

Attitudes of General Dental Practitioners toward Biopsy Procedures

¹E Anuradha Sunil, ²Arun Mohan, ³Jobin Mathew, ⁴Archana Mukunda, ⁵Archana Nair

ABSTRACT

Introduction: It is mandatory for general dental practitioners (GDPs) to identify questionable oral lesions and provide a suitable diagnosis and treatment plan for the same. Biopsy serves as an important aid in establishing the histological characteristics of oral lesions leading to their accurate diagnosis. But most dentists are reluctant to perform biopsies and refer cases to higher centers.

Aims and objectives: To explore the attitude of GDPs of Thrissur district of Kerala to biopsy of oral lesions, to explore the reasons for reluctance of GDPs to perform biopsies, to emphasize the importance of oral pathologists, and to create general awareness about the importance of oral biopsies.

Materials and methods: A self-designed questionnaire detailing open- and close-ended questions regarding the sociodemographic and professional aspects of the dental practitioners and their knowledge about oral biopsy procedures filled in by the randomly selected dental practitioners was used.

Results: Most dentists agreed that biopsy was important in diagnosis and management of oral lesions, though most of them did not perform biopsies due to various reasons. The knowledge of the practitioners regarding the various oral lesions, biopsy techniques, handling of specimen, and laboratory techniques were found to be inadequate.

Conclusion: As of now, no emphasis is given regarding the mandatory need for biopsy by general dentists in the current curriculum of Dental Council of India (DCI) for the Bachelor of Dental Surgery degree. It is hoped that the study will help in emphasizing the need for specific training or continuing dental education (CDE) programs to enhance the practical skills of dental practitioners so that biopsy is regularly used as a tool in the diagnosis of questionable oral lesions.

Keywords: General dental practitioner, Oral biopsy, Oral lesions.

How to cite this article: Sunil EA, Mohan A, Mathew J, Mukunda A, Nair A. Attitudes of General Dental Practitioners toward Biopsy Procedures. *Oral Maxillofac Pathol J* 2017;8(1):9-15.

Source of support: Nil

Conflict of interest: None

¹Professor and Head, ^{2,5}Senior Lecturer, ³Postgraduate Student
⁴Professor

¹⁻⁵Department of Oral Pathology and Microbiology, Royal Dental College, Palakkad, Kerala, India

Corresponding Author: Jobin Mathew, Postgraduate Student
Department of Oral Pathology and Microbiology, Royal Dental College, Palakkad, Kerala, India, Phone: +919846940122
e-mail: mathew.jobinmathew@gmail.com

INTRODUCTION

In our country, general dental practitioners (GDPs) come across a lot of pathological lesions in the oral cavity. Compared with most other sites, oral lesions are readily accessible to examination.¹⁻³ Thus oral cancer and other lesions are amenable to early detection. This is particularly important as most of these lesions have a much improved prognosis and survival rate, if diagnosed and treated early.²⁻⁵ The diagnoses of many of these lesions require additional investigative procedures, of which biopsy plays a central role. Biopsy and subsequent tissue examination help in establishing the histological characteristics, level of differentiation, and the extent of spread of the suspected lesion. In some cases it may be the only method to get a confirmatory diagnosis.^{6,7} Apart from diagnosis, biopsies also help in predicting the biological behavior of the lesions and help in adopting appropriate treatment strategies. Although primary indications for oral biopsies are for suspected malignancies and premalignant lesions, they are also applied for benign lesions, vesiculobullous lesions, periapical lesions, and cysts.⁶ In addition, they have undeniable medico-legal value.⁸

However, in spite of the wide range of information available from routine oral biopsy and histopathological examination, biopsy procedures remain unpopular among GDPs.⁹ Previous studies have revealed conflicting opinions on whether GDPs should perform biopsies, and if so, for what lesions and when.¹⁰⁻¹⁴ It is a fact that the number of oral lesions biopsied is far less than the number of lesions examined¹⁵ due to many reasons. The reasons which make GDPs hesitant to conduct biopsies include lack of confidence in diagnostic skills,¹⁶ lack of training in biopsy procedures,^{17,18} medico-legal implications,¹² and the concern that they are not trained to inform the patient that he/she has cancer.¹⁹

In this study, an attempt to reveal and elucidate the reasons for failure to perform biopsies on pathological or potentially malignant lesions has been made by gathering information through questionnaires on:

- Awareness of GDPs about the necessity of biopsies
- Willingness of GDPs to perform biopsies
- Perceptions of GDPs regarding their role in diagnosis of oral lesions
- Knowledge and training GDPs have in carrying out biopsies and handling tissue specimens.

MATERIALS AND METHODS

Thrissur is the second largest urbanized district in the South Indian state of Kerala with an approximate population of 34 lakhs. The study focused on 110 randomly selected GDPs across the district. The GDPs had an undergraduate qualification of Bachelor of Dental Surgery and those with a minimum experience of 2 years were included in the study. Postgraduate professionals focusing on specific specialties were excluded. A pretexted questionnaire comprising a total of 21 questions, including 4 open-ended and 17 close-ended questions was distributed among the practitioners.

The questions were devised to obtain information on:

- Awareness on the importance of biopsies in oral lesions
- Theoretical knowledge and practical skills in diagnosis and biopsy of oral lesions
- Knowledge of tissue handling and laboratory procedures
- Proximity to an Oral Pathologist.

A pilot study was conducted among 10 GDPs due to their proximity to the investigational team. Since the responses were satisfactory, no changes were made to the questionnaire and the pilot study was included along with the study sample. A list of GDPs was obtained from the list of dentists registered with the Indian Dental Association, Thrissur Branch. Questionnaires were distributed to randomly selected GDPs in person. The purpose of the study was explained and verbal consent was obtained. Results were then tabulated as percentage.

RESULTS

The entire 110 participants GDPs (100%) who were approached for the study answered the questionnaire. The mean age of the study groups is 37.91 years. Of the participated GDPs, 99 were male dentists (90%) and rest were female dentists (10%). Approximately 85% of the GDPs were doing solo practice and the rest did the group practice.

For the question whether biopsy is an important procedure to follow in a dental clinic, most of the participant dentists (91.4%) agreed but only 11% of them did biopsy on a routine basis (Table 1). Regarding the type of lesions that they encounter in their practice, 11% of them came across malignant lesions, 32% came across premalignant lesions, 14% of them came across benign lesions and cysts alone and 43% of them came across all the above mentioned lesions (Table 2).

When asked, for which all lesions biopsy was done by them, 38% of the participants GDPs answered that they performed biopsies for all lesions, while 9% performed biopsies only for malignant lesions, 12% for premalignant lesions, 20% for malignant and premalignant lesions, 16%

for premalignant and benign lesions, 4% for malignant and benign lesions and 1% for benign and cystic lesions only.

Based on results from many previous studies, we had framed a question to know the reason why most GDPs were not willing to do biopsies. A total of 47.23% considered biopsy to be a specialist procedure; meanwhile 23.03% of them expressed lack of confidence in their biopsy skills (Graph 1). Most of the participant GDPs(98%) preferred to refer major lesions to higher centers (Table3) and most of them preferred to sent biopsy specimens to a general pathology lab (59%) followed by dental colleges (23%) (Table 4).

Table 1:

Question	Yes	No
Whether biopsy is a important procedure to follow in dental clinic for correct diagnosis?	91.4%	8.6%
Whether you are doing biopsy in your dental clinic?	11%	89%

Table 2:

