Introduction

Worldwide, head and neck cancers are some of the most common cancers, being epidemiologically significant in many countries with the greatest burden falling upon developing countries.

Head and neck cancers mostly affect the upper aerodigestive tract with 931,931 new cases and 467,125 deaths reported in 2020\(^1\); these cancers are found at various sites in the airways of the head and neck such as the oral cavity, oropharynx, nasopharynx, hypopharynx, larynx, and nasal sinuses. They are the most prominent issue in oral healthcare due to their life-threatening outcomes which is an integral concern of general health. Cancers significantly affect the patients’ quality of life; consequently, cancers effects are extended to important body functions such as speech and swallowing, especially if the patient is diagnosed and treated late, although they are some of the preventable causes of disability and death worldwide\(^2\).

According to the data from GLOBOCAN (2020), upper aerodigestive tract cancer (UADTC) is classified in the group of “other cancers”: its frequencies differ according to the location: oral cavity (2.28%), nasopharynx (0.96%), oropharynx (0.51%) and hypopharynx (0.44%). The total frequency is 4.88% and the mortality rate is 4.7% which ranks it in the 7th position\(^3,4\).

For most countries, the current five-year survival rates for treated oral and oropharynx cancers are around 50–60%. The best outcomes for overall five-year survival rates of treated mouth cancers are for cancer of the lip, with a percentage over 90% of patients. In general, prognosis decreases with advanced disease, low socioeconomic status (SES), advanced age, and continuing...
More than 70% of UADTC were detected at a late stage (III-IV) where treatments -if they can be undertaken with curative aim- are more difficult to be effective and very often mutilating. Despite the therapeutic progress made, long-term survival is low and has remained relatively stable and identical for the last 15 years. The impact of the delay on locoregional control has been clearly demonstrated for these relatively fast-growing tumors.

In Morocco, 3,246 (5.41%) new cases were diagnosed in 2020 distributed by location: larynx (2.0%), nasopharynx (1.5%), oral cavity (1.44%), hypopharynx (0.25%), and oropharynx (0.22%) mortality rate were (5.52%)³. The main risk factors are tobacco and alcohol, among many others such as Human Papilloma Virus infection, a diet lacking in fruit and vegetables; exposure to carcinogens in some work environments; teeth in poor condition or Human Immunodeficiency Virus infection. In addition, these cancers are strongly linked to socio-economic factors. There are more deaths in people with a lower level of education compared to people with a higher level⁴. The risk of developing one of these cancers is greater in those with low incomes or belonging to a poorer socio-professional category⁵.

Therefore, this study aims to provide a description of the epidemiological profile of patients with UADTC and to predict the relationship between UADTC sites and risk factors.

**Patients and methods**

A cross-sectional study was conducted from December 2018 to February 2020 at the National Institute of Oncology Sidi Mohammed Ben Abdellah in Rabat, specifically in three units, radiotherapy, chemotherapy, and outpatient consultations. It is the largest university-affiliated referral hospital for cancer care in Morocco dedicated exclusively to fighting cancer and where most of the cases are diagnosed and treated.

This study includes Moroccan patients with a histologically confirmed diagnosis of naso sinus, oral cavity, oropharyngeal, nasopharyngeal, hypopharyngeal and laryngeal cancers. Consecutive recruitment of respondents during the survey period was carried out until the sample size was reached. All patients that meet the inclusion criteria were involved and the sample reached a total of 201 participants. Furthermore, recidivist patients suffering from mental illness, psychiatric disorders or those who refused to participate were excluded from the study.

This study was approved by The Ethics Committee for Biomedical Research, Faculty of Medicine and Pharmacy of Rabat, Mohammed V (N/R: Folder Number 93/18) and did not receive funding for its execution.

The variables included in the analysis were socio-demographic, data revealing symptoms of the disease, lifestyle habits harmful to health such as smoking and drinking alcohol, and other related factors. The patients’ clinical data were extracted from hospital records.

