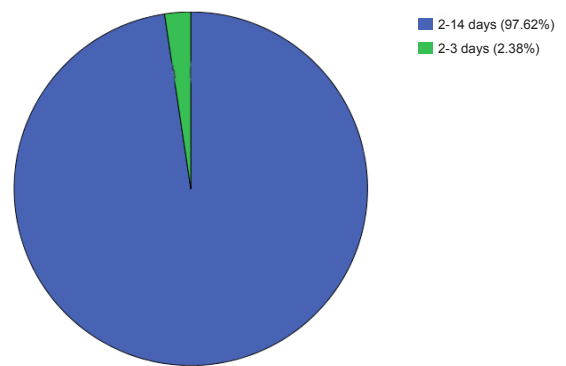


Figure 8: Pie chart depicting the answer to the question, "What is the incubation period of the virus?". 97% of the participants answered 2-14days (blue) and 3% answered 2-3 days (green).

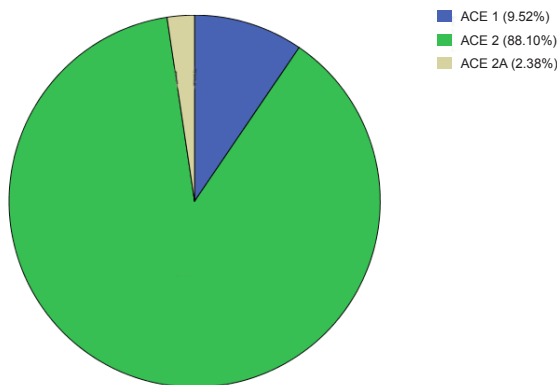


Figure 6: Pie chart depicting the answer to the question, "What is the common receptor for SARS-COV2 and SARS-COV?". 86% of the participants answered ACE2 (green), 9% ACE1 (blue) and 2% answered ACE2A (grey).

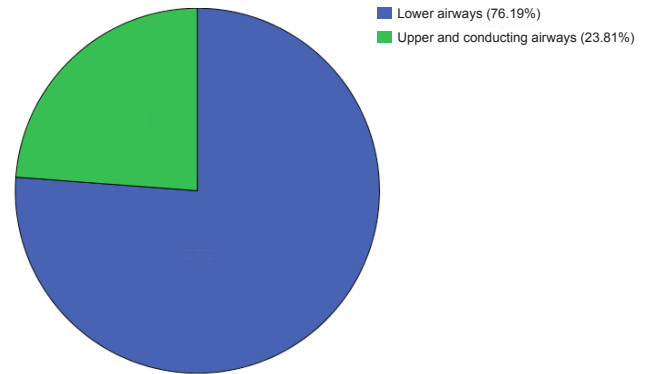


Figure 9: Pie chart depicting the answer to the question, "Which level of the airway is affected in stage 2 of the disease process?". 76% of the participants answered lower airways (blue) and 24% answered upper and conducting airways (green).

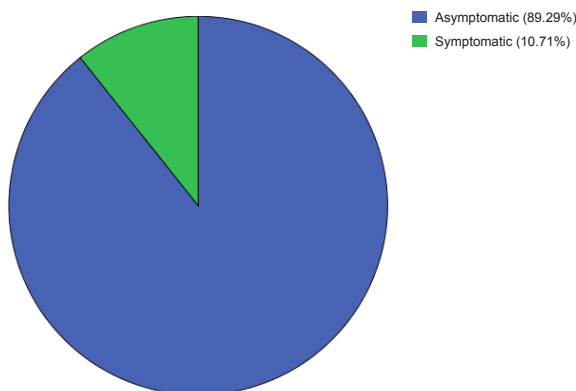


Figure 7: Pie chart depicting the answer to the question, "Which of the following describes Stage I of the disease process?". 99% of the participants answered asymptomatic (blue), and 10% answered symptomatic (green).

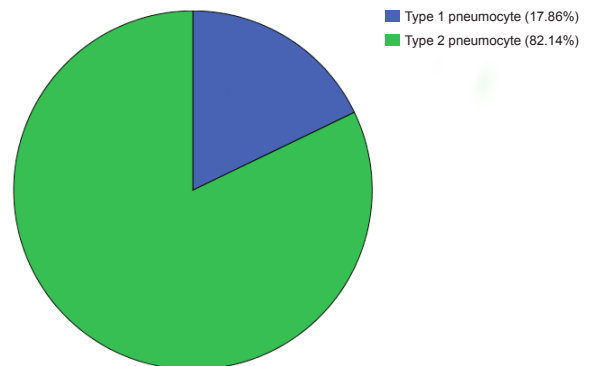


Figure 10: Pie chart depicting the answer to the question, "Which cell in the lung is affected?". 82% of the participants answered Type2 pneumocyte (green) and 18% answered Type 1 pneumocyte (blue).

