



## **Epidemiological and Clinico-Pathological Characteristics of Head and Neck Cancer (Retrospective Analysis)**

**Safia Abd-Elhamed Abo-Alhassan, Mohamed Abd-Algawad Soliman, Mostafa Mohamed Mohamed Toam, Ahmed Ali Obaya**

Department of Clinical Oncology & Nuclear Medicine, Faculty of Medicine, Zagazig University, Egypt

Email: [safia949494@gmail.com](mailto:safia949494@gmail.com)

**Article History:** Received 10th June, Accepted 5th July, published online 10th July 2023

### **Abstract**

**Background:** Head and neck cancer (HNC) are a group of malignancies involving lips, oral cavity, pharynx, ear, nose, salivary glands, para nasal sinuses and larynx.

**Objective:** to study of epidemiological and Clinico-Pathological Characteristics of (HNC) in Clinical Oncology Department in Zagazig University Hospital.

**Methods:** This retrospective cross sectional study was conducted in Clinical Oncology and Nuclear Medicine Department in Zagazig University Hospitals. All old (HNC) patients files in Clinical Oncology and Nuclear Medicine Department medical records room from (2016-2021) was included in the study.

**Results:** the most frequent sites were oral cavity, larynx and nasopharynx (29.9%, 23.6% and 15.1% respectively). Most frequent subsites were nasopharynx (15.1%), lip (10.7%) and oral tongue (10.3%). SCC were the most frequent pathological type. Grade II was reported in 79% of the cases. PNI was present in 19.2% of the cases and LVi 4.8%. Most frequent cT was cT2 (56.1%), cN was cN2 (56.8%), AJCC clinical stage was stage II (43.2%) and pathological state was II (15.1%). CR was reported in 19.6% of the cases and OAR in 53.1% of the cases. Local recurrence was founded in 62.4% of the 133 cases and regional in 62.4% of them. Distant metastasis was founded in 19.5% and relapse in 77.8% of 135 cases while regression in 83.8% of 136 cases. Finally mortality rate was 52%. There was a statistical significance increase in NR, local recurrence, distant metastasis, relapse and progression response among dead compare to lived cases. There was a statistical significance increase in median overall survival among cases less than 50 years old, stage II AJCC, CR cases and cases with absent local recurrence.

**Conclusion:** Head and neck cancer is a major health problem in Zagazig, and its incidence is increasing. The high prevalence of tobacco consumption and HPV infection makes screening programs, and the surveillance of those patients represents a very important tool for early detection of HNC cases.

**Keywords:** Epidemiological, Head and Neck Cancer, Clinico-Pathological Characteristics

### **Introduction**

Head and neck cancers are a heterogeneous group of malignant tumors that vary in their tissue of origin, primary anatomical sites, histopathology, and clinical presentations. arise in the upper alimentary and respiratory tracts, including the oral cavity, lips, mouth, gums, alveolar ridge, two-thirds in front of the tongue, floor of mouth, hard palