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KNOWLEDGE ON SALIVARY BIOMARKERS IN ORAL CANCER DETECTION AMONG DENTAL STUDENTS

Indumathi M[1], Dr. Archana Santhanam[2], Kavitha S[3]

Abstract

Background: *Oral cancers are the sixth most frequent cancer with a high mortality rate. Oral squamous cell carcinoma accounts(OSCC) for more than 90% of all oral cancers. The use of saliva for early cancer detection in the search for new clinical markers is a promising approach because of its non-invasive sampling methods.Saliva's direct contact with oral cancer lesions makes it a more specific and potential sensitive screening tool. The identification of potential salivary signatures for early, noninvasive detection of OSCC leads to early detection, better outcome and survival. More than 100 biomarkers have been identified at differential levels in saliva of patients with OSCC. Most cases of OSCC are detected in advanced stages, thus a reliable early stage diagnostic marker is needed.*

Aim: *The aim of the present study is to assess the knowledge and awareness on salivary biomarkers in oral cancer detection among undergraduate dental students.*

Materials and methods: *A descriptive cross sectional survey was conducted among undergraduate dental college students aged 18-25 years from March to April 2020 to assess their knowledge and awareness on salivary biomarkers in oral cancer detection. A total of 280 participants were involved in the study. Self administered questionnaire of close ended questions was prepared and it was distributed among undergraduate dental college students through the online survey "Google forms". The responses were collected, tabulated in excel sheet and analysed using SPSS software. Chi square test was used to analyze the level of education of students and their knowledge on salivary biomarkers in oral cancer detection with statistical significance of $P < 0.05$.*

Results: *The majority of the participants (92.1%) were aware that oral squamous cell carcinoma accounts for more than 90% of all oral cancers. 79.6% of the participants were aware that salivary biomarkers to be used to discriminate physiological and pathological conditions.* ***Conclusion:*** *Majority of the second year undergraduate students had very good knowledge on salivary biomarkers for oral cancer detection.*

Key words*:* *Salivary biomarkers;oral cancer;early detection;awareness*

Introduction

Human saliva is a biological fluid which is slightly acidic in nature, contains a mixture of secretions from multiple salivary glands. Biomarker refers to measurable and quantifiable biological parameters that can serve as indicators for health and physiology- related assessments, such as pathogenic process or pharmacologic responses to a therapeutic intervention[1]. Oral cancers are the sixth most frequent cancer with a high mortality

[1] Saveetha Dental College and Hospitals, Saveetha Institute of Medical and Technical Sciences, Saveetha University, Chennai, India, Email: 151901063.sdc@saveetha.com
[2] Corresponding AuthorAssistant Professor, Department of Oral Pathology, Saveetha Dental College and Hospitals, Saveetha Institute of Medical and Technical Sciences, Saveetha University, Chennai, India, Email:drarch.s@gmail.com
[3] Lecturer, Department of Biochemistry, Saveetha Dental College and Hospitals, Saveetha Institute of Medical and Technical Sciences, Saveetha University , Chennai, India, Email:kavithas.sdc@saveetha.com

mortality rate. The use of saliva for early cancer detection is a promising approach because of it's non-invasive sampling methods, and is inexpensive. Saliva's direct contact with oral cancer lesions makes it a more specific and potentially sensitive screening tool [2] . The amount of importance given to systemic health is far more than oral health. But there is a strong relationship between Oral health status and oral hygiene practices on the development of oral cancer[3] .The identification of potential salivary signatures for OSCC leads to early detection, better outcome and survival. More than 100 biomarkers have been identified in saliva of patients of OSCC[4]. Saliva can be used as a diagnostic tool because of specific markers namely MMP-9, Chemerin for early detection of Oral Squamous Cell Carcinoma [5]. Consumption of tobacco and alcohol is the greatest risk factor for the development of oral cancer[6]. Diagnosis of oral cancer presently relies on thorough clinical examination combined with biopsy for histopathological interpretation. Early detection plays an essential role in successful therapy and to improve the quality of life of the patient [7,8] . Most cases of OSCC are detected in advanced stages, thus a reliable early stage diagnostic marker is needed [9]. In order to understand the complete realisation of the potential of saliva, however extensive profiling of the constituents must be conducted and diagnostic biomarkers must be thoroughly validated [10] .Previously our team had conducted numerous original studies [11–15] and surveys[16–21] over the past 5 years. Now we are focussing on epidemiological surveys. The idea for this survey stemmed from the current interest in our community. Thus the aim of the present study is to assess the knowledge and awareness on salivary biomarkers in oral cancer detection among undergraduate dental college students.

MATERIALS AND METHODS:

Study design:

A cross sectional study was conducted through an online survey from March to April 2020 among Undergraduate dental college students of private dental institution, Chennai.

Study subjects:

A simple random sampling was used to select the study participants. Among 280 participants, 61 participants belong to first year, 76 participants belong to second year, 51 participants belong to third year, 51 participants belong to fourth year and 41 participants belong to interns.

Inclusion criteria: All undergraduate dental college students of private dental institutions who were willing to participate were included.

Ethical considerations:

Returning the filled questionnaire was considered as implicit consent as a part of the survey. Ethical approval for the study was obtained from the Institutional Review Board (IRB), Saveetha Dental College.

Study methods:

Self administered questionnaire of 12 close ended questions was prepared and it was distributed among undergraduate dental college students of private dental institutions from March -April 2020 through the online survey “google forms”. The collected data were checked regularly for clarity, competence, consistency, accuracy and validity. Demographic details were also included in the questionnaire.

Statistical analysis:

Data was analysed with SPSS version (22.0). Descriptive statistics as percent were calculated to summarise qualitative data. Chi square test was used to analyze and compare the education level of students and their knowledge on salivary biomarkers in oral cancer detection . The confidence level was 95% and of statistical significance $P < 0.05$. Finally, the result was presented by using bar charts, pie charts and percentage tables.

RESULTS:

Among 280 participants, 46.4% were males and 53.6% were females. Among the dental undergraduates college students, 21.7% of the participants belong to first year, 27.1% of the participants belong to second year, 18.3% of the participants belong to third year, 18.3% of the participants belong to fourth year and 14.6% of the participants belong to interns.

In the present study, 92.1% were aware that OSCC accounts for more than 90% of all oral cancers. About 77.5% agreed that biomarkers are indicators of biological,pathological and pharmacological response to treatment. 79.3% of the participants in the present study were aware that saliva has an edge over other body fluids to be used as biomarkers. In the present study, 79.3% agreed that saliva is a non- invasive uncomplicated diagnostic tool and 79.6% of the participants were aware that salivary biomarkers can be used to discriminate between physiological and pathological conditions. It is interesting to see that 72.5% were aware that most of the oral cancer patients undergo diagnosis at an advanced clinical stage and 75.5% were aware that salivary biomarkers can be used as screening tools for diagnosis of potentially malignant disorders. About 75% of the participants agreed that salivary biomarkers help in early oral cancer detection and 74.3% of the participants were aware that detection of salivary biomarkers will help to tailor therapeutic interventions for oral cancer patients. In the present study, 78.9% of the participants were aware that levels of salivary biomarkers can determine the prognosis of the patient [Table 1].

Table 1: Depicts percentage of responses on Knowledge and awareness on salivary biomarkers among undergraduate dental college students.