Consent was obtained, and then the participants were interviewed using a face-to-face structured questionnaire. This tool was pretested and modified before the final data collection was executed. All interviews were conducted by the researcher.

**Statistical analysis**

The sample size was calculated from an anticipated prevalence of 50% of UADTC risk factors by using the formula developed by Schwartz⁶. The minimum number of participants required for this study was observed to be 96 for a relative precision of 10% and 95% confidence level.

The parameters collected in survey forms were stored, coded, analyzed using the Statistical Package for Social Sciences (SPSS) V18 (IBM Corporation, Armonk, NY, USA).

Initially, a descriptive analysis was performed, means and frequency distributions were examined for all variables. Subsequently, related factors were identified using the Chi-Square test or Fisher's exact test when the Chi-Square test's criteria were not met. A threshold of p<0.05 was considered significant.

**Results**

**Socio-demographic characteristics of the study population**

The patients’ characteristics are described in Table 1. The mean age of patients was 54.1 years ±15.2, more than half were men (65.7%). Also, almost three-quarters were married (74.1%), 68.7% were urban inhabitants. In addition, nearly half of patients were illiterate (48.3%), the majority of patients had social security (97.5%), 56.2% were employed, 74.1% were poor.

**Socio-demographic characteristics by cancer site**

The socio-demographic characteristics according to tumor location are presented in Table 2. The lowest average age was observed in nasopharyngeal cancer (46.8±15.7), hypopharyngeal cancer patients were women, 69.8% of oral cavity cancer were married, 28.3% of laryngeal cancer had more than 5 children, 79.2% of laryngeal cancer were urban residents, 48.1% of patients with nasopharyngeal cancer cases were employed or retired and 88.9% of patients with oropharyngeal cancer had a low socioeconomic level.

**Clinical characteristics of the study population**

According to clinical variables (Table 3), the majority of patients (95.0%) did not have a personal history of can-
cer while 49.8% had a family history of cancer in which 10% had UADTC. More than one-third of the sample had nasopharynx cancer (39.3%), followed by oral cavity (26.4%) and laryngeal (26.3%). Over half (55.7%) had Squamous cell carcinoma and 79.4% of the total patients were diagnosed at an advanced stage of the disease (III-IV).

When it comes to earlier symptoms (Table 3), the most prevalent were adenopathies identified for 30.8% of the cases, bleeding (26.9%), dysphonia (24.9%), swelling (23.9%), and Pain (20.4%).

Factors related to UADT cancer

Regarding UADTC risk factors (Table 4), of all the cases, 50.3% were current or past smokers. Among them, 71.3% have smoked for more than 20 years, 29.7% of the participants smoked an average of more than 20 cigarettes per day. 26.9% of the patients were current or former alcohol drinkers and 40.7% of them drank for more than 20 years and the number of glasses consumed per week was over 20 in 35.2% of the patients.

26.4% of the participants were both tobacco and alcohol consumers at the same time, 18.9% were current or former cannabis users, 31.6% of which smoked for more than 20 years. 62.2% of participants practiced daily oral hygiene 45.6% of which practiced once a day, and over three-quarters (75.1%) had never been to a dentist before.

Tumor location related factors

The nasal cavity was excluded from this association due to the extremely small number (n = 2) and was therefore deemed not suitable for statistical examination. For the oropharynx (n = 9) and hypopharynx (n = 5), we used Fisher’s exact test because the Chi-Square test’s criteria were not met. The relationship between tumor location and related factors is summarized in (Table 5). The results showed that cancers of the oral cavity (p = 0.039), nasopharynx (p < 0.001), and larynx (p < 0.001) were significantly related to smoking. It can be seen from the table above that a significant relationship between alcohol consumption and cancers of the oral cavity (p = 0.049), nasopharynx (p < 0.001), oropharynx (p = 0.047), and larynx (p < 0.001) is presented. Both smoking and alcohol consumed at the same time were related to cancers of the oral cavity (p = 0.041), nasopharynx (p < 0.001), oropharynx (p = 0.042), and larynx (p < 0.001).

Oral hygiene (p = 0.049) and denture irritation (p < 0.001) were only related to oral cavity cancer. Cannabis use showed a relationship with laryngeal cancer (p = 0.042), while there was no significant relationship between passive smoking and UADTC location. In addition, cancer of the hypopharynx showed no significant difference from all related factors studied in this research.

Discussion

The main objective of this study was to describe the epidemiological profile of patients with UADTC and to investigate the relationship between UADTC site, and risk factors such as tobacco smoking, alcohol drinking, cannabis use, oral hygiene and prosthetic irritation.

In the present study, UADT tumors were observed to be more common in males (65.7%), similarly, the mean age of the patients was between the 4th to 6th decade which is consistent with most series.

A total of (79.4%) of the cancers detected were at advanced stages indicating a tendency towards late diagnosis and the aggressive nature of the tumors in this series.

Squamous cell carcinoma was the predominant histological type of cases. Our results concur closely with the available data in the literature.

Adenopathy, Bleeding, Dysphonia, Swelling, and Pain

Table 1 Sociodemographic characteristics of the study population (n = 201)

| Characteristics | n | % |
|-----------------|---|---|
| Age (years) Mean±SD* | 54.1 ±15.2 |
| Gender | | |
| Female | 69 | 34.3 |
| Male | 132 | 65.7 |
| Marital status | | |
| Married | 149 | 74.1 |
| Single | 27 | 13.4 |
| Divorced | 10 | 5.0 |
| Widowed | 15 | 7.5 |
| Number of children | | |
| No children | 39 | 19.4 |
| Between 1 and 3 | 75 | 37.3 |
| Between 4 and 5 | 49 | 24.4 |
| More than 5 children | 38 | 18.9 |
| Origin of patients | | |
| Urban | 138 | 68.7 |
| Rural | 63 | 31.3 |
| Level of education | | |
| Illiterate | 97 | 48.3 |
| Primary | 50 | 24.9 |
| Secondary | 41 | 20.4 |
| Higher | 13 | 6.4 |
| Social security | | |
| Yes | 196 | 97.5 |
| No | 5 | 2.5 |
| Occupation | | |
| Employed | 113 | 56.2 |
| Retired | 8 | 4.0 |
| Unemployed | 73 | 36.3 |
| Student | 7 | 3.5 |
| Spouse’s occupation (n = 149) | | |
| Employed | 38 | 25.5 |
| Retired | 4 | 2.7 |
| Unemployed | 107 | 71.8 |
| Socio economic status | | |
| Low | 149 | 74.1 |
| Moderate | 51 | 25.4 |
| High | 1 | 0.5 |

*SD : Standard Deviation
were the most prevalent general symptoms affecting patients with UADTC. It is possibly due to the high number of patients with advanced disease, which coincides perfectly with the findings of a study conducted in Brazil, demonstrating that various symptoms of UADTC were mostly associated to an advanced stage.

Our results indicated that the dominant etiologic factors which have been associated with the majority of locations were cigarette smoking and alcohol drinking used separately or together.

In our series, as compared to other sites, smoking tobacco was found to be associated with tumors of the oral cavity, nasopharynx, and larynx. On the other hand, drinking alcohol was associated with oral cavity, nasopharynx, Oropharynx and larynx. Tobacco smoking and alcohol drinking are well-established risk factors of UADTC.

Both tobacco smoking and alcohol drinking at the same time demonstrated a relationship with cancers of the oral cavity, nasopharynx, oropharynx and larynx. According to the American Cancer Society, the risk of these cancers is even higher when it comes to people who both smoke and drink alcohol, with the highest risk in heavy smokers and drinkers. This risk may be as much as 100 times higher than the risk in people who do not smoke or drink.

A causal association between alcohol and tobacco consumption and UADTC was shown by many studies; however, the data on the role of these two carcinogens in developing countries is still quite limited.

Our study showed that both poor oral health and poor dental care were related to increased risk of the Oral cavity independently of other known risk factors. Both a lack of oral hygiene and poor oral health seem to be risk factors.

| Table 2  Socio-demographic characteristics of the study population by cancer site (n = 201) |
|-----------------------------------------------|-----------------------------------------------|-----------------------------------------------|-----------------------------------------------|-----------------------------------------------|-----------------------------------------------|
| Location of the tumor                        | Nasal cavity                                 | Oral cavity                                  | Nasopharynx                                  | Oropharynx                                   | Hypopharyngeal                               | Larynx                                      |
| Characteristics                              | n (%)                                        | n (%)                                        | n (%)                                        | n (%)                                        | n (%)                                        | n (%)                                        |
| Age (years)*                                | 52.0±7.1                                     | 57.0±15.4                                    | 46.8±15.7                                    | 59.8±13.4                                    | 51.0±15.0                                    | 61.4±9.1                                    |
| Gender                                       |                                              |                                              |                                              |                                              |                                              |                                              |
| Female                                       | 0 (0.0)                                      | 22 (41.5)                                    | 36 (45.6)                                    | 1 (11.1)                                     | 5 (100.0)                                    | 5 (9.4)                                      |
| Male                                         | 2 (100)                                      | 31 (58.5)                                    | 43 (54.4)                                    | 8 (88.9)                                     | 0 (0.0)                                      | 48 (90.6)                                    |
| Marital status                               |                                              |                                              |                                              |                                              |                                              |                                              |
| Married                                      | 1 (50.0)                                     | 37 (69.8)                                    | 55 (69.6)                                    | 7 (77.8)                                     | 3 (60.0)                                     | 46 (86.8)                                    |
| Single                                       | 0 (0.0)                                      | 8 (15.1)                                     | 15 (19.0)                                    | 1 (11.1)                                     | 1 (20.0)                                     | 2 (3.8)                                      |
| Divorced                                     | 1 (50.0)                                     | 4 (7.5)                                      | 2 (2.5)                                      | 0 (0.0)                                      | 0 (0.0)                                      | 3 (5.7)                                      |
| Widowed                                      | 0 (0.0)                                      | 4 (7.5)                                      | 7 (8.9)                                      | 1 (11.1)                                     | 1 (20.0)                                     | 2 (3.8)                                      |
| Number of children                           |                                              |                                              |                                              |                                              |                                              |                                              |
| No children                                  | 1 (50.0)                                     | 11 (20.8)                                    | 20 (25.3)                                    | 2 (22.2)                                     | 1 (20.0)                                     | 4 (7.5)                                      |
| Between 1 and 3                              | 1 (50.0)                                     | 19 (35.8)                                    | 34 (43.0)                                    | 4 (44.4)                                     | 0 (0.0)                                      | 17 (32.1)                                    |
| Between 4 and 5                              | 0 (0.0)                                      | 15 (28.3)                                    | 14 (17.7)                                    | 2 (22.2)                                     | 1 (20.0)                                     | 17 (32.1)                                    |
| More than 5 children                         | 0 (0.0)                                      | 8 (15.1)                                     | 11 (13.9)                                    | 3 (33.3)                                     | 6 (12.0)                                     | 15 (28.3)                                    |
| Origin of patients                           |                                              |                                              |                                              |                                              |                                              |                                              |
| Urban                                        | 1 (50.0)                                     | 35 (66.0)                                    | 51 (64.6)                                    | 7 (77.8)                                     | 2 (40.0)                                     | 42 (79.2)                                    |
| Rural                                        | 1 (50.0)                                     | 18 (34.0)                                    | 28 (35.4)                                    | 2 (22.2)                                     | 5 (60.0)                                     | 11 (20.8)                                    |
