

**Coronavirus Pandemic 2019: Implications for Oral & Maxillofacial Pathologists and Microbiologists operating in Histopathology, Cytology and Hematology Laboratories**

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**Abstract**

**Background:** The staff working in histopathology, cytology and hematology laboratories are vulnerable to infection by tissue specimens and body fluids in the COVID-19 pandemic. Oral and Maxillofacial Pathologists are highly at risk, as they deal with tissues from oropharyngeal region which leads to high viral load. Thus, the Covid -19 pandemic has definite inference for reconciliation in protocol to be followed in these laboratories.

The present study determines the knowledge, attitude and awareness of Oral Pathologists with respect to these modifications required.

**Materials and Method:** A self-created e-questionnaire was prepared it consists of 22 questions then it was validated and circulated online through many 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 and Maxillofacial Pathology were considered as eligible. The data was analyzed on the basis of age, gender, qualification, affiliation and years of experience for the Oral Pathologist-based survey using Chi-Square test.

**Results:** A relatively low knowledge was observed among Oral Pathologists, regarding modifications required in various laboratory guidelines during the COVID-19 pandemic. It was seen that mostly the respondents had a good frame of mind towards the preparedness and longevity of their laboratory and its staff .

**Conclusion:** Adequate knowledge and training with regards to modifications in protocol in the time of COVID-19 pandemic is essential for safeguarding Oral and Maxillofacial Pathologists working in histopathology, cytopathology and hematology laboratories. A positive attitude of Oral Pathologists towards laboratory and its personnel/staff would ensure a secure and structured work environment.

**Keywords:** COVID -19 ,Oral and Maxillofacial Pathologist, Personal Protective Equipment, Guidelines, Biopsy and Cytology.

### Introduction

COVID-19 cases have been on an exponential growth ever since its outbreak .A number measures have been undertaken by the government officials and public health authorities in countries throughout the globe such as maintaining physical distancing, wearing masks, lockdown and sanitization programmes in order to physically limit this pandemic<sup>1</sup>. It has been evaluated that the causative virus, SARS-CoV-2 tends to spread by means of air-borne droplets from the infected patients<sup>1</sup>. Knowing the fact that a valuable size of virus exists in the oropharyngeal region particularly in the saliva of the infected patients,<sup>2</sup> dental practitioners treating these cases are at high risk of getting infected.<sup>2,3</sup> The biopsies or aspirates/cytology obtained from lesions in oropharyngeal areas could possibly transmit the infection,must not be unnoticed.<sup>4</sup> Therefore the specimens which are transported to Histotechnique laboratories may constitute a significant threat to the pathologist. Thus this justifies the use of appropriate transporting and fixation of disinfection protocols. Health authorities such as WHO or CDC actively described a recommended laboratory protocols in such situations. It is necessary that staff in laboratories follow these rules so that to prevent and be on least chance of getting infection to themselves and their fellow worker . The present research was undertaken to assess the knowledge, attitude and practice of Oral Pathologists in Delhi and Kashmir Region with respect to these recommended modifications in the laboratory protocol pertaining to the COVID-19 pandemic. The observational study was undertaken to objectively highlight the respective modifications in laboratory

protocol and illustrating their significance in the Histopathological laboratories.

### Materials and Methods

A self-created questionnaire was pilot experimented for face and content validity with a team of 7 researchers, a public health expert was also included. This questionnaire comprised of a total of twenty two close ended questions concerned to knowledge and point of view about, and their practice of modified laboratory guidelines required in the present COVID-19 pandemic situation. This study was carried out by means of the questionnaire by using Google Forms. All the respondents either pursuing a post-graduation course in Oral Pathology and microbiology or those having an MDS Oral Pathology degree in India were considered as eligible for the study. Social media platforms like messenger apps, emails and others online platforms were used for the survey to the eligible respondents.

### Sample size

Sample size was set on using a single proportion formula and it was evaluated that relatively 70 respondents should complete the survey.