S.NO	QUESTION	CHOICES	PERCENTAGE
1.	Gender	• Male • Female	• 46.4% • 53.6%
2.	Year of studying	• 1st year • 2nd year • 3rd year • 4th year • Intern	• 21.7% • 27.1% • 18.3% • 18.3% • 14.6%
3.	Are you aware that oral squamous cell carcinoma accounts for more than 90% of all oral cancers?	• Yes • No	• 92.1% • 7.9%
4.	Biomarkers are indicators of normal biological,pathological process and pharmacological response to treatment	• Agree • Disagree	• 77.5% • 22.5%
5.	Does saliva have an edge over the other body fluids to be used as a biomarker?	• Yes • No	• 79.3% • 20.7%
6.	Do you agree that saliva is a non invasive uncomplicated,diagnostic tool in oral cancer diagnosis?	• Agree • Disagree	• 79.3% • 20.7%
7.	Can salivary biomarkers be used to discriminate between physiological and pathological conditions?	• Yes • No	• 79.6% • 20.4%

8.	Do you agree that most of the oral cancer patients undergo diagnosis at the advanced clinical stages?	• Agree • Disagree	• 72.5% • 27.5%
9.	Can salivary biomarkers be used as a screening tool or diagnosis of potentially malignant disorder?	• Yes • No	• 75.7% • 24.3%
10.	Do you think identification of biomarkers from saliva helps in early oral cancer detection?	• Yes • No	• 75% • 25%
11.	Detection of salivary biomarkers will help to tailor therapeutic interventions for oral cancer patients.	• Yes • No	• 74.3% • 25.7%
12.	Based on the levels of certain salivary biomarkers, prognosis of the patient can be determined.	• Yes • No	• 78.9% • 21.1%

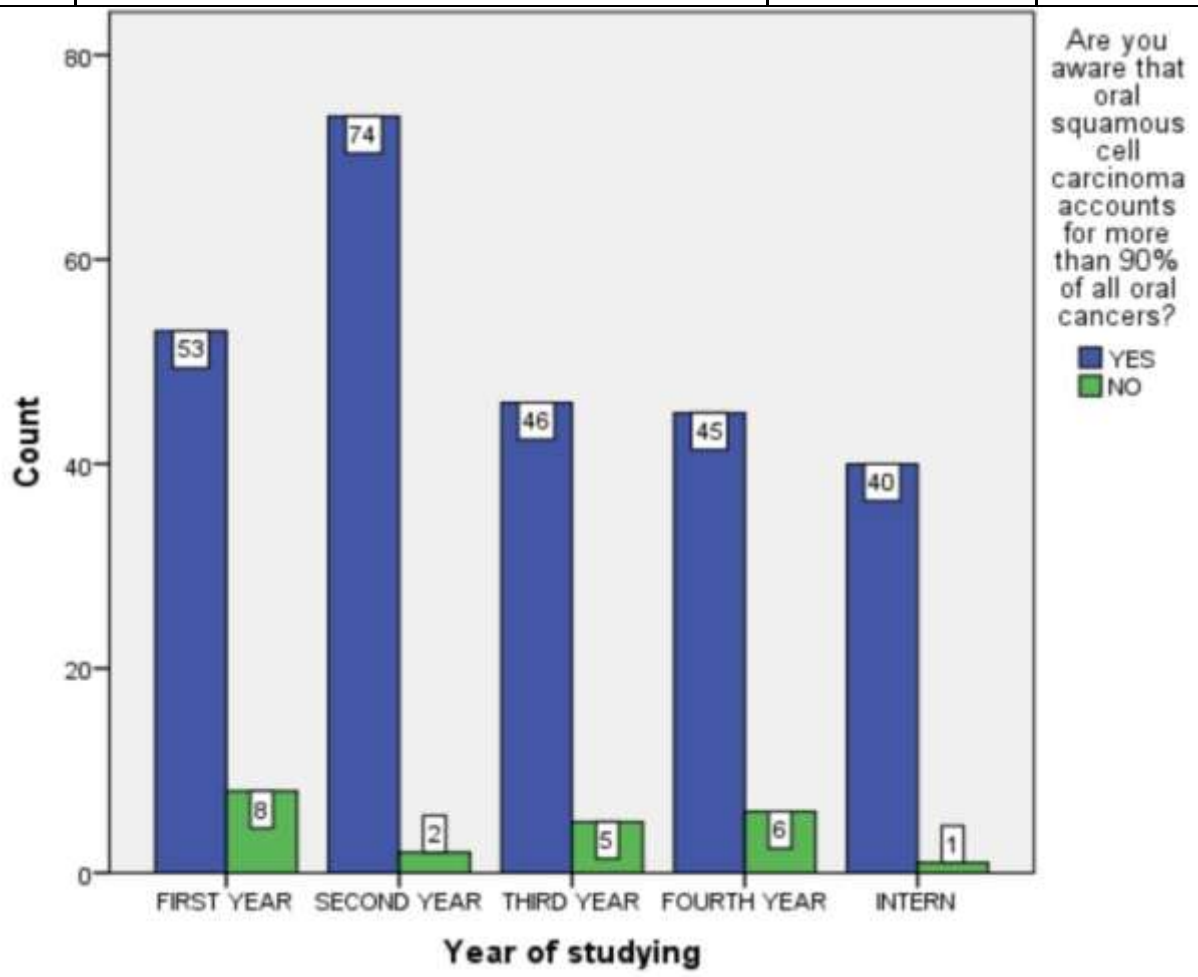

Figure 1: Bar graph representing comparison of different educational levels of undergraduate dental students and awareness on Oral squamous cell accounts for more than 90% of all oral cancers, where blue denotes yes and green denotes no. X axis represents the education levels and Y axis represents the number of dental students. More second year undergraduate dental college students (74) were aware that oral squamous cell

carcinoma accounts for more than 90% of all oral cancers. However the difference was statistically not significant. Chi square test p value = 0.843(>0.05) - statistically not significant.

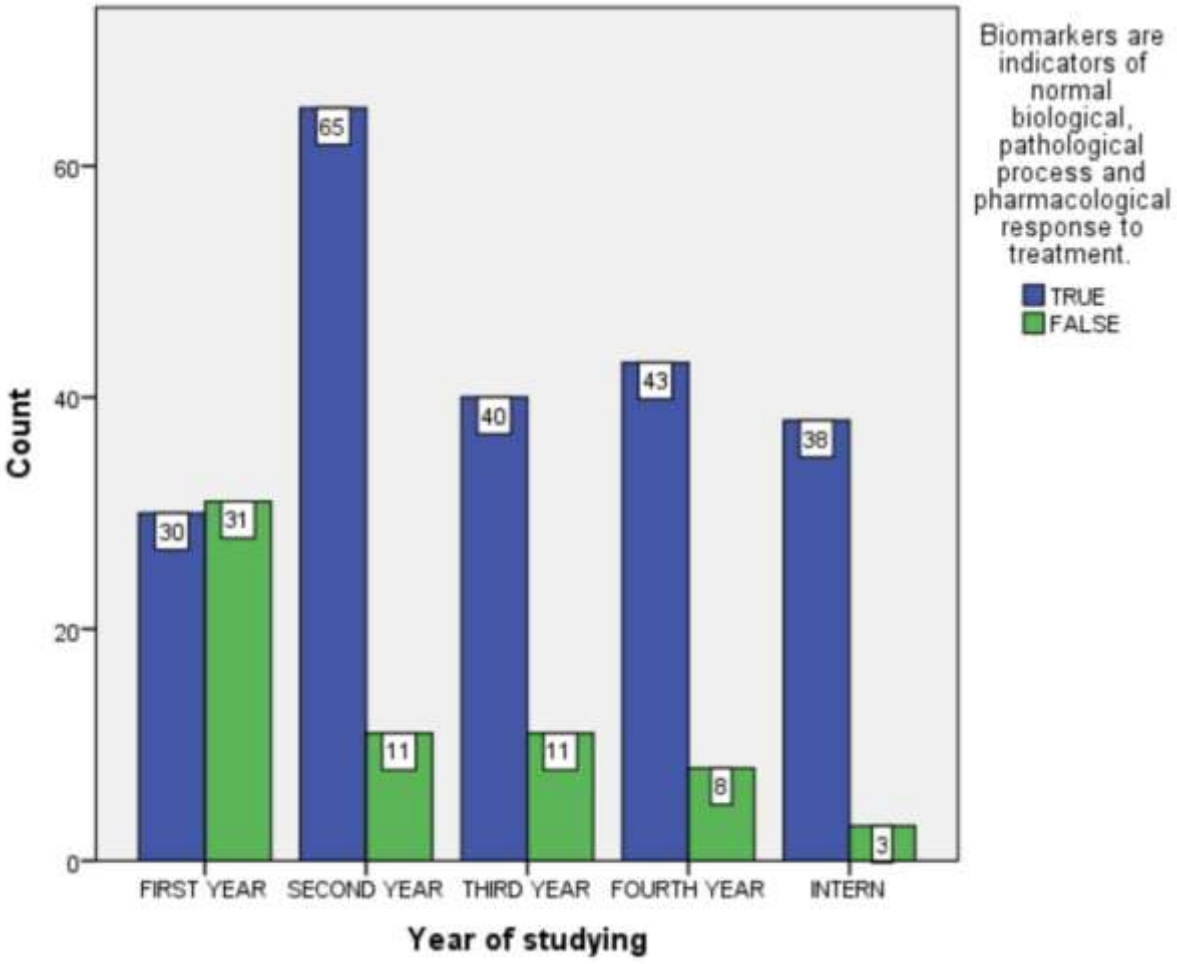

Figure 2: Bar graph representing comparison of different educational levels of undergraduate dental students and knowledge on salivary biomarkers , where blue denotes true and green denotes false. X axis represents the education levels and Y axis represents the number of dental students. 65 second year undergraduate students were much aware of knowledge on salivary biomarkers. However the difference was statistically significant. Chi square test p value = 0.000(< 0.05) - statistically significant.

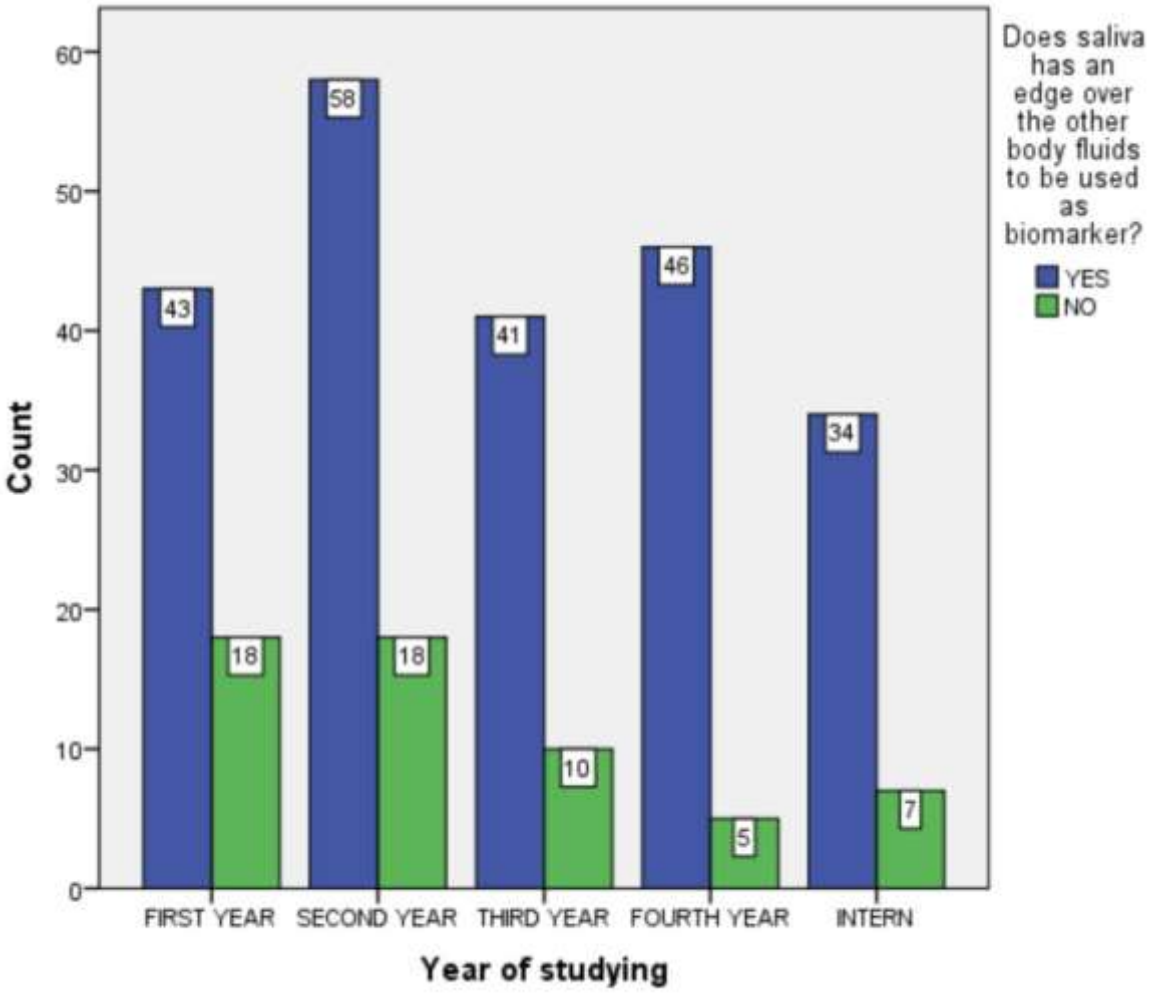

Figure 3: Bar graph representing comparison of different educational levels of undergraduate dental students and knowledge on saliva as biomarkers , where blue denotes yes and green denotes no. X axis represents the education levels and Y axis represents the number of dental students. 58 second year undergraduate students were well aware that saliva has an edge over other body fluids to be used as biomarkers. However the difference was statistically not significant. Chi square test p value = 0.119 (> 0.05) - statistically not significant.

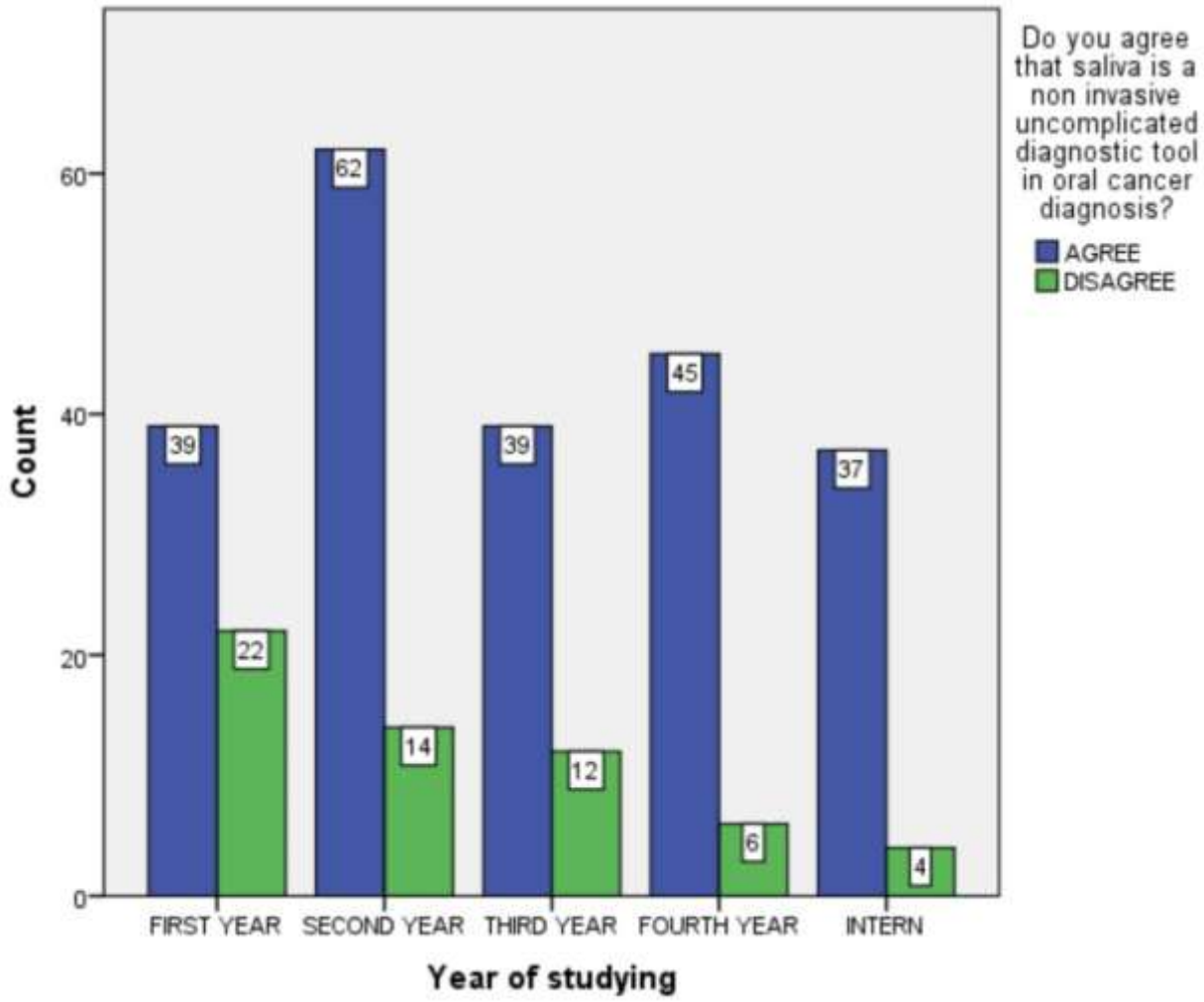

Figure 4: Bar graph representing comparison of different educational levels of undergraduate dental students and knowledge on saliva as a diagnostic tool , where blue denotes agree and green denotes disagree. X axis represents the education levels and Y axis represents the number of dental students. 62 participants of second year undergraduates had good knowledge on saliva as a diagnostic tool. However the difference was statistically significant. Chi square test p value = 0.005(<0.05) - statistically significant.

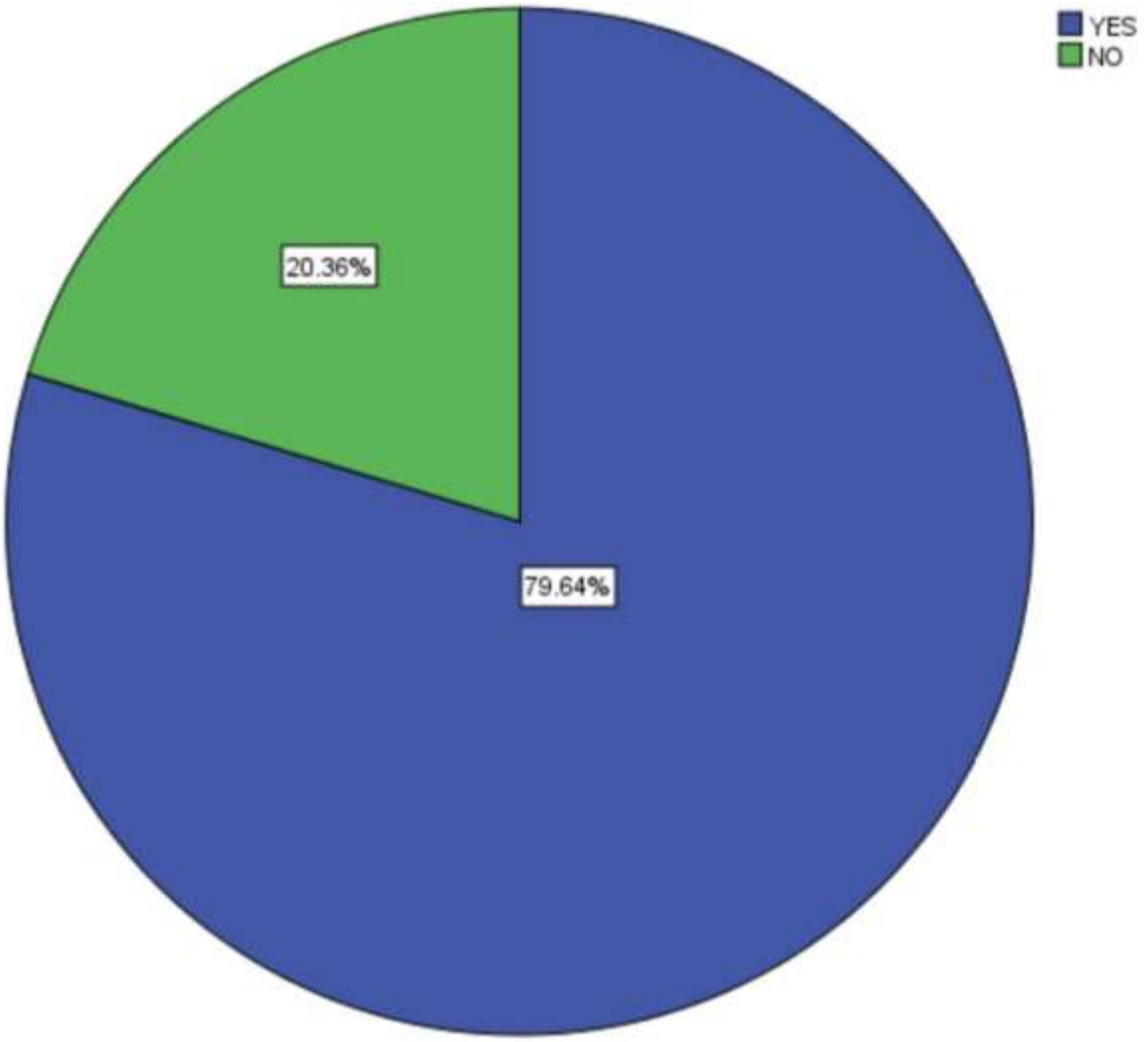

Figure 5 : Pie chart representing percentage distribution of knowledge on salivary biomarkers to discriminate between physiological and pathological conditions, where blue denotes yes and green denotes no. Majority of the participants 79.6%(blue) were aware.

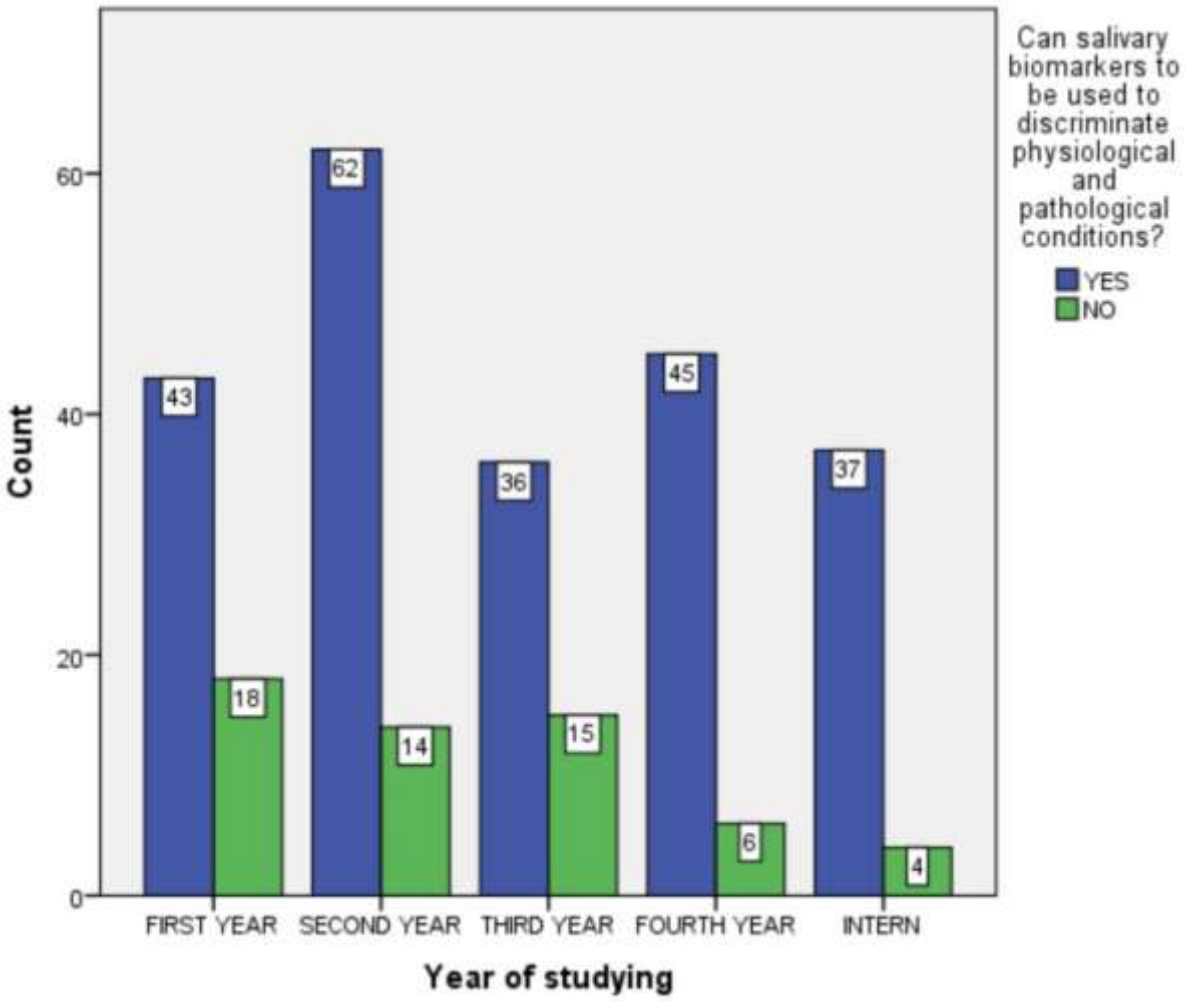

Figure 6: Bar graph representing comparison of different educational levels of undergraduate dental students and knowledge on salivary biomarkers to discriminate between physiological and pathological conditions where blue denotes yes and green denotes no. X axis represents the education levels and Y axis represents the number of dental students. 62 participants of second year students had better knowledge over the other dental students. However the difference was statistically not significant. Chi square test p value = 0.026 (< 0.05)- statistically significant.

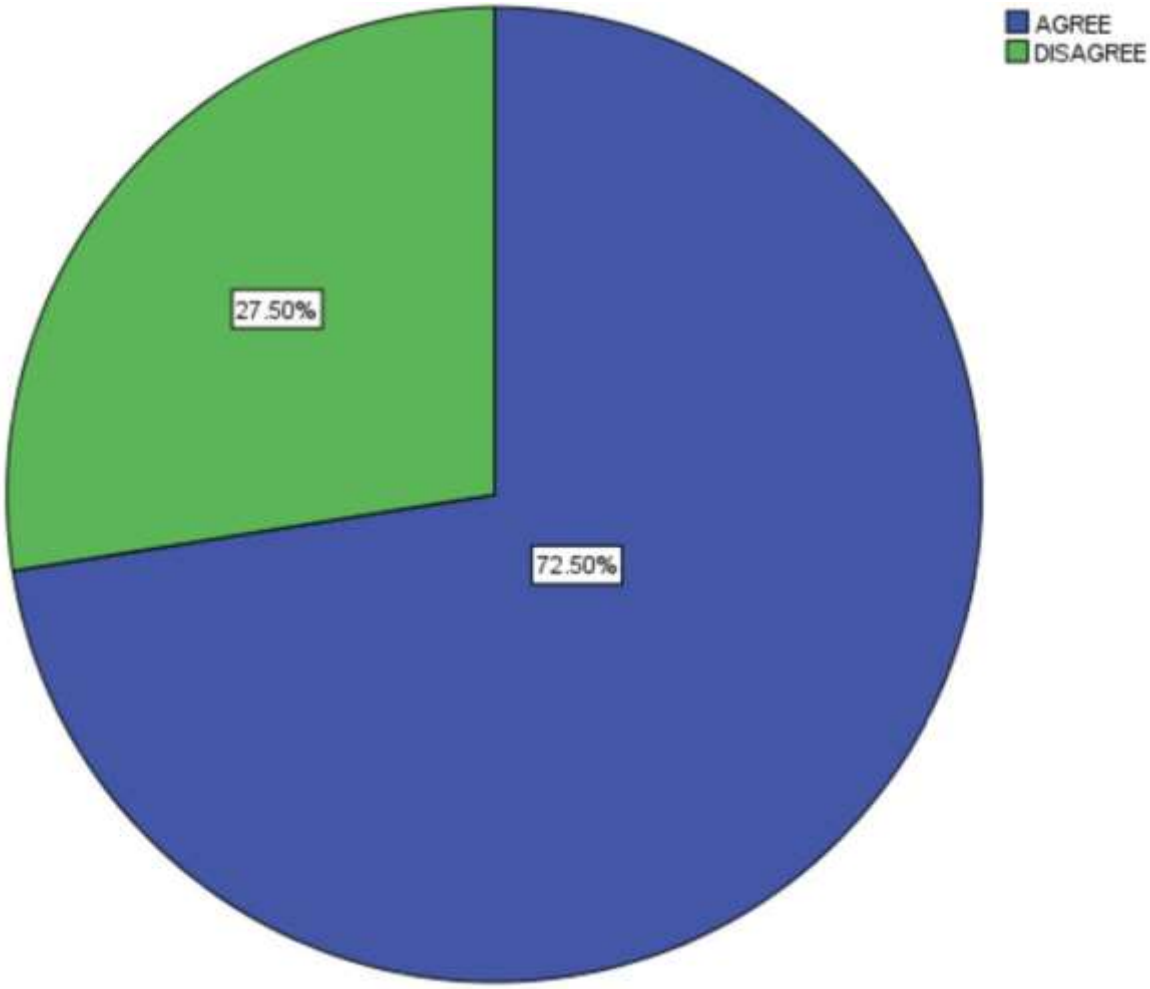

Figure 7: Pie chart representing percentage distribution of awareness on diagnosis of oral cancer at the advanced clinical stages, where blue colour denotes agree and green colour denotes disagree. About 72.5%(blue) of the participants were aware .