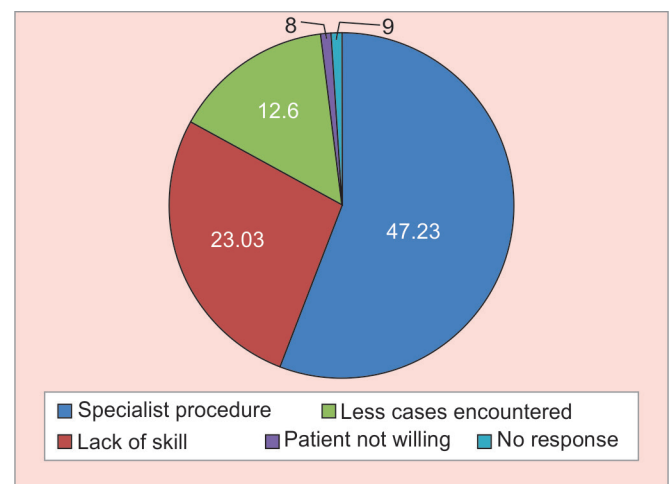
Question	Malignant	Premalignant	Benign	All of above
Which all major lesions you came across in your practice ?	11%	32%	14%	43%

Table 3:

Question	Yes	No
Whether you refer major lesion to higher centres?	98%	2%

Table 4:

Question	General pathology	Dental college	Medical college	Any of the above
Where do you send the biopsy specimen to	59%	23%	10%	8%



Graph 1: Reasons for not performing biopsy

Table 5:

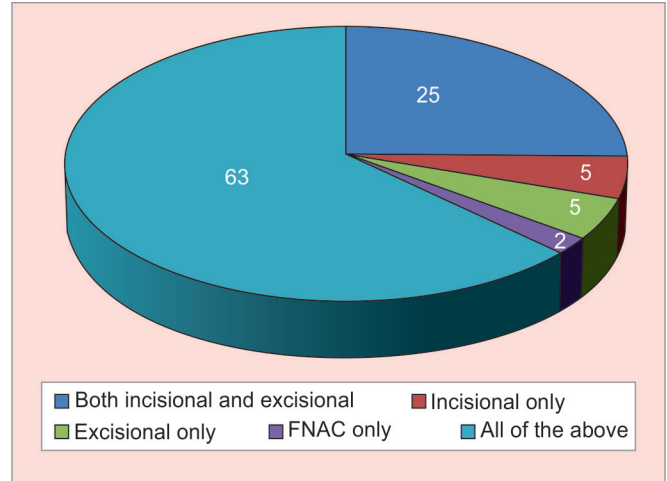
	Yes	No
Do you think every lesion should be send for histopathological examination?	11%	89%
If you do biopsy do you send for histopathological examination?	90%	10%
Do you take advice from an oral pathologist or oral surgeon before taking a biopsy?	8%	92%
Do you wash the specimen prior to placement in the preservative?	92%	8%
Do you expect tissue alteration if specimen is preserved for long time?	95%	5%
Do you send clinical history along with specimen?	90%	10%
Are you able to interpret the language of histopathological report?	96%	4%
Have you been satisfied with the histopathological report in the past?	93%	7%
Do you feel there is a need to update your knowledge regarding lesions and biopsy procedure?	90%	10%

When asked whether every lesion should be biopsied and sent for histopathological examination, most of the participants (89%) replied that not every lesion needed to be biopsied and sent for histopathological examination. Ninety percent of them replied that they would send the specimens for histopathological examination if they did biopsies (Table 5). The questionnaire sought opinion about taking advice from an oral pathologist or oral surgeon before the procedure. Only 8% of them preferred to take advice (Table 5).

