



Original Research Article

COVID-19 Pandemic: Implications for Oral Pathologists working in histopathology, cytology and hematology laboratories

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ABSTRACT

Context: The personnel in histopathology, cytology and hematology laboratories are vulnerable to infection by tissue specimens and body fluids in the COVID-19 pandemic. This risk is essentially amplified for Oral Pathologists as they deal with tissues from oropharyngeal region which harbors high viral load. Thus, the pandemic has certain implications for modification in protocol to be followed in these laboratories. The present study gauges knowledge, attitude and awareness of Oral Pathologists with respect to these modifications required.

Materials and Methods: A self-constructed e-questionnaire comprising of 22 questions was validated and then circulated online with the aid of messenger applications and e-mails to the eligible participants. All the respondents pursuing a post-graduation course or academic faculty in the subject of Oral Pathology were considered as eligible. The data was analyzed based on age, gender, qualification, affiliation and years of experience for the Oral Pathologist-based survey using Chi-Square test.

Results: A relatively low knowledge was discerned amongst Oral Pathologists, regarding modifications required in various laboratory guidelines during the COVID-19 pandemic. Most of the respondents had a healthy attitude towards the preparedness and sustainability of their laboratory and its personnel.

Conclusion: Adequate knowledge and training with regards to modifications in protocol in the wake of COVID-19 pandemic is essential for safeguarding Oral Pathologists working in histopathology, cytopathology and hematology laboratories. A healthy attitude of Oral Pathologists towards laboratory and its personnel would ensure a safe and efficient work environment.

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1. Introduction

The number of cases of COVID-19 have been on an exponential rise ever since its inception. Various measures have been undertaken by the governments and health authorities in countries all across the world such as social distancing, lockdown and sanitization programmes in order to physically limit the outbreak. It has been demonstrated that the causative virus, SARS-CoV-2 tends to spread by means of air-borne droplets from the infected patients.¹ Considering the fact that a substantial viral load exists in the oropharyngeal region especially in the saliva of

the infected patients,² dental practitioners dealing with treatment procedures within the oral cavity are at a high risk of getting infected.³

The fact that biopsies or aspirates obtained from lesions in oropharyngeal areas could possibly transmit the infection must not be overlooked.⁴ Thus, specimens transported to histopathological laboratories may pose a significant risk to the pathologist and warrant use of appropriate transporting and fixation disinfection protocols. Health authorities such as WHO or CDC actively delineate recommended laboratory protocols in such situations. It is critical that personnel in laboratories follow these protocols so as to ensure minimal risk of infection to themselves and their colleagues.

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The present research was undertaken to assess the knowledge, attitude and practice of Oral Pathologists in Maharashtra with respect to these recommended modifications in the laboratory protocol pertaining to the COVID-19 pandemic. The cross-sectional study was undertaken to objectively highlight the respective modifications in laboratory protocol and illustrating their importance in the histopathological laboratories.

2. Materials and Methods

A self-constructed questionnaire (attached as annexure 1) was pilot tested for face and content validity with a team of 5 researchers, including a public health expert. The questionnaire comprised of a total of 22 closed-ended questions pertaining to knowledge and attitude about, and their practice of modified laboratory guidelines required in the present COVID-19 pandemic situation. The cross-sectional study was carried out by means of the questionnaire using Google Forms. All the respondents either pursuing a post-graduation course in Oral Pathology or those having an MDS Oral Pathology degree in India were considered as eligible for the study. Online platforms like emails, messenger apps and other social media were utilised in order to dole out the survey to the eligible respondents.

2.1. Sample size

Sample size was determined using a single proportion formula and it was estimated that approximately 70 respondents should complete the survey

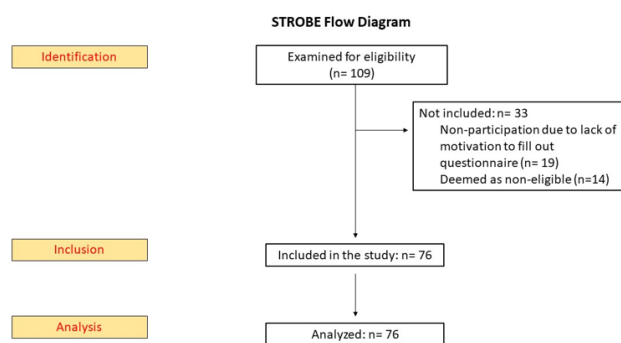


Fig. 1: Outlines the procurement of ‘n’ responses for inclusion and analysis in the study by means of a STROBE Flow Diagram

2.2. Statistical analysis

The filled responses obtained from online platform were transformed into a MS Office Excel Sheet (v 2010, Microsoft Redmond Campus, Redmond, Washington, United States). The compiled data was subjected to statistical analysis using Statistical package for social

sciences (SPSS v 17.0, IBM). Descriptive statistics like frequencies and percentage for categorical data, Mean & SD for numerical data has been depicted. The categorical variables involved included gender, academic qualification and funding source of institution. Comparison of frequencies of categories of variables & responses with demographic variables were done by using Chi-Square test. For all the statistical tests, $p < 0.05$ was considered to be statistically significant, keeping α error at 5% and β error at 20%, thus giving a power to the study as 80%.

3. Results and Discussion

The total number of respondents were 76 comprising of 52 female and 24 males with age ranging from 24 to 65 years with a mean age of 36.03 years. Amongst the eligible respondents, 28 were residents and 40 were academic faculty. 27 respondents were affiliated with Government institution and 41 respondents were affiliated with a Private/ Semi-aided institution. The remainder of 8 oral pathologists comprised of those practicing independent of an institution.

3.1. Additional safety measures and guidelines

The possible risk of infection from the specimens obtained from oropharyngeal region, such as biopsies and aspirates, warrants certain modifications in the protocol for operation of histopathological laboratories with respect to various histotechnical and cytopreparatory procedures. Overall, there was adequate awareness amongst oral pathologists wherein 97.4% of respondents agreed that additional safety measures are required to be implemented in histopathological, cytopathological and hematology laboratories during the COVID-19 Pandemic. These aspects include factors such as layout of the laboratory, equipment used for these procedures, containment of samples transported to the laboratory, details in the request form received by the laboratory along with the specimen, decontamination of laboratory surfaces and equipment. The personnel working in the laboratory also need to undertake additional precautionary measures such as reduction in number of personnel working together in a laboratory, maintaining adequate social distancing and hygiene measures, donning adequate protective personal equipment so as to ensure minimal risk of infection from the specimen to be processed. 73% of the respondents were aware that modifications in all of these aspects of a histopathology laboratory were essential to be implemented.

Over time, health authorities such as WHO or CDC have laid down certain guidelines with respect to handling of specimens that may pose the risk of transmission of a disease.^{5,6} However, the relative awareness about such guidelines is relatively low amongst oral pathologists wherein only 40.8% of respondents were aware about these guidelines according to our results. A greater percentage

of unawareness was observed in post graduate respondents possibly because of lack of work experience in the field.

3.2. Packaging and transport of specimen

Considering the present circumstances, SARS-Cov-2 may be categorized as “Risk Group 2 of infective microorganisms” implying that laboratory exposures to the pathogen may cause serious infection, but effective treatment and preventive measures may limit the infection.⁷ Moving infectious substances within the laboratory should be undertaken following Good Microbiological Practices and Procedures (GMPP) to prevent incidents of cross-contamination and inadvertent spillage. Sealed containers such as screw-capped tubes should be used. Trays and boxes of smooth impervious material that can be cleaned and disinfected effectively must be utilized. Snap-cap lids should be avoided as they are less secure. All the specimens must be delivered by hand whenever possible by personnel that is trained in safe handling and spill decontamination procedures. The laboratory must be notified that the specimen is being transported with proper requisitions and labelling in a timely manner. The International Air Transport Association (IATA) has laid down certain specifications with respect to packaging and transport of specimens which are recommended to be followed by all the pathology and cytology laboratories. Patient specimens from suspected or confirmed cases should be transported labelled as UN3373, “Biological Substance Category B”.⁸