| Level of education                           |                                              |                                              |                                              |                                              |                                              |                                              |
| Illiterate                                   | 1 (50.0)                                     | 31 (58.5)                                    | 36 (45.6)                                    | 3 (33.3)                                     | 4 (80.0)                                     | 22 (41.5)                                    |
| Primary                                      | 0 (0.0)                                      | 9 (17.0)                                     | 18 (22.8)                                    | 3 (33.3)                                     | 0 (0.0)                                      | 20 (37.7)                                    |
| Secondary                                    | 1 (50.0)                                     | 10 (18.9)                                    | 20 (25.3)                                    | 2 (22.2)                                     | 1 (20.0)                                     | 7 (13.2)                                     |
| Higher                                       | 0 (0.0)                                      | 3 (5.7)                                      | 5 (6.3)                                      | 1 (11.1)                                     | 1 (0.0)                                      | 4 (7.5)                                      |
| Social security                              |                                              |                                              |                                              |                                              |                                              |                                              |
| Yes                                          | 2 (100.0)                                    | 51 (96.2)                                    | 77 (97.5)                                    | 8 (88.9)                                     | 5 (100.0)                                    | 52 (98.1)                                    |
| No                                           | 0 (0.0)                                      | 2 (3.8)                                      | 2 (2.5)                                      | 1 (11.1)                                     | 0 (0.0)                                      | 1 (1.9)                                      |
| Occupation                                   |                                              |                                              |                                              |                                              |                                              |                                              |
| Employed                                     | 2 (100.0)                                    | 26 (49.0)                                    | 36 (45.6)                                    | 4 (44.4)                                     | 1 (20.0)                                     | 44 (83.0)                                    |
| Retired                                      | 0 (0.0)                                      | 2 (3.8)                                      | 2 (2.5)                                      | 1 (11.1)                                     | 0 (0.0)                                      | 3 (5.7)                                      |
| Unemployed                                   | 0 (0.0)                                      | 25 (47.2)                                    | 34 (43.0)                                    | 4 (44.4)                                     | 4 (80.0)                                     | 6 (13.3)                                    |
| Student                                      | 0 (0.0)                                      | 0 (0.0)                                      | 7 (8.9)                                      | 0 (0.0)                                      | 0 (0.0)                                      | 0 (0.0)                                      |
| Spouse’s occupation (n = 149)                |                                              |                                              |                                              |                                              |                                              |                                              |
| Employed                                     | 0 (0.0)                                      | 11 (29.7)                                    | 21 (38.2)                                    | 1 (14.3)                                     | 1 (33.3)                                     | 4 (8.7)                                      |
| Retired                                      | 0 (0.0)                                      | 1 (2.7)                                      | 3 (5.5)                                      | 0 (0.0)                                      | 0 (0.0)                                      | 0 (0.0)                                      |
| Unemployed                                   | 1 (100.0)                                    | 25 (67.6)                                    | 31 (56.4)                                    | 6 (85.7)                                     | 2 (66.7)                                     | 42 (91.3)                                    |
| Socio economic status                        |                                              |                                              |                                              |                                              |                                              |                                              |
| Low                                          | 0 (0.0)                                      | 40 (75.5)                                    | 60 (75.9)                                    | 8 (88.9)                                     | 4 (80.0)                                     | 37 (69.8)                                    |
| Moderate                                     | 2 (100.0)                                    | 12 (22.6)                                    | 19 (24.1)                                    | 1 (11.1)                                     | 1 (20.0)                                     | 16 (30.2)                                    |
| High                                         | 0 (0.0)                                      | 1 (1.9)                                      | 0 (0.0)                                      | 0 (0.0)                                      | 0 (0.0)                                      | 0 (0.0)                                      |