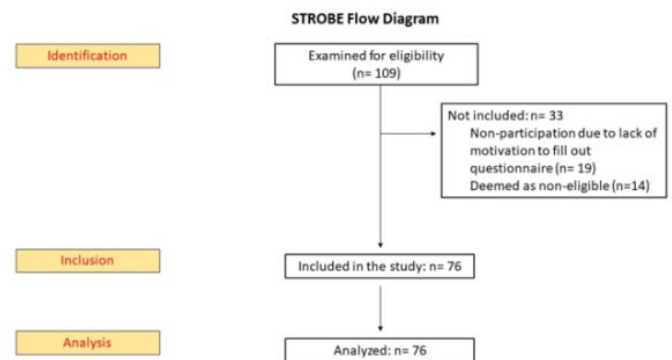


Fig. 1: Shows the obtainment of ‘n’ responses for inclusion and analysis in the study through a STROBE Flow Chart

### Statistical analysis

The filled responses obtained from social media platforms were moved to a MS Office Excel Sheet. The data was

compiled and it was subjected to statistical analysis using Statistical package for social sciences (SPSS v 17.0, IBM). Descriptive analysis like frequencies and percentage for categorical data, Mean & SD for numerical data has been described. The variables which were categorised included gender, academic qualification and funding source of colleges. Chi-square test was done for comparison of both frequencies of categories of variables & responses with demographic variables. For all the statistical tests,  $p < 0.05$  was considered to be statistically significant, keeping a error at 5% and b error at 20%, thus giving a power to the study as 81%.

### **Results and Discussion**

The total number of respondents was 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 08 oral pathologists comprised of those practicing independent of an institution.

### **Additional safety measures and guidelines**

The possible threat of infection from the specimens obtained from oropharyngeal region, such as tissue biopsies and Fine needle aspiration cytology, call for number of modifications in the protocol for operation of histopathological laboratories with respect to various histotechnical and cytopreparatory procedures. It was seen that, there was adequate awareness amongst oral and Maxillofacial pathologists wherein 97% of respondents came to same opinion that several other safety measures are needed to be implemented in histopathology, cytopathology and hematology laboratories during the COVID-19 Pandemic. These conditions include factors such as layout of the laboratory,

equipment used for the procedures, containment of samples transported to the laboratory, details in the requisitions form received by the laboratory along with the specimen, decontamination of laboratory surfaces and equipment. The staff 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 physical distancing and sanitation, wearing adequate protective personal equipment so as to ensure least risk of infection from the specimen to be processed. 72% of the respondents were having the knowledge that modifications in all of these aspects of a histopathology laboratory were required to be implemented. WHO or CDC have gradually laid down various guidelines with respect to handling of specimens that may cause the risk of transmission of a disease.<sup>5,6</sup> According to our results, the respective awareness about such guidelines is quite low amongst oral pathologists wherein only 40.7% of respondents were knowing about these guidelines. A substantial percentage of unawareness was noticed in post-graduate respondents because of lack of work experience in the field.

### **Packaging and transport of specimen**

As per the present scenario, SARS-Cov-2 may be classified as "Risk Group 2 of infective microorganisms" suggested that laboratory exposures to the pathogen may cause serious infection, but effective treatment and preventive measures may limit the infection.<sup>7</sup> The moving infectious substances in the laboratory should be undertaken following Good Microbiological Practices and Procedures (GMPP) to restrict the incidents of cross contamination and accidental spillage. Containers which are sealed such as screw-capped tubes should be utilised. Trays and boxes of smooth impervious material that can be cleaned and disinfected effectively must be utilized. Snap-cap bottles should be avoided as they are

least secure. All the specimens must be delivered by hand whenever possible by staff who trained in safe handling and spill decontamination procedures. The laboratory must be aware that the specimen is being transported with appropriate order, and labelling in a timely manner. The International Air Transport Association (IATA) has given several specifications with respect to packaging and transport of specimens which are recommended to be followed by all the pathology and cytology laboratories. The Patient specimens from suspected or confirmed cases should be transported labelled as UN3373, "Biological Substance Category B".<sup>7,8</sup>

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

(b) For fluids, absorbent material must be placed between the primary container 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 numerous fragile primary containers are in a single secondary packaging, they must be either wrapped individually or separated to prevent contact between them. As per 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.