(a) The packaging must consist of three components: (i) a leak-proof primary receptacle(s); (ii) a leak-proof secondary packaging; (iii) an outer packaging of adequate strength for its capacity, mass and intended use and with at least one surface having minimum dimensions of 100 mm × 100 mm

(b) For liquids, absorbent material in sufficient quantity to absorb the entire contents must be placed between the primary receptacle(s) and the secondary packaging so that, during transport, any release or leak of a liquid substance will not reach the outer packaging and will not compromise the integrity of cushioning material

(c) When multiple fragile primary receptacles are in a single secondary packaging, they must be either individually wrapped or separated to prevent contact between them.

According to our results, there was a relatively low awareness amongst oral pathologists regarding this aspect wherein only 42.1% of the respondents held knowledge about the three-layer packaging.

3.3. Risk carried by laboratory procedures

The pathologist comes into contact with cytological smears and aspirates soon after they are freshly harvested from oral tissues in a chemically unaltered, hazardous form. Such specimens undoubtedly pose a high risk of infection

to the pathologist, despite adequate precautions taken in packaging and transport. The biopsy specimens transported to laboratory are generally immersed in formalin solution for fixation. Formalin has been proved to have an inactivating effect on SARS-CoV at 25°C within 24 hours.⁹ Thus, it could be extrapolated that a tissue adequately fixed in formalin could be considered as having a low risk of infection. The virus has been reported to become inactivated in solutions containing 70% or greater alcohol¹⁰. Thus, routine processing of tissue specimens which involves immersing them in high concentration alcohols further lower the risk of infection. Subsequent immersing of tissue in high temperature paraffin bath and hot water bath used during sectioning of the paraffin embedded tissues could further lower the potential infectivity of the specimen by heat-induced inactivation of the virus.

Table 1: Summarizes the percentage of respondents being aware about the respective histopathological laboratory procedures lowering the risk of infection

Histopathology Procedure	% of Respondents
Formalin fixation	36.8%
Tissue Processing	30.3%
Paraffin embedding	7.9%
Sectioning	9.2%
Staining	6.6%
All of the above	44.7%
None of the above	3.9%
Unaware	10.5%

Viral shedding has been identified in blood and plasma products.¹¹ Laboratory personnel may occasionally encounter needle stick injuries, exposure by spills or splashes of blood and body fluids directly or by contaminated gloves. Therefore, routine hematological procedures carry a relatively high risk of infection to the laboratory personnel. Additionally, cytopreparatory and hematology procedures involve centrifugation of samples to obtain a concentrate of cells and spraying of fixatives on smears. Such procedures lead to generation of aerosols which could permit the viruses to become air-borne thereby increasing the risk of infection to the pathologist. Thus, it is highly recommended that such procedures be entirely avoided unless absolutely warranted. One must meticulously discern the possible benefits from cytopathological procedures and proceed only when these significantly outweigh the risks carried by them. 65% of respondents were not confident about cytological procedures being a safe option for diagnosis during the time of pandemic. Moreover, 71.1% of respondents would recommend the surgeon to suspend aspiration from oral lesions temporarily.

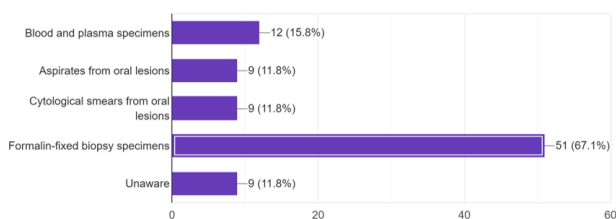


Fig. 2: Illustrates number of responses that considered the respective diagnostic samples can be attributable as low-risk for oral pathologists in the COVID-19 pandemic