*Age is measured as mean and standard deviation.
factors for cancers of the Oral cavity. In Morocco, cannabis production and consumption were illegal, both medicinally and recreationally. Morocco consistently ranks among the top five cannabis producers in the world. Even the law in Morocco prohibits the use of cannabis, but many people use it illegally.

On 11 March 2021, the Moroccan government approved a bill authorizing the medical, cosmetic, and industrial use of cannabis. It paves the way for the legalization of cannabis for medical use as well as regulating its production. On May 26, 2021, the Moroccan Parliament voted and approved this law. Recreational use however is still illegal.

This study revealed a relationship between cannabis use and larynx cancer. Indeed, tobacco and alcohol may be confounding factors in the association between cannabis and laryngeal cancer: all patients who use cannabis also use tobacco (28.3%), 11 (20.8%) of patients used alcohol and cannabis at the same time and 10 (18.9%) of patients use tobacco, alcohol, and cannabis at the same time.
Studies conducted in the USA found that marijuana use was positively associated with oral and laryngeal cancers, which corresponds with the findings of other studies.\textsuperscript{23, 24}

Patients in the present study had never used a mouthwash; however, other studies found that frequent use of mouthwash may be a risk factor due to the alcohol contained in many formulations.\textsuperscript{25, 26}

The evidence for the risk associated with alcohol-containing mouthwashes is limited. Although a recent meta-analysis showed no statistically significant association between mouthwash use and oral cancer. Nevertheless, this issue may still be considered controversial.\textsuperscript{27, 28}

Prosthetic irritation and oral cancer were related in our series, while a review based on evidence for chronic mechanical irritation as a causative factor in oral cancer found that the available evidence is limited and controversial and the level of evidence is not conclusive.\textsuperscript{29}

UADTC prevention strategies may want to consider promoting oral health and dental care, regularly attending the dentist, good personal oral hygiene practices.

There are several limitations in the present study. First, we were unable to know if our patients were infected with HPV or and EBV due to the lack of data in the patients' records. HPV is a well-established risk factor for squamous cell carcinoma of the nasopharynx and oropharynx. However, its role remains unclear in the oral cavity and laryngeal cancer.\textsuperscript{30} EBV is classified by the International Agency for Research on Cancer (IARC) as an established cause of several malignancies in humans, including nasopharyngeal carcinoma. Considering the high international distributions of EBV and less frequent occurrence of nasopharyngeal cancer, the existence of cofactors mediating the effect of EBV on this cancer is estimated.\textsuperscript{31} These factors should be addressed in the future. Second, the sample size may not be large enough to analyze the individual variables because the patients' number needed for this study was calculated based on the proportion of the patients who harbor any of the risk factors and not each risk separately. In addition, this study's results are limited to the populations treated at the National Institute of Oncology, and the extrapolation of our results requires more studies.

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Conflict of interest
The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Table 4 Factors related to UADT cancer (n=201)