**Risk carried by laboratory procedures**

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

adequate precautions taken in packaging and transport. The biopsy specimens are normally immersed in formalin and transported to laboratory. It has been proved that Formalin has an inactivating effect on SARS-CoV at 25 C within 24 hours.<sup>9</sup> Thus, it could be hypothesized that a tissue properly fixed in formalin chances of having infection is very low. The virus has been reported to become inactivated in solutions containing 70% or greater alcohol<sup>10</sup>. Consequently routine tissue processing of histological specimen who involves dipping them in high concentration alcohols also lowers the risk of infection. Following wax infiltration of tissue and hot water bath used during sectioning of the paraffin embedded tissues and could further lower the risk of 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%

In blood and plasma products viral shedding has been identified.<sup>11</sup> occasionally laboratory staff may encounter needle stick injuries, exposure by spills or splashes of blood and body fluids directly or by contaminated gloves. Therefore, routine haematological procedures carry a relatively high risk of infection to the laboratory personnel. Additionally, cytopreparatory and haematological procedures involve centrifugation of samples to obtain a concentrate of cells and spraying of fixatives on smears. These procedures lead to production

of aerosols which could allow the viruses to become air-borne by which increases the chance of infection to the pathologist. Therefore, it is highly suggested and advised that such procedures should be completely avoided unless absolutely guaranteed. One must meticulously discern the possible benefits from cytopathological procedures and proceed only when these significantly outweigh the risks carried by them. 66% of respondents were not assured 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.

**Protective equipment**

Wearing proper Personal protective equipment (PPE) i.e laboratory coveralls, gowns or uniforms is recommended to be worn for cytological, histopathological and hematology procedures in the laboratory. Proper 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. Adequate hand hygiene must be practiced within and before leaving the laboratory gloves

must be removed aseptically. Face shields, Safety glasses or other protective devices must be worn for the protection of eyes during the procedure.<sup>12</sup> Appropriate close-toed footwear that is designed to prevent slipping to lower the likelihood of injury or exposure is recommended to be worn in the laboratory. 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.<sup>6</sup> However, the possibility of expected shortage of filter masks and PPE could warrant restriction of their use only when absolutely demanded by the procedure. Knowing the importance of conserving the PPE for frontline workers, it would be sensible saving this equipment by utilizing selective components rather than a comprehensive set. With the view that not all procedures cause the same amount of threat to the laboratory staff, the extent of PPE could be modified. The percentage of feedback to the extent of PPE that is appropriate for the respective laboratory procedures as considered by Oral Pathologists are indicated in Table 2.

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%

**Sustainability of laboratory**

An oral pathology laboratory is not entirely in control over the receiving of specimens thus, the laboratory workers may be exposed to organisms of higher risk

groups than the biological safety level of the laboratory.<sup>13</sup> observing this possibility, it is advisable that diagnostic and health-care laboratories must be designed for Biosafety Level 2 (BSL-2) or above as recommended

in WHO Laboratory Biosafety Manual, 3rd edition.<sup>14</sup> 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 disinfected before discarding or cleaning for reuse. Work surfaces must be sanitized after any spill of potentially dangerous material and also at the end of the day. Consequently, 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. 71.37% of the respondents had a strong belief wherein their laboratory would be able to sustain the additional equipment and chemicals required during the pandemic. However, although it was insignificant statistically, the assurance in laboratory feasibility was found to be lower in Oral Pathologists working in private laboratories.

#### **Personnel training and biosafety management**

Even the most safeguarded of the laboratories could be compromised by human error and improper technique. Therefore, it is very critical to have a well-trained staff adept in procedures and controlling laboratory hazards with a safety-conscious frame of approach. Thus, a sensible staff, well informed about the recognition and control of laboratory hazards, is essential for prevention of laboratory acquired infections, incidents and accident. According to our results, 64.5% of respondents had a positive attitude that the staff in their laboratory would expertly cope up and follow the modified protocol in routine pathology laboratory procedures. For this purpose, continuous in-service training in safety measures is essential<sup>15</sup>. The Directors or managers of laboratory 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 wearing and removing of PPE, spill and decontamination procedures, disinfection and sterilization protocols. A sample of the biosafety manual should be accessible in the laboratory and provided to the trained staff as well. The director of laboratory should daily check the health of laboratory personnel and also monitor the condition of equipments . 59.35% of pathologists affiliated with a Government-funded 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 associated with a private/ semi-aided institution wherein a less frequent inspection was deemed appropriate by the respondents.

#### **Conclusion**

Considering the range 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 and Maxillofacial Pathologists need to have a profound knowledge about the risks carried by different procedures in the laboratory as well as the counter measures to protect them from the same. Modifications in laboratory guidelines are extremely essential and it is of equal importance that the staff follows these under regular scrutiny. Comprehensive knowledge and a positive attitude towards laboratory and its staff could warrant a safe and productive working environment for the Oral Pathologists.

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