3.4. Protective equipment

Donning of adequate Personal protective equipment (PPE) i.e laboratory coveralls, gowns or uniforms is recommended to be worn for cytopreparatory, histopathology and hematology procedures in the laboratory. Appropriate gloves must be worn as all the histology, cytology and hematology procedures involve direct or accidental contact with blood, body fluids and other potentially infectious materials. Gloves must be removed aseptically and adequate hand hygiene must be practiced within and before leaving the laboratory. Safety glasses, face shields or other protective devices must be worn if protection of eyes and face from splashes is necessitated by the procedure.¹² Appropriate close-toed footwear that is designed to prevent slipping to reduce the likelihood of injury or exposure is recommended to be worn in the laboratory. Respiratory protection is generally not a part of the core requirements however, in case of the COVID-19 pandemic, use of respiratory protection (fit-tested particulate respirator, e.g. EU FFP2, US 6 NIOSH-certified N95 or equivalent, or higher protection) would be critical especially if the procedures involve generation of aerosols or airborne pathogens.⁶

However, the possibility of anticipated shortage of filter masks and PPE could warrant restriction of their use only when absolutely demanded by the procedure. Considering the importance of conserving the PPE for frontline workers, it would be rational to attempt saving these equipment by utilizing selective components rather than a comprehensive set. With the view that not all procedures pose the same amount of risk to the laboratory personnel, the extent of protective equipment could be modified. The percentage of responses to the extent of PPE that should be utilized for the respective laboratory procedures as deemed by Oral Pathologists are denoted in Table 2.

3.5. Sustainability of laboratory

A histopathology laboratory does not have complete control over the specimens it receives and thus, the laboratory workers may be exposed to organisms of higher risk groups than the biological safety level of the laboratory.¹³

Recognizing this possibility, it is advisable that diagnostic and health-care laboratories must be designed for Biosafety Level 2 (BSL-2) or above as informed in WHO Laboratory Biosafety Manual, 3rd edition.¹⁴ Good microbiological practices and procedures (GMPP) should be followed when handling and processing histopathology, cytology and serological specimens. The laboratory should be kept neat, clean and free of materials that are not pertinent to the work minimizing fomites that may serve to accommodate the virus.

All contaminated materials, specimens and cultures must be decontaminated before disposal or cleaning for reuse. Work surfaces must be decontaminated after any spill of potentially dangerous material and also at the end of the day. Thus, the pandemic would pose a tremendous financial burden on the institutions of pathologist in acquiring and maintaining the additional equipment and chemicals for their laboratory. 70.37% of the respondents had a healthy confidence wherein their laboratory would be able to sustain the additional equipment and chemicals required during the pandemic. However, although statistically insignificant, the confidence in laboratory sustainability was found to be lower in Oral Pathologists working in private laboratories.

3.6. Personnel training and biosafety management

Even the most safeguarded of the laboratories could be compromised by human error and improper technique. It is, therefore, critical to have a well-trained staff adept in procedures and controlling laboratory hazards with a safety-conscious frame of approach. Thus, a safety-conscious staff, well informed about the recognition and control of laboratory hazards, is key to the prevention of laboratory acquired infections, incidents and accident. According to our results, 64.5% of respondents had a positive attitude that the personnel in their laboratory would be able to efficiently cope up with and follow the modified protocol in routine pathology laboratory procedures. For this reason, continuous in-service training in safety measures is essential. Laboratory directors or managers are integral for an effective laboratory safety programme. The responsibility to ensure that safe laboratory practices and basic biosafety management programme are integrated into the basic training of employees lies with the laboratory directors. This includes training in donning and doffing of PPE, spill and decontamination procedures, disinfection and sterilization protocols. A copy of the biosafety manual should be available in the laboratory and provided to the trained personnel as well. Daily assessment of health of laboratory personnel and condition of equipment must be monitored by the director. 59.25% of pathologists affiliated with a Government-aided institution supported daily assessment of personnel and laboratory by the laboratory director. However, this percentage of respondents was found to be lower (34.6%) for those

Table 2: Attitude of Oral Pathologists towards extent of PPE to be donned during the respective routine laboratory procedures.