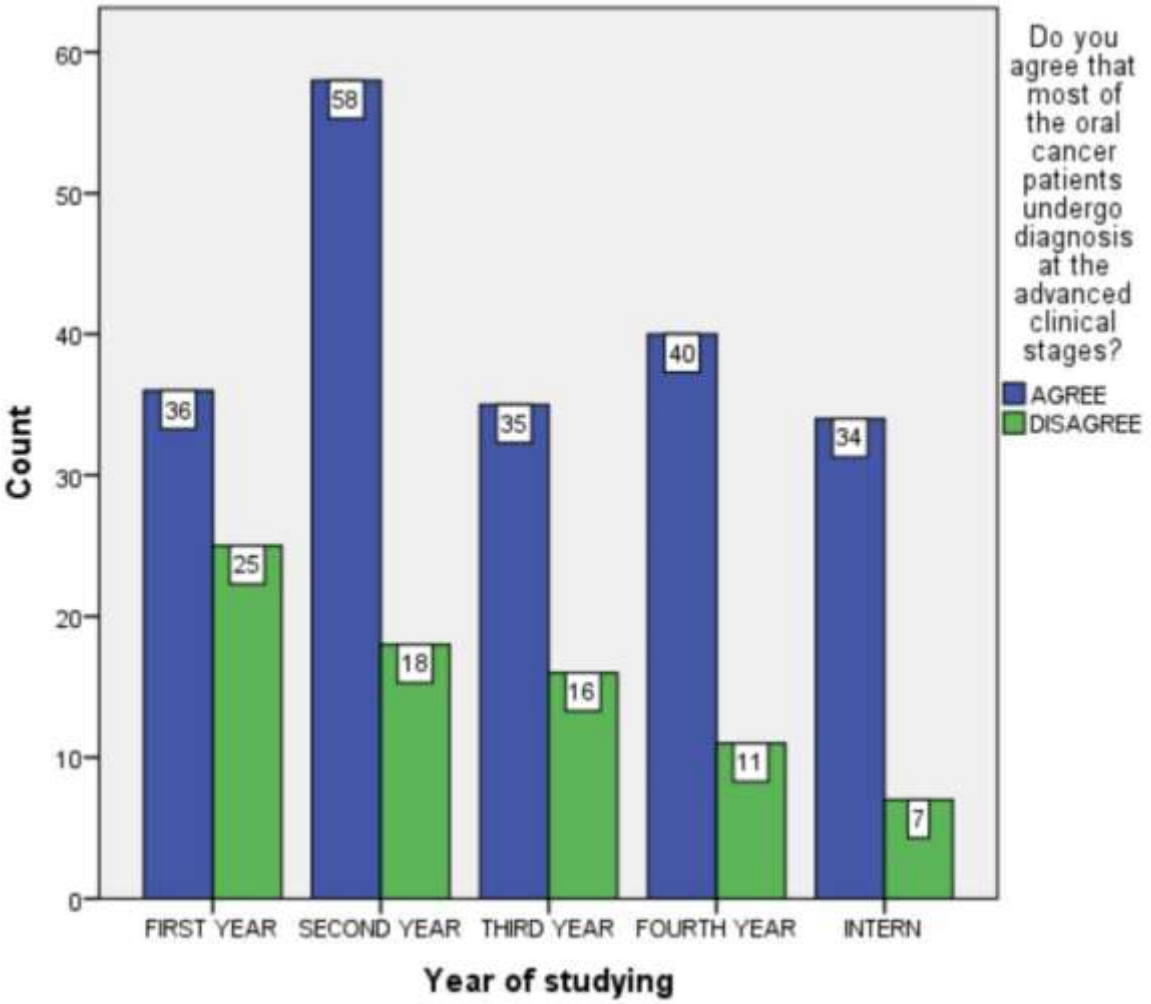

Figure 8: Bar graph representing comparison of different educational levels of undergraduate dental students and awareness on diagnosis of oral cancer at the advanced clinical stages, where blue denotes agree and green denotes disagree. X axis represents the education levels and Y axis represents the number of dental students. Second year students (58 participants- blue) had better knowledge. However the difference was statistically not significant. Chi square test p value = 0.047 (<0.05) - statistically significant.

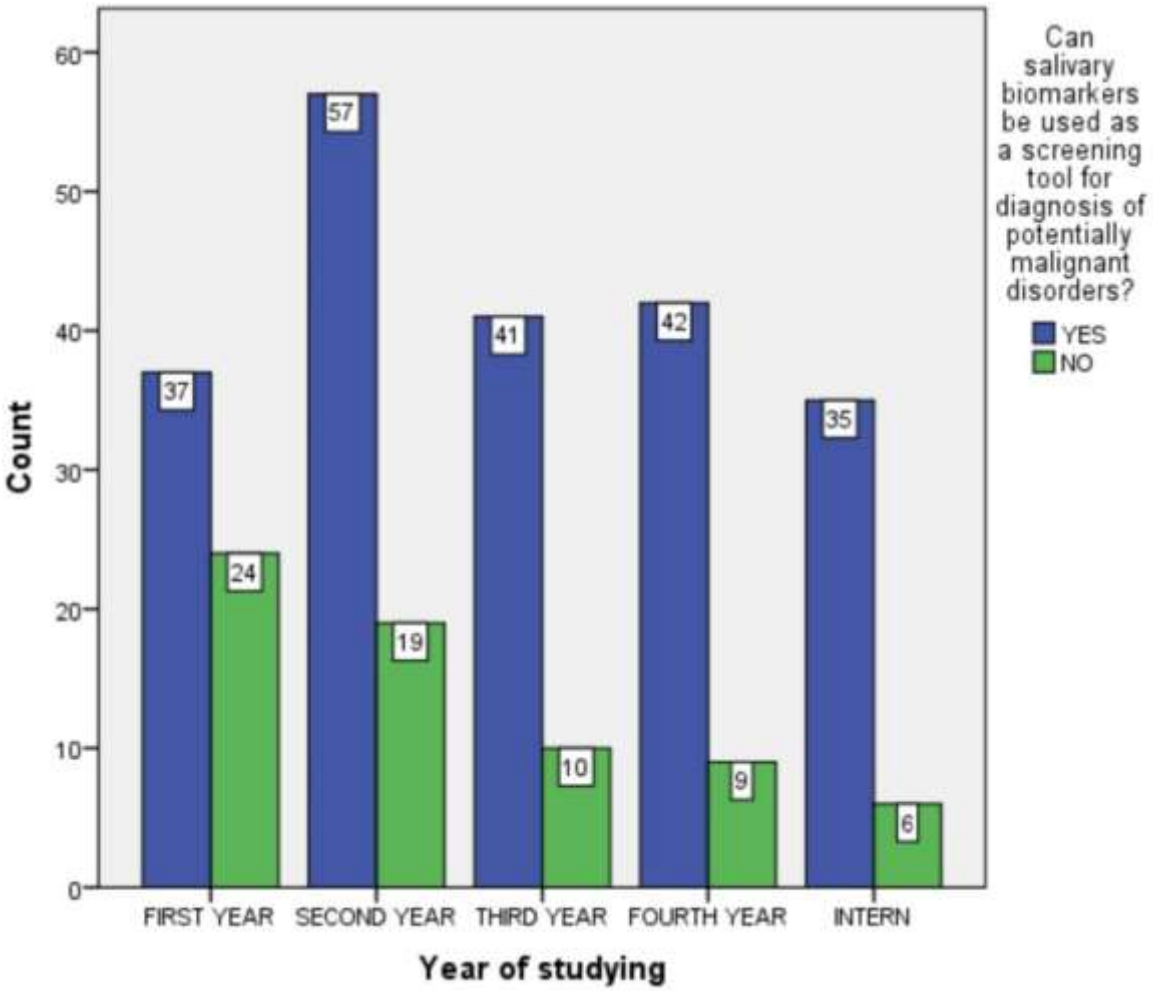

Figure 9: Bar graph representing comparison of different educational levels of undergraduate dental students and knowledge on salivary biomarkers as a screening tool for diagnosis of potentially malignant disorders, where blue denotes yes and green denotes no. X axis represents the education levels and Y axis represents the number of dental students. 57 participants of second year undergraduate students were well aware that salivary biomarkers can be used as a screening tool. However the difference was statistically not significant. Chi square test p value = 0.022 (< 0.05) - statistically significant.