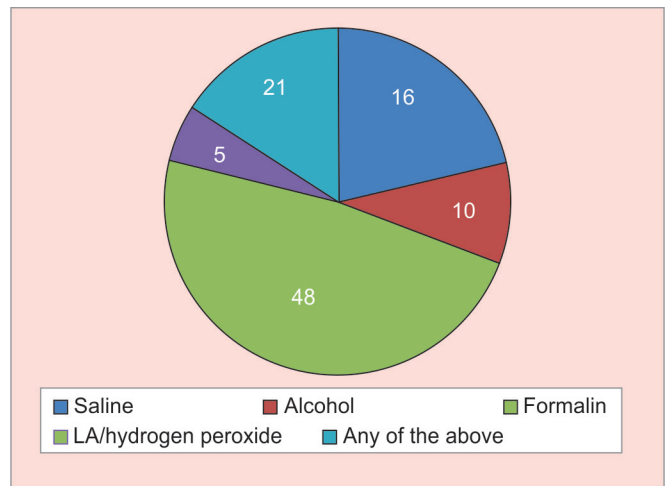
Further on asking the types of biopsies procedures that GDPs normally performed, 63% of them were familiar with incisional, excisional and FNAC techniques (Graph 2). Most of the GDPs (92%) were unaware that they have to wash the specimen prior to placement in fixative solution (Table 3). When asked about what preservative measures should be taken regarding tissue specimen placement after biopsy, only 48% of the participants replied that they should keep the specimen in the formalin (Graph 3).

Most of the GDPs (95%) believe that tissue alteration occurs when kept for long time in formalin (Table 5). For the question about the time delay in sending the specimen for histopathological analysis, after biopsy, 71% of them sent the specimen on the same day, 1% sent it 2 to 3 days later, 26% of them sent it on any other day of the week and 2% of them sent it more than a week later. 90% of the participant GDPs claimed that they send relevant clinical history along with specimen (Table 5). For the question on when did they expect the biopsy report, 55% of them expected the report the very next day, 30% of them in 2 to 3 days, 10% of them within one week and 5% of them expected it only after a week.

Most of the GDPs (96%) answered that they could interpret the results and 93% of them are satisfied with the report (Table 5). Most of the GDPs (90%) feel that there



Graph 2: Which types of biopsy technique you normally perform?



Graph 3: In what solution do you think the specimen should be preserved before sending for analysis?

is a need to update your knowledge regarding various pathological lesions and biopsy procedures (Table 5). In that context, when the GDPs were asked how they intended to update their knowledge, 59% of them preferred to attend workshops or CDE programmes, 22% of them by attending conferences, 10% of them through internet and 9% of them through journals.

DISCUSSION

Biopsy is of prime importance in the diagnosis of oral lesions.^{6,20-22} There have been conflicting opinions on whether GDPs should perform biopsies, and if so, for what lesions and when. Some believe small incisional and excisional biopsies are well within the scope of GDPs and encourage them to do biopsy of suspicious lesions which will help in early diagnosis.^{12-14,20} Others argue that the suspicious lesions should be immediately referred,^{10,11} especially because surgeons prefer to see oral lesions intact and unscarred.¹⁶

Most GDPs who took part in our study (91.4%) believed that biopsy is a vital surgical procedure for accurate diagnosis. Most of these dentists came across a lot of lesions, including cysts, benign lesions, premalignant lesions, and malignant tumors. This emphasizes the exposure of GDPs to a wide variety of oral lesions and their role in diagnosis of these lesions. Moreover, it has been reported that lesions in oral cavity are much more accessible compared with other sites.¹⁻³

Regarding the pathology which requires biopsy, majority of the participant GDPs (99%) were aware of the importance of biopsy in early diagnosis of premalignant and malignant lesions. This was reassuring, as it is a well-established fact that prognosis and survival rates of these lesions improves remarkably with early diagnosis, histological evaluation, and subsequent treatment, depending on the stage of the disease.^{2-5,23} However, 41% did not consider it necessary to perform biopsies for benign lesions and cysts. This bespeaks a lack of awareness among GDPs about the importance of biopsy in benign lesions. This is a matter of concern, as failure in early diagnosis and treatment of these lesions can result in severe morbidity in patients.

Our study revealed that only 11% of GDPs who took part in our study performed biopsies on a routine basis. This was lower than the results observed by Murgod et al²⁴ (14.93%) in a similar study conducted in South India among GDPs in the city of Belgaum. Studies conducted in other countries have shown varying results. The findings of Cowan et al²⁵ (12% in Northern Ireland) and Diamanti et al²⁰ (15% in Manchester) were comparable with our results. However, Warnakulasuriya and Johnson²⁶ reported 21% in the UK, Seoane et al²⁷ reported 24.5% in North-West Spain, and Berge et al²⁸ reported 56% in Norway, of dentists performing biopsies of all suspicious lesions on a regular basis. These results were higher than our study. In our study, 98% of GDPs preferred to refer the patients to a higher center or a specialist, which was much higher when compared with other similar studies (Murgod et al²⁴ – 64.67%, Wan and Savage⁹ – 76.2%). These results reveals that most GDPs, in spite of coming across a lot of lesions and their ease of access in the oral cavity are still reluctant to perform biopsies, even though they are aware of its significance. This in turn may lead to persistence of misdiagnosed lesions, unfavorable downstream course of disease, and possible medico-legal action against the dentist for negligence.^{17,20,24,29}

In our study, 59% of participants preferred to send the tissues to a General Pathology lab instead of sending it to an Oral Pathology lab. This reflects the need for more efforts on the side of oral pathologists to reach

out to GDPs. Franklin and Jones³⁰ have reported a marked increase of biopsy specimens to Oral Pathology Department in the School of Clinical Dentistry, Sheffield due to an increased encouragement they gave to recent dental graduates to send in their material. Moreover, according to some previous studies, most GDPs preferred a collection service for specimens by an oral pathology courier laboratory, similar to the service provided by laboratories for general medical practitioners, with links to oral medicine and oral surgery professionals for advice. Some GDPs also reportedly considered a pictorial color handbook or charts showing oral lesions that need to be biopsied as helpful.²⁰

In this study it was observed that 89% dentists did not think histopathologic analysis was required for all biopsied lesions. This is similar to the study of Franklin and Jones,³⁰ who estimated that 85% of dentists in their region did not send biopsies for histological analysis. The rationale for this could be that the excisional biopsy of lesions they consider to be clinically apparent, like mucocele, fibromas, periapical granulomas, etc., might only be for treatment purpose. However, this trend should be discouraged as biopsy is considered to be the most reliable technique that can establish the accurate diagnosis and prognosis of a clinical lesion.^{20,21} Various studies, comparing the clinical diagnosis with the final diagnosis after histological examination, have revealed incorrect diagnosis in as high as 57 to 63%.^{31,32} Also, the American Academy of Oral and Maxillofacial Pathology recommends “all abnormal tissue be submitted promptly for microscopic evaluation and analysis.”³³ So it may be important for accurate diagnosis and medico-legal reasons that all tissue removed from patients be submitted for histopathological analysis.

Regarding the type of biopsy they normally perform, 63% of them performed only incisional and excisional biopsies. On closer enquiry, it was deduced that most GDPs were a little hesitant to perform fine-needle aspiration cytologies or punch biopsies as they were not familiar with the procedure. Selection of most appropriate biopsy technique is important for early and accurate diagnosis of lesions.²⁴ Thus GDPs should be more acquainted with various types of biopsy techniques and their indications and contraindications.

On asking about the handling of tissues after biopsy, 92% of the participants did not wash the specimen before fixation. This is an aspect of biopsy which the clinicians should not overlook as unwashed blood can result in artefacts and may mask significant features. Moreover, regarding the solution in which the specimen should be preserved after biopsy, only 48% practitioners rightly

knew it to be formalin. Surprisingly, majority of them believed that the specimen should be stored in saline, alcohol, local anesthetic solution, or hydrogen peroxide. Moreover, though 95% of the GDPs were aware of chances of tissue alteration with increased preservation time, 28% of them usually send it more than 3 days after the biopsy. These results point to the fact that most clinicians are not aware of the importance of preservation and fixation of specimens after biopsy. Selection of the right preservative solution, concentration and volume of the solution, and duration of preservation are important factors in preserving tissue architecture and consequent diagnosis of the specimen.^{34,35} According to previous studies, two important situations in which a diagnosis may not be possible are: (1) Unfixed specimens, due to preservation of specimens in solutions other than formalin and (2) lack of adequate tissue in which the specimens submitted may be too insufficient or shallow to make a prompt diagnosis.³⁰

Improper preservation of specimens and failure to select the most representative tissue site for biopsy may lead to repeated biopsy of the same lesion, increasing patient's physical and mental trauma.