| Characteristics | n   | %  |
|-----------------|-----|----|
| **Smoked tobacco** |     |    |
| Current smoker  | 49  | 24.4 |
| Past smoker     | 52  | 25.9 |
| Never smoker    | 100 | 49.8 |
| **Number of years of smoking tobacco (n = 101)** |     |    |
| ≤ 10            | 11  | 10.9 |
| 11 ≤ & ≤ 20    | 18  | 17.8 |
| ≥ 21            | 72  | 71.3 |
| **Number of cigarettes smoked per day** |     |    |
| ≤ 10            | 26  | 25.7 |
| 11 ≤ & ≤ 20    | 45  | 44.6 |
| ≥ 21            | 30  | 29.7 |
| **Passive smoking of tobacco** |     |    |
| Yes             | 50  | 24.9 |
| No              | 151 | 75.1 |
| **Number of years of passive smoking (n = 50)** |     |    |
| ≤ 10            | 7   | 14.0 |
| 11 ≤ & ≤ 20    | 25  | 50.0 |
| ≥ 21            | 18  | 36.0 |
| **Alcohol drinker** |     |    |
| Current smoker  | 13  | 6.5 |
| Past smoker     | 41  | 20.4 |
| Never smoker    | 147 | 73.1 |
| **Number of years of alcohol drinker (n = 54)** |     |    |
| ≤ 10            | 10  | 18.6 |
| 11 ≤ & ≤ 20    | 22  | 40.7 |
| ≥ 21            | 22  | 40.7 |
| **Number of standard glasses consumed per week (n = 54)** |     |    |
| ≤ 10            | 22  | 40.7 |
| 11 ≤ & ≤ 20    | 13  | 24.1 |
| ≥ 21            | 19  | 35.2 |
| **Use of tobacco and alcohol at the same time** |     |    |
| Yes             | 53  | 26.4 |
| No              | 148 | 73.6 |
| **Cannabis** |     |    |
| Current smoker  | 16  | 8.0 |
| Past smoker     | 22  | 10.9 |
| Never smoker    | 163 | 81.1 |
| **Number of years of cannabis use (n = 38)** |     |    |
| ≤ 10            | 16  | 42.1 |
| 11 ≤ & ≤ 20    | 10  | 26.3 |
| ≥ 21            | 12  | 31.6 |
| **Oral hygiene** |     |    |
| Yes             | 125 | 62.2 |
| No              | 76  | 37.8 |
| **Frequency of oral hygiene (n = 125)** |     |    |
| Once/day        | 57  | 45.6 |
| Twice a day     | 37  | 29.6 |
| Three times a day | 23 | 18.4 |
| Some time per week | 8 | 6.4 |
| **Prosthetic Irritation** |     |    |
| Yes             | 12  | 6.0 |
| No              | 189 | 94.0 |
| **Consultation with the dentist** |     |    |
| Yes             | 50  | 24.9 |
| No              | 151 | 75.1 |
| **Last visit to the dentist (n = 50)** |     |    |
| < 1 An          | 28  | 56.0 |
| > 1 An          | 22  | 44.0 |

\*UADT: Upper Aerodigestive Tract
Table 5  Tumor location related factors (n = 201)

| Related factors | Oral Cavity | Nasopharynx | Oropharynx | Hypopharyngeal | Larynx |
|-----------------|-------------|-------------|------------|----------------|--------|
|                 | Present (n = 53) | Absent (n = 148) | Present (n = 79) | Absent (n = 122) | Present (n = 9) | Absent (n = 192) | Present (n = 5) | Absent (n = 196) | Present (n = 53) | Absent (n = 148) |
| Smoked tobacco   | Yes 24      | 77 0.039 | Yes 26 | 66.6 | Yes 7 | 94 0.170* | Yes 0 101 0.290* | Yes 47 | 54 <0.001 |
|                 | No 29       | 71 0.009 | No 29 | 51.0 | No 27 | 90 0.234 | No 5 95 0.001 | No 6 94 0.110 |
| Passive smoking of tobacco | Yes 9      | 41 0.121 | Yes 22 | 28 | Yes 3 | 57 0.140 | Yes 1 | 49 1.000* | Yes 15 | 35 0.501 |
| Alcohol drinker | Yes 13      | 41 0.049 | Yes 7 | 47 | Yes 4 | 49 0.047* | Yes 5 | 54 0.327* | Yes 27 | 27 <0.001 |
| Both Tobacco and alcohol | Yes 13     | 40 0.041 | Yes 7 | 46 | Yes 5 | 49 0.042* | Yes 5 | 53 0.328* | Yes 26 | 27 <0.001 |
| Cannabis        | Yes 8       | 30 0.409 | Yes 13 | 25 | Yes 1 | 37 1.000* | Yes 0 | 38 0.586* | Yes 15 | 23 0.042 |
| Oral hygiene    | Yes 30      | 95 0.049 | Yes 55 | 70 | Yes 6 | 119 1.000* | Yes 5 | 120 0.159* | Yes 27 | 98 0.328 |
| Prosthetic Irritation | Yes 9    | 3 <0.001* | Yes 2 | 10 | Yes 0 | 12 1.000* | Yes 0 | 12 1.000* | Yes 1 | 11 0.189* |

Significant at p value <0.05 with a 95% confidence level.

*The Fisher’s exact test was systematically used when the Chi Square test’s criterion was not met.

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