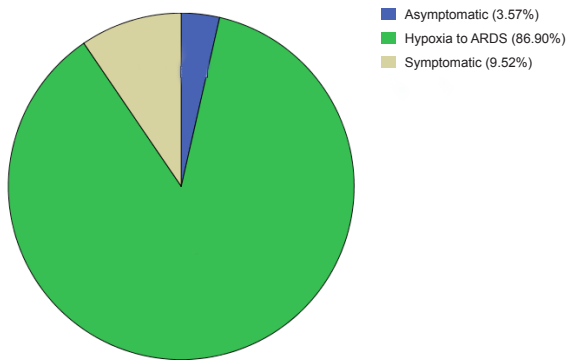


Figure 11: Pie chart depicting the answer to the question, "Which of the following describes Stage 3 of the disease process?". 86% of the participants answered Hypoxia and ARDS (green), 9% symptomatic (grey) and 4% answered asymptomatic (blue).

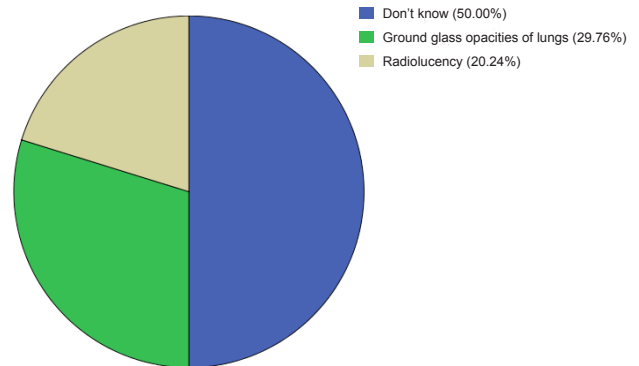


Figure 14: Pie chart depicting the answer to the question, "What is the characteristic X ray finding?". 50% of the participants are not aware (blue), 29% ground glass appearance of the lungs (green) and 20% answered radiolucency (grey).

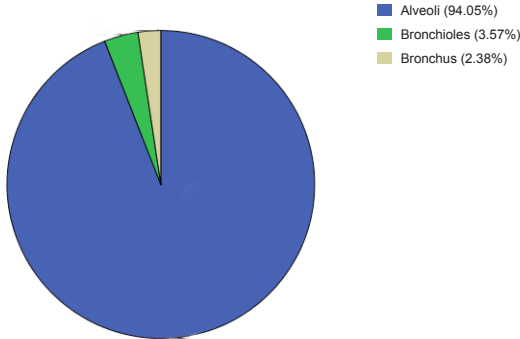


Figure 12: Pie chart depicting the answer to the question, "Which part of the lung is severely affected during 3rd stage?". 84% of the participants answered Alveoli (blue), 3% bronchioles (green) and 2% answered bronchus (grey).

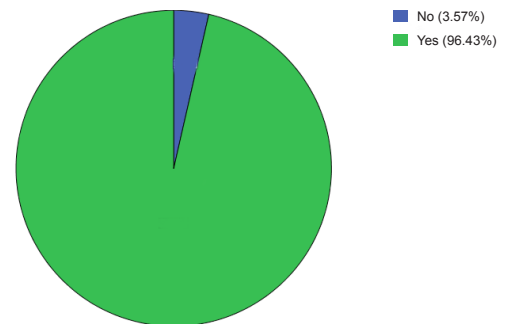


Figure 15: Pie chart depicting the answer to the question, "Is plasma therapy useful for COVID19?". 96% of the participants answered yes (green) and 4% answered no (blue).

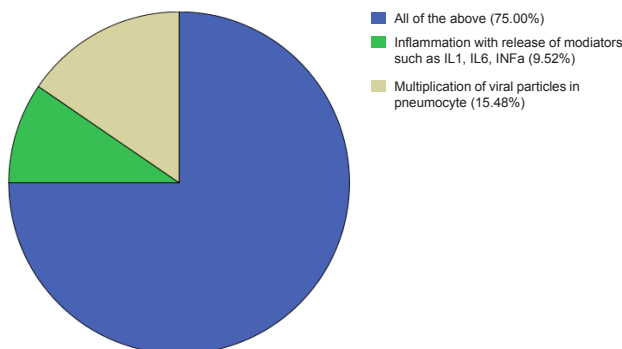


Figure 13: Pie chart depicting the answer to the question, "What is the pathogenesis behind SARS-COV 2?". 75% of the participants answered release of inflammatory mediators such as IL1, IL6 and TNF alpha (blue), 15% Multiplication of viral particles in pneumocyte (grey) and 9% answered all of the above (green).