Moreover, 10% of the participants did not send any clinical history along with the specimen, whereas 55% of them expected a histopathologic report on the next day after sending the specimen. While the former results reveal a lack of knowledge among GDPs regarding the importance of clinico-pathological correlations of lesions, the latter shows their ignorance about standard laboratory procedures.

In our study since majority of the GDPs were reluctant to perform biopsies, the reason for the same was asked for. Based on previous studies, this can be generally attributed to factors like a lack of perceived value in obtaining a tissue specimen for histopathologic diagnosis, fear of medico-legal complications, inadequate clinical skills for performing biopsy, chances of diagnostic error, and the misconception that it is a specialist procedure.^{9,20,24} In our study 47.23% participants believed biopsy to be a specialist procedure, beyond their scope of practice. This was comparable to the results obtained by Diamanti et al²⁰ (55%) and Cowan et al²⁵ (37.62%) whereas Warnakulasuriya and Johnson²⁶ and Coulthard et al³⁶ reported higher percentages of 74 and 84 respectively. It has been previously reported that GDPs are largely discouraged by oral and maxillofacial surgeons from performing biopsies.²⁰ But as Boyle³⁷ has rightly commented, an individual's qualifications have little to do with their ability to perform biopsy. Our study also revealed that 23% of the participants lacked faith in personal skills for performing biopsies. This result was similar to studies conducted by Murgod et al²⁴

(22.39%), Diamanti et al²⁰ (25%), and Greenwood et al³⁸ (21%). Of the participants, 8% responded their unwillingness as the reason. The reason most patients are not willing for biopsies could be the fear that the results would reveal anything serious (cancer). Also some patients are reportedly worried of technical incompetence, irrespective of who performs biopsy.²⁴ However, this problem should be overcome by motivating and educating the patients regarding the lesion, the technique of biopsy, and the importance of early diagnosis and treatment.

Throughout our study we could observe a lack of willingness of GDPs to conduct biopsies, inadequate knowledge of various oral lesions, lack of confidence in diagnosing lesions and performing biopsies, and a general lack of knowledge about postbiopsy handling of tissues and subsequent laboratory procedures. Similar trends were also observed in various previously conducted studies.^{9,20,24,30} To a large extent this could be attributed to the lack of practical training in biopsy technique these GDPs have received during the course of their dental training. Though current curriculum of Dental Council of India (DCI) for the Bachelor of Dental Surgery Degree specifically includes that the undergraduates be taught the clinical presentation, diagnosis, and management of oral lesions, it does not emphasize on practically training them on various biopsy techniques.³⁹ Franklin and Jones³⁰ have reported a steady increase in the number of GDPs who regularly submit specimens after 1990, which they attributed to the changes in undergraduate teaching in oral and maxillofacial surgery. So, the GDPs who had been taught how to biopsy and had practical experience of the same during their undergraduate course were more likely to undertake biopsies later in their practice.

In our study, 90% of the GDP participants agreed that they need to update their knowledge regarding biopsy procedures and suggested that more training in biopsy techniques is essential if biopsy is to be facilitated among them. Also, majority of them wished to update it by taking part in workshops, conferences, and continuing dental education (CDE) programs. Thus, more focused efforts should be put forward for conducting specific workshops or CDE programs to provide the GDPs with the knowledge and practical training necessary to carry out biopsies confidently.

CONCLUSION

Our study clearly points out to the fact that even though most of the GDPs are aware of the importance of biopsy, very less number of them actually perform biopsies. The reason for this mainly stems from inadequate emphasis placed on biopsy procedures in the undergraduate

curriculum and thus a lack of experience in performing biopsies. So an increased emphasis on performing biopsies in the DCI curriculum and organization of workshops and CDE programs is essential for improving the current scenario. This will also lead to the fulfillment of the national drive to detect cancers at very early stages and ensure better quality of life for our citizens.