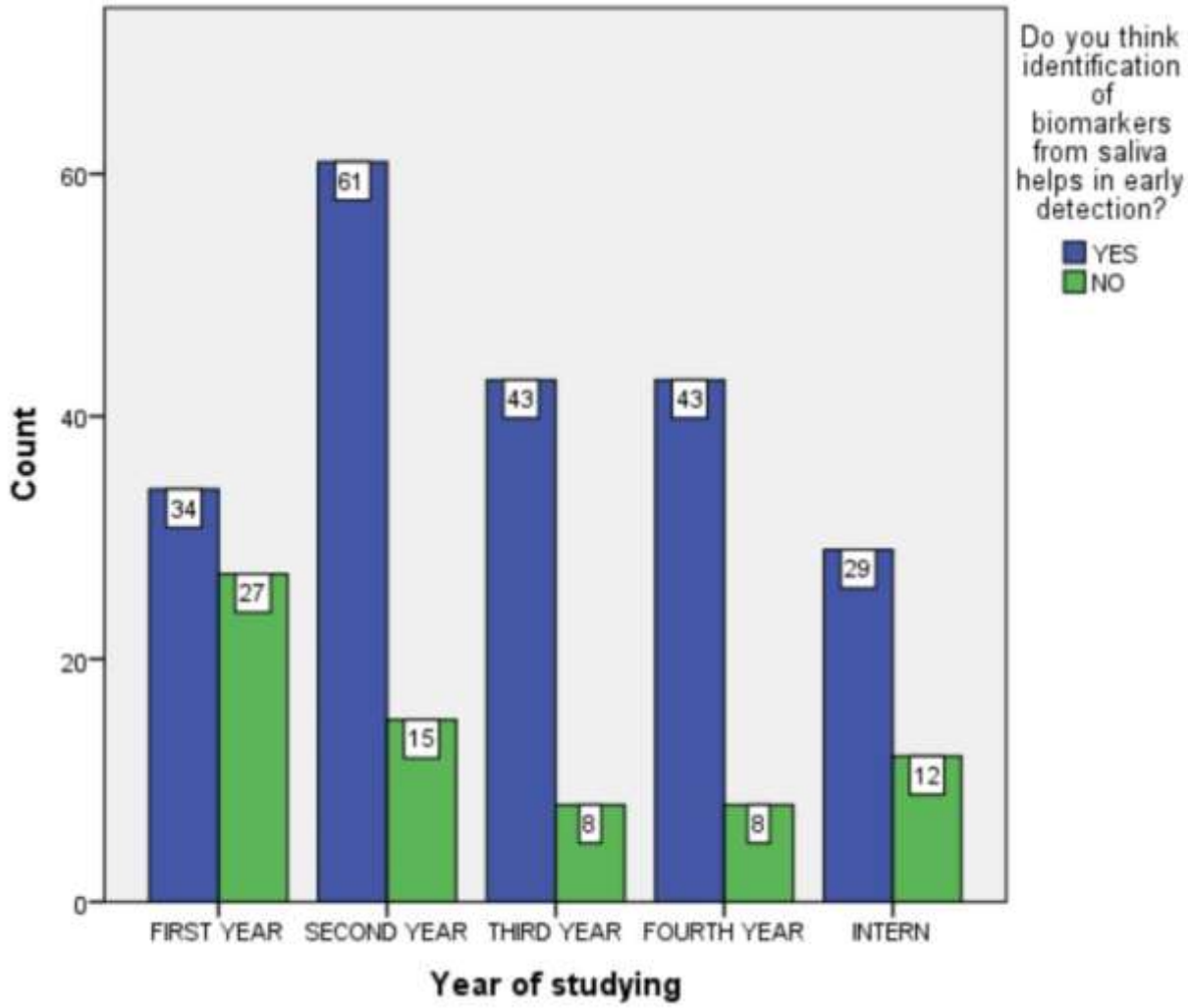

Figure 10: Bar graph representing comparison of different educational levels of undergraduate dental students and knowledge on salivary biomarkers for early detection of oral lesions , where blue denotes yes and green denotes no. X axis represents the education levels and Y axis represents the number of dental students.Majority of the second year (61 participants) undergraduate students were aware that salivary biomarkers help in early oral cancer detection. However the difference was statistically significant. Chi square test p value = 0.001 (< 0.05) - statistically significant.

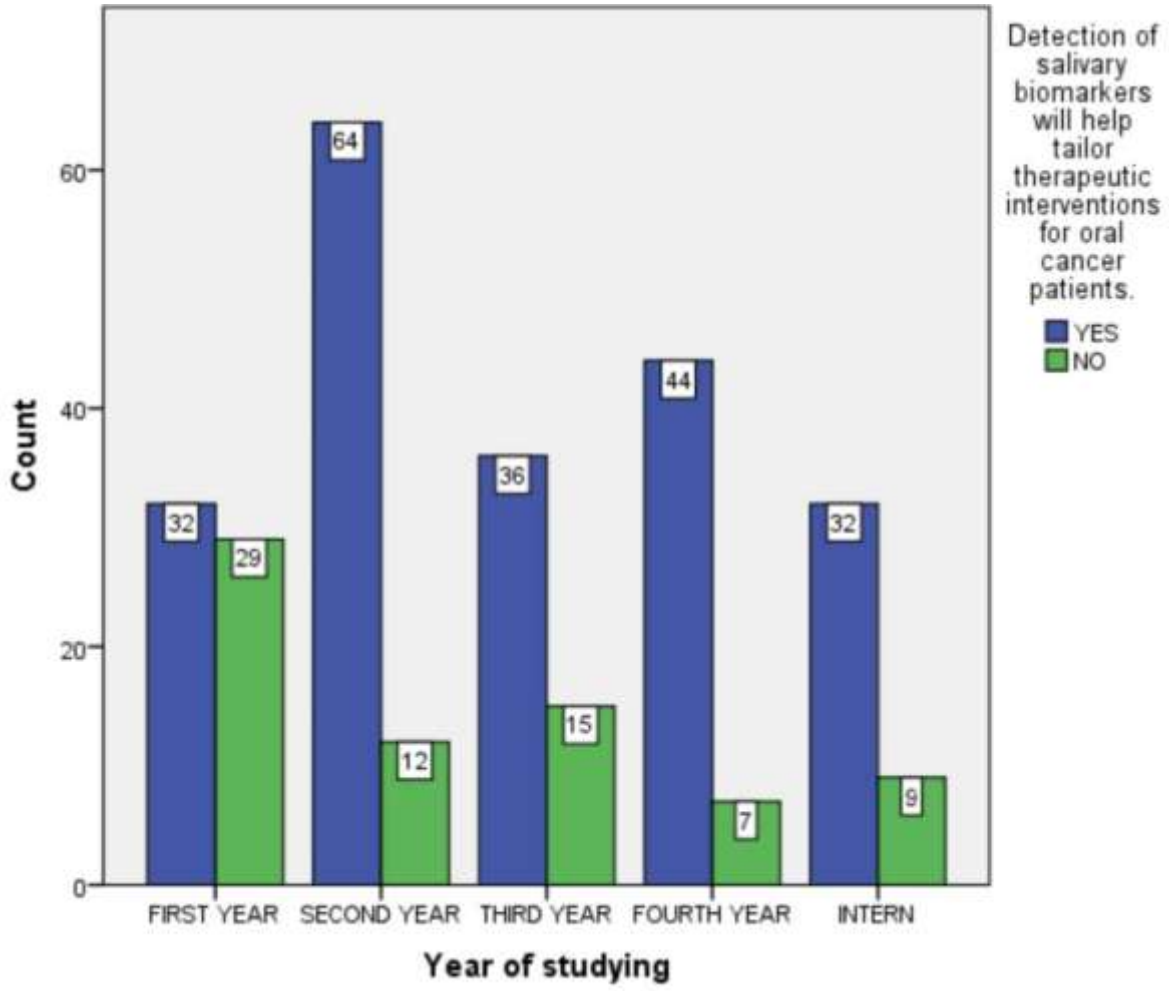

Figure 11: Bar graph representing comparison of responses based on different educational levels of undergraduate dental students and knowledge on salivary biomarkers for therapeutic interventions where blue denotes yes and green denotes no. X axis represents the education levels and Y axis represents the number of dental students. 64 participants of second year undergraduate students were much aware that detection of salivary biomarkers will help to tailor therapeutic interventions for oral cancer patients. However the difference was statistically significant. Chi square test p value = 0.000 (< 0.05) - statistically significant..