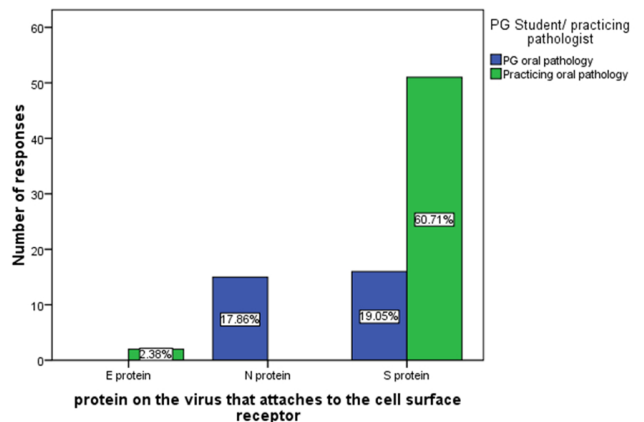


Figure 16: Bar graph representing the association between the response to the question "What is the protein on the virus that attaches to the cell surface receptor?" and qualification. X axis represents the proteins in the virus and Y axis the number of responses. Maximum of the practicing oral pathologists (60%) answered S protein. Chi square test also showed statistical significance with (Chi square value = 31.696) $p=0.000$ ($p<0.05$). A significantly increased awareness regarding the viral protein was present among the practicing pathologists.

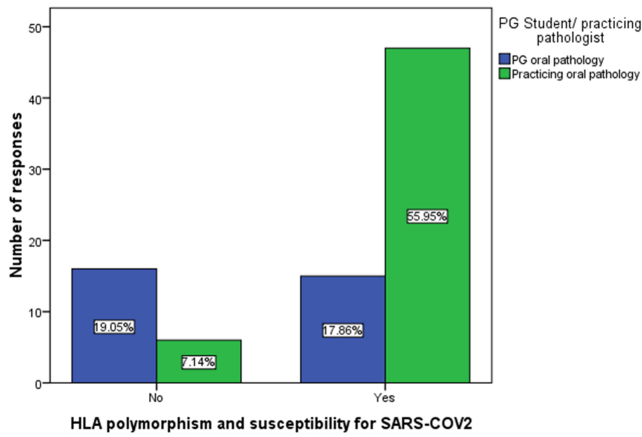


Figure 17: Bar graph representing the association between qualification and response to the question “Is there a link between HLA polymorphism and SARS-COV2 susceptibility?”. X axis represents the response and Y axis the number of responses. Maximum of the practicing oral pathologists (55%) answered yes. Chi square test also showed statistical significance with (Chi square value = 12.082) $p=0.007$ ($p<0.05$). A significantly increased awareness among the practicing pathologists.

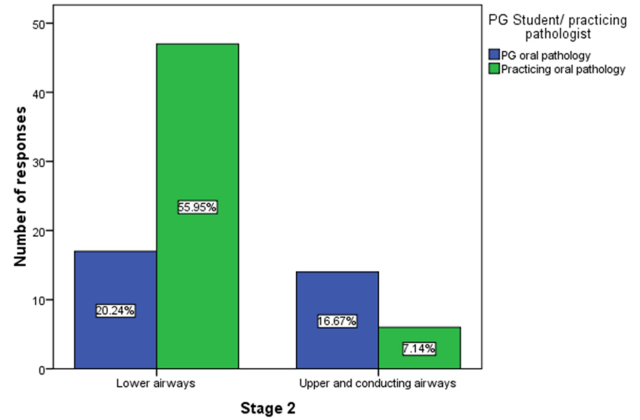


Figure 19: Bar graph representing the association between qualification and response to the question “Which part of the airway is affected in stage 2?”. X axis represents the part of the airway and Y axis the number of responses. Maximum of the practicing oral pathologists (56%) answered lower airways. Chi square test also showed statistical significance with (Chi square value = 12.348) $p=0.000$ ($p<0.05$). A significantly increased awareness was seen among the practicing pathologists.

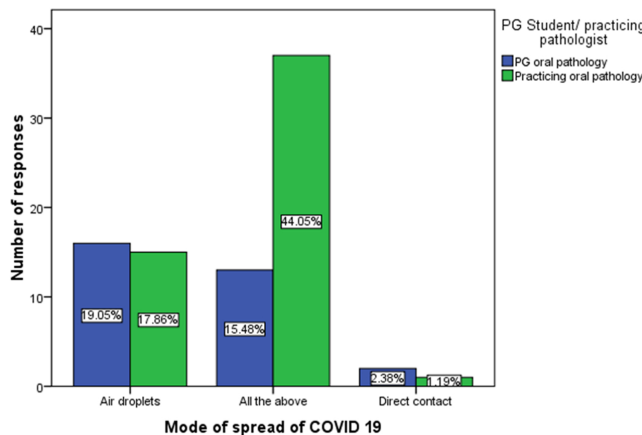


Figure 18: Bar graph representing the association between qualification and response to the question “What is the mode of spread of SARS-COV2?”. X axis represents the mode of spread and Y axis the number of responses. Maximum of the practicing oral pathologists (44%) answered all of the above. Chi square test also showed statistical significance with (Chi square value = 6.575) $p=0.037$ ($p<0.05$). A significantly increased awareness among the practicing pathologists.

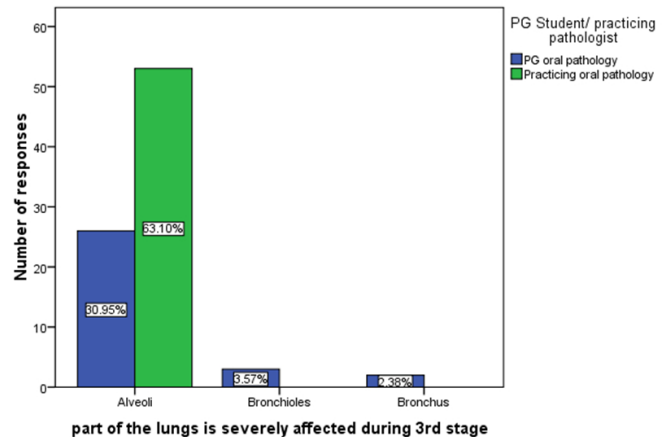


Figure 20: Bar graph representing the association between qualification and response to the question “Which part of the lung is severely affected during stage3?”. X axis represents the part of the lung and Y axis the number of responses. Maximum of the practicing oral pathologists (63%) answered alveoli. Chi square test also showed statistical significance with (Chi square value = 9.089) $p=0.011$ ($p<0.05$). A significantly increased awareness was seen among the practicing pathologists.

QUESTIONNAIRE

KAP SURVEY ON COVID-19 PATHOGENESIS AMONG ORAL PATHOLOGISTS IN CHENNAI

1. Are you aware of COVID 19?
o Yes o No
2. SARS-COV2/SARS COV is a type of
o RNA virus o DNA virus
3. ____ protein of the virus attaches to the receptor on the host cell
o S protein o N protein o E protein
4. Immune cells affected by SARS-COV2 are
o Macrophages o Neutrophils o Antigen presenting cells o All of the above o None of the above
5. Do you think HLA polymorphism correlate to the susceptibility of SARS-COV infection
o Yes o No
6. How does COVID spread?
o Direct contact o Touch o Air droplets o Fecal contamination o All the above
7. Which are the main receptors for both SARS-COV2 and SARS-COV?
o ACE 1 o ACE 2 o ACE 2A
8. Which area of the tract is affected in 80% of the infected peoples?
o Upper respiratory tract o Lower respiratory tract
9. How many stages are there in COVID?
o No stages o 1 o 2 o 3
10. The stage 1 will be
o Asymptomatic o Symptomatic
11. What are the average days of onset of symptoms for COVID?
o 1-14 days o 2-3 days o Months
12. How many days does it take to show the symptoms in the body?
o 2-3 days o 2-14 days o 1 month
13. What is the stage 2 progression of the disease
o Upper and conducting airways o Lower airways
14. SARS COV/SARS COV2 virus affects receptors on
o Type 1 pneumocyte o Type 2 pneumocyte
15. What is stage 3
o Asymptomatic o Symptomatic o Hypoxia to ARDS
16. Which part of the lungs is severely affected during 3rd stage of disease?
o Alveoli o Bronchus o Bronchioles
17. SARS COV/SARS COV2 causes
o Inflammation with release of mediators such as IL1, IL6, TNFa o Multiplication of viral particles in pneumocyte o Alveolar edema o All of the above
18. Complication of SARS-COV virus
o Fibrosis o Pneumonia o SIRS o MODS o Death o All of the above
19. The progression of stage 2 to stage 3 of the disease is majorly due to the cytokine stor.
o Yes o No
20. What are the characteristic x-ray findings?
o Ground glass opacities of lungs o Radiolucency o None o Don't know
21. Which are the materials used for testing the patients for the confirmation?
o Sputum o Nasal swab o Bronchal lavage o Blood o All of the above
22. What the underlying comorbidities that aggravates COVID 19?
o Diabetes o Hypertension o Immunocompromised status (Transplant patient, cancer, chemotherapy) o Compromised Nutritional status o Stress o Lifestyle changes o Age o All of the above
23. Are you aware that loss of smell and loss of taste are newly reported symptoms?
o Yes o No
24. Do you think plasma therapy is useful to treat COVID?
o Yes o No
25. Was this survey useful?
o Yes o No