REFERENCES

1. Khatri JM, Goyal S, Parekh M, Jyothi PA, Hoshing C, Akifuddin S. Knowledge, attitude and awareness of oral carcinoma among dental practitioners – a survey. *Int J Oral Care Res* 2015;3(4):32-36.
2. Neville BW, Day TA. Oral cancer and precancerous lesions. *CA Cancer J Clin* 2002 Jul-Aug;52(4):195-215.
3. Steele TO, Meyers A. Early detection of premalignant lesions and oral cancer. *Otolaryngol Clin North Am* 2011 Feb;44(1):221-229.
4. Warnakulasuriya S. Global epidemiology of oral and oropharyngeal cancer. *Oral Oncol* 2009 Apr-May;45(4-5):309-316.
5. Warnakulasuriya KA, Ekanayake AN, Sivayoham S, Stjernswärd J, Pindborg JJ, Sobin LH, Perera KS. Utilization of primary health care workers for early detection of oral cancer and precancer cases in Sri Lanka. *Bull World Health Organ* 1984;62(2):243-250.
6. López Jornet P, Velandrino Nicolás A, Martínez Beneyto Y, Fernández Soria M. Attitude towards oral biopsy among general dentists in Murcia. *Med Oral Patol Oral Cir Bucal* 2007 Mar;12(2):E116-E121.
7. Fedele S. Diagnostic aids in the screening of oral cancer. *Head Neck Oncol* 2009 Jan;1:5.
8. Mota-Ramírez A, Silvestre FJ, Simó JM. Oral biopsy in dental practice. *Med Oral Patol Oral Cir Bucal* 2007 Nov;12(7):E504-E510.
9. Wan A, Savage NW. Biopsy and diagnostic histopathology in dental practice in Brisbane: usage patterns and perceptions of usefulness. *Aust Dent J* 2010 Jun;55(2):162-169.
10. Williams HK, Hey AA, Browne RM. The use by general dental practitioners of an oral pathology diagnostic service over a 20-year period: the Birmingham Dental Hospital experience. *Br Dent J* 1997 Jun;182(11):424-429.
11. Williams PM, Poh CF, Hovan AJ, Ng S, Rosin MP. Evaluation of a suspicious oral mucosal lesion. *J Can Dent Assoc* 2008 Apr;74(3):275-280.
12. Marder MZ. The standard of care for oral diagnosis as it relates to oral cancer. *Compend Contin Educ Dent* 1998 Jun;19(6):569-572, 574, 576.
13. Myall RW, Howell RM. A rational approach to biopsy. *J Oral Med* 1971 Apr-Jun;26(2):71-74.
14. Bramley PA, Smith CJ. Oral cancer and precancer: establishing a diagnosis. *Br Dent J* 1990 Feb;168(3):103-107.
15. Kumaraswamy KL, Vidhya M, Rao PK, Mukunda A. Oral biopsy: Oral pathologist's perspective. *J Can Res Ther* 2012 April-Jun;8(2):192-198.
16. McAndrew PG. Oral cancer biopsy in general practice. *Br Dent J* 1998 Nov;185(9):428.
17. Margarone JE, Natiella JR, Natiella RR. Primates as a teaching model for biopsy. *J Dent Educ* 1984 Oct;48(10):568-570.
18. Bonner P. Biopsy – an essential diagnostic tool. *Dent Today* 1998;17:83-85.
19. Cawson, RA.; Odell, EW. *Essentials of oral pathology and oral medicine*. 6th ed. London: Churchill Livingstone Publications; 1998.
20. Diamanti N, Duxbury AJ, Ariyaratnam S, Macfarlane TV. Attitudes to biopsy procedures in general dental practice. *Br Dent J* 2002 May;192(10):588-592.
21. Czerninski T, Nadler C, Kaplan I, Regev E, Maly A. Comparison of clinical and histologic diagnosis in lesions of oral mucosa. *Essay Presented at: Annual Meeting of the American Academy of Oral and Maxillofacial Pathology*. San Antonio; 2006.
22. Fischer DJ, Epstein JB, Morton TH, Schwartz SM. Interobserver reliability in the histopathologic diagnosis of oral pre-malignant and malignant lesions. *J Oral Pathol Med* 2004 Feb;33(2):65-70.
23. Messadi DV. Diagnostic aids for detection of oral precancerous conditions. *Int J Oral Sci* 2013 Jun;5(2):59-65.
24. Murgod V, Angadi PV, Hallikerimath S, Kale AD, Hebbal M. Attitudes of general dental practitioners towards biopsy procedures. *J Clin Exp Dent* 2011;3(5):418-423.
25. Cowan CG, Gregg TA, Kee F. Prevention and detection of oral cancer: the views of primary care dentists in Northern Ireland. *Br Dent J* 1995 Nov;179(9):338-342.
26. Warnakulasuriya KA, Johnson NW. Dentists and oral cancer prevention in the UK: opinions, attitudes and practices to screening for mucosal lesions and to counselling patients on tobacco and alcohol use: baseline data from 1991. *Oral Dis* 1999 Jan;5(1):10-14.
27. Seoane J, Varela-Centelles PI, Ramírez JR, Comeselle-Teijeiro J, Romero MA. Artefacts in oral incisional biopsies in general dental practice: a pathology audit. *Oral Dis* 2004 Mar;10(2):113-117.
28. Berge TI. Oral surgery in Norwegian general dental practice – a survey. Extent, scope, referrals, emergencies, and medically compromised patients. *Acta Odontol Scand* 1992 Feb;50(1):7-16.
29. Alexander RE, Wright JM, Thiebaud S. Evaluating, documenting and following up oral pathological conditions. A suggested protocol. *J Am Dent Assoc* 2001 Mar;132(3):329-335.
30. Franklin CD, Jones AV. A survey of oral and maxillofacial pathology specimens submitted by general dental practitioners over a 30-year period. *Br Dent J* 2006 Apr;200(8):447-450.
31. Kondori I, Mottin RW, Laskin DM. Accuracy of dentists in the clinical diagnosis of oral lesions. *Quintessence Int* 2011 Jul-Aug;42(7):575-577.
32. Patel KJ, De Silva HL, Tong DC, Love RM. Concordance between clinical and histopathologic diagnoses of oral mucosal lesions. *J Oral Maxillofac Surg* 2011 Jan;69(1):125-133.
33. Haug, RH.; Allaire, M.; Trangoni, K. *Parameters and pathways: clinical practice guidelines for oral and maxillofacial surgery; diagnosis and management of pathologic conditions*. Chicago: American Association of Oral and Maxillofacial Surgeons; 2001.
34. Margarone JE, Natiella JR, Vaughan CD. Artifacts in oral biopsy specimens. *J Oral Maxillofac Surg* 1985 Mar;43(3):163-172.

35. Ficarra G, McClintock B, Hansen LS. Artefacts created during oral biopsy procedures. *J Craniomaxillofac Surg* 1987 Feb;15(1): 34-37.
36. Coulthard P, Kazakou I, Koran R, Worthington HV. Referral patterns and the referral system for oral surgery care. Part 2: The referral system and telemedicine. *Br Dent J* 2000 Apr;188(7): 388-391.
37. Boyle PE. Who should take the biopsy? *Oral Surg Oral Med Oral Pathol* 1955 Feb;8(2):118-122.
38. Greenwood LF, Lewis DW, Burgess RC. How competent do our graduates feel? *J Dent Educ* 1998 Apr;62(4):307-313.
39. Dental Council of India. India: BDS course regulation 2007. Available from: http://www.dciindia.org/dciregulation_2006_pages/BDS_course_regulation.html.