Extent of PPE	Routine Laboratory Procedures(% of respondents)		
	Histopathology	Cytopathology	Hematology
Complete PPE (N-95 Masks, Headcap, Gloves, Protective eyewear, Gown and Shoe covers)	27.6%	59.2%	53.9%
Selective PPE (eliminating one or more components as discerned by pathologist)	65.8%	38.2%	42.2%
No additional equipment other than routine gloves, mask and headcap	6.6%	2.6%	3.9%

affiliated with a private/ semi-aided institution wherein a less frequent inspection was deemed appropriate by the respondents.

4. Conclusion

Considering the extent and frequency of exposure of Oral Pathologists to the disease, it is crucial to safeguard them by adequate provisions in the laboratory and supervised training during the COVID-19 pandemic. The Oral Pathologists need to have a sound knowledge about the risks carried by different procedures in the laboratory as well as the countermeasures to protect them from the same. Modifications in laboratory guidelines are extremely essential and it is of equal importance that the personnel follow these under regular scrutiny. Thorough knowledge and a healthy attitude towards laboratory and its personnel could ensure a safe and efficient working environment for the Oral Pathologists.

5. Source of Funding

None.

6. Conflict of Interest

None.

References

- Sahu KK, Mishra AK, Lal A. COVID-2019: update on epidemiology, disease spread and management. *Monaldi Arch Chest Dis.* 2020;90(1):1292.
- Yoon JG, Yoon J, Song JY, Yoon SY, Lim CS, Seong H, et al. Clinical Significance of a High SARS-CoV-2 Viral Load in the Saliva. *J Korean Med Sci.* 2020;35(20):e195.
- Peng X, Xu X, Li Y, Cheng L, Zhou X, Ren B. Transmission routes of 2019-nCoV and controls in dental practice. *Int J Oral Sci.* 2020;12(1):1–6.
- Zou L, Ruan F, Huang M, Liang L, Huang H, Hong Z, et al. SARS-CoV-2 viral load in upper respiratory specimens of infected patients. *N Engl J Med.* 2020;382(12):1177–9.
- Centers for Disease Control and Prevention. Laboratory biosafety guidelines for handling and processing specimens associated with

SARS-CoV; 2020. Available from: <https://www.cdc.gov/sars/guidance/f-lab/app5.html>.

- World Health Organization. Laboratory biosafety guidance related to the novel coronavirus (2019-nCoV). Available from: https://www.who.int/docs/default-source/coronaviruse/laboratory-biosafety-novel-coronavirus-version-1-1.pdf?sfvrsnZ912a9847_2.
- World Health Organisation Staff. General Principles in Laboratory Biosafety Manual. World Health Organization; 2004. p. 1–2.
- International Air Transport Association (IATA) Dangerous Goods Regulations (DGR) ; 2020. Available from: <https://www.iata.org/contentassets/b08040a138dc4442a4f066e6fb99fe2a/dgr-61-en-3.6.2.pdf>.
- Darnell MER, Subbarao K, Feinstone SM, Taylor DR. Inactivation of the coronavirus that induces severe acute respiratory syndrome, SARS-CoV. *J Virological Methods.* 2004;121(1):85–91.
- Chen CC, Chi CY. Biosafety in the preparation and processing of cytology specimens with potential coronavirus (COVID-19) infection: Perspectives from Taiwan. *Cancer Cytopathol.* 2020;128(5):309–16.
- Chang L, Yan Y, Wang L. Coronavirus disease 2019: coronaviruses and blood safety. *Transfus Med Rev.* 2020;34(2):75–80.
- World Health Organization Staff. Basic laboratories – Biosafety Levels 1 and 2 in Laboratory Biosafety Manual . World Health Organization; 2004. p. 10–2.
- Garner JS. Hospital Infection Control Practices Advisory Committee. *Am J Infect Control.* 1996;p. 24–52.
- World Health Organisation Staff. Biological safety cabinets in Laboratory Biosafety Manual 3rd Edition. World Health Organization. World Health Organization; 2004. p. 51–60.

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