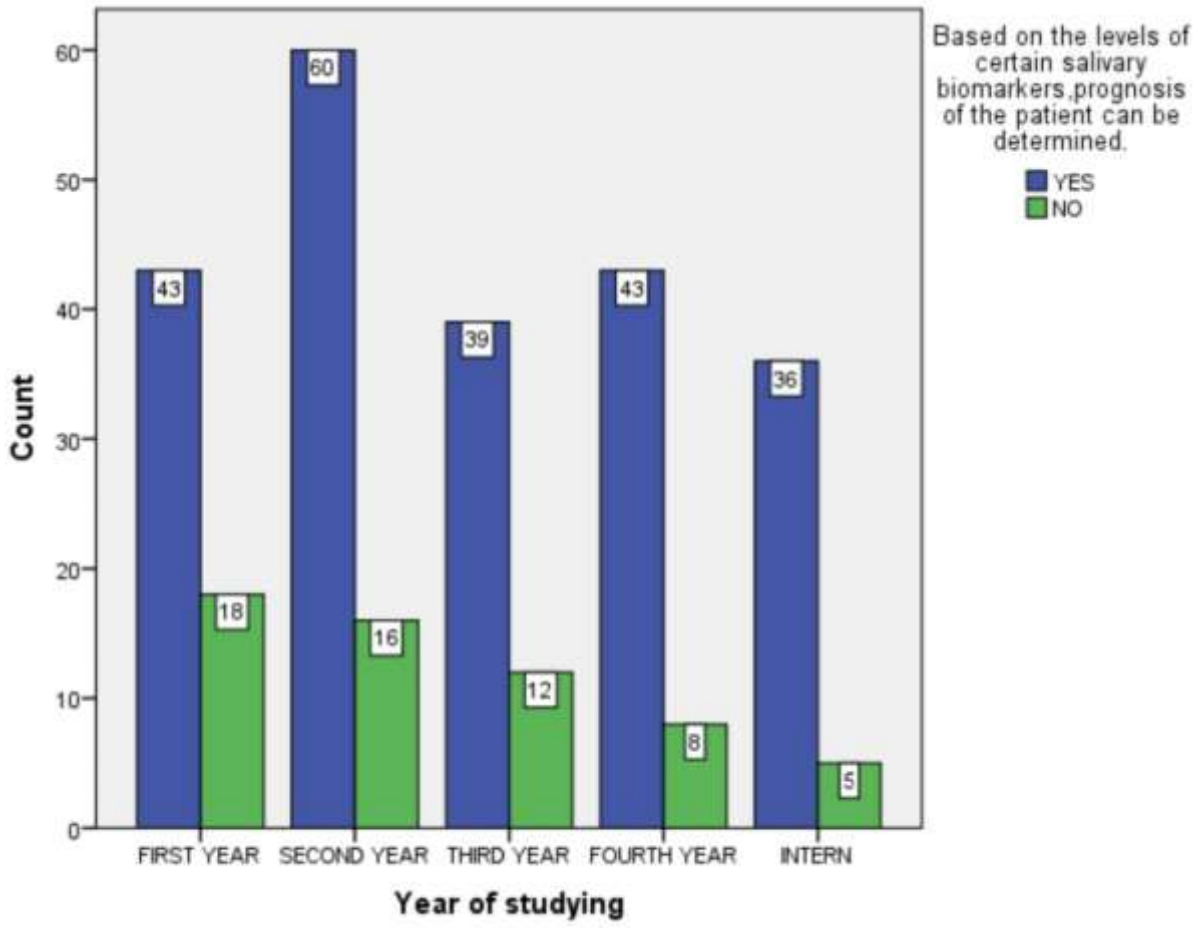

Figure 12: Bar graph representing comparison of responses based on different educational levels of undergraduate dental students and knowledge on salivary biomarkers for prognosis on oral lesions where blue denotes yes and green denotes no . X axis represents the education levels and Y axis represents the number of dental students. 60 second year undergraduate students were well aware that prognosis of patients can be determined based on levels of salivary biomarkers. However the difference was statistically not significant. Chi square test p value = 0.229 (> 0.05) statistically not significant.

DISCUSSION:

In the present study, 92.1% were aware that OSCC accounts for more than 90% of all oral cancers. 74 participants of second year students were maximum aware of it followed by 53 participants of first year undergraduate dental students. Pearson chi square test showed p value = 0.843 (>0.05) which was statistically not significant. Second year graduates are well aware because of different curriculum patterns and level of knowledge increase with increasing levels of education (Figure1). In the present study, 77.5% agreed that biomarkers are indicators of biological,pathological and pharmacological response to treatment. 65 second year and 43 fourth year undergraduate students were much aware of knowledge on biomarkers. Level of education of students and their knowledge showed a positive correlation with p value = 0.000(< 0.05) which was statistically significant (Figure 2). Oral squamous cell carcinoma (OSCC) is one of the most common cancers globally. Salivary biomarkers have been shown to play a non-invasive role in the diagnosis of oral cancer. The direct contact between the saliva and the oral cancer lesions makes it a most sensitive and specific screening method in diagnosis of oral cancer [22].

79.3% of the participants in the present study were aware that saliva has an edge over other body fluids to be used as biomarkers.Among 280 participants ,58 second year undergraduate students were aware of the same with p value = 0.119(>0.05) which was statistically not significant (Figure 3). In the present study, 79.3% agreed that saliva is a non- invasive uncomplicated diagnostic tool. Among the dental students, 62 participants

of second year and 45 participants of fourth year undergraduates had good knowledge regarding the same with p value- 0.005(<0.05) which was statistically significant (Figure 4). Saliva testing, a non-invasive alternative to serum testing, may be an effective modality for diagnosis and determining the prognosis of oral cancer [23].

79.6% of the participants were aware that salivary biomarkers can be used to discriminate between physiological and pathological condition(Figure 5). 62 participants of second year students had better knowledge over the other dental students with p value- 0.026(<0.05) which was statistically significant (Figure 6). Undergraduate dental students (72.5%) were aware that most of the oral cancer patients undergo diagnosis at an advanced clinical stage (Figure 7). Among the undergraduate dental students, second year students (58) had better knowledge compared to others with p value = 0.047 (<0.05) which was statistically significant (Figure 8). Even though the oral cavity is easily accessible for direct visual examination, most oral squamous cell carcinoma are not diagnosed until an advanced stage, which was the major reason for the low survival rate [24].

About 75.5% were aware that salivary biomarkers can be used as screening tools for diagnosis of potentially malignant disorders. It is interesting to see that 57 participants of second year undergraduate students were well aware about the same with the p value = 0.022(<0.05) which was statistically significant (Figure 9). In the present study, 75% of the participants agreed that salivary biomarkers help in early oral cancer detection. Majority of the second year (61) and fourth year undergraduate students (43) were aware that salivary biomarkers help in early oral cancer detection with p value = 0.001(<0.05) which was statistically significant (Figure 10). Early detection of oral cancer is of utmost importance for improving survival rates and prognosis of patients with the disease [25].

About 74.3% of the participants were aware that detection of salivary biomarkers will help to tailor therapeutic interventions for oral cancer patients of which 44 fourth year undergraduate students were well aware regarding the same with p value = 0.000(<0.05) which was statistically significant (Figure 11). In the present study, 78.9% of the participants were aware that levels of salivary biomarkers can determine the prognosis of the patient. Among 280 participants, 60second year undergraduate students were well aware that prognosis of patients can be determined based on levels of salivary biomarkers with p value = 0.229(>0.05) which was statistically not significant (Figure 12). The potential of molecular biomarkers for the diagnosis, prognosis, or monitoring of the treatment efficacy in OSCC has been extensively explored in the previous studies [26].

The present study is a novel study, hence there is no existing previous studies. The reason for the better knowledge and awareness among second and fourth year students is that they follow different curriculum patterns and they are well exposed to clinical cases than the first year students. The identification of potential salivary biomarkers signatures for early, noninvasive detection of oral squamous cell carcinoma leads to better outcome and survival. The implementation of newer screening techniques is of utmost importance which could reduce morbidity and mortality. Limitation of the study is less sample size. In future an extensive study with large sample size and varied population can be used to assess the awareness and knowledge on salivary biomarkers for oral cancer detection.

CONCLUSION:

The overall knowledge on salivary biomarkers tends to be moderate among undergraduate dental students. From the present study, the second year undergraduate dental students had good knowledge compared to other undergraduate dental students. Being dentists the utility of the salivary biomarkers should be incorporated into the curriculum for its better application.

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AUTHOR CONTRIBUTIONS:

Indumathi M: Literature search, survey, data collection, analysis, manuscript writing

Dr.Archana Santhanam: Study design, data verification, manuscript drafting

CONFLICTS OF INTEREST:

The authors declare that there were no conflicts of interest in the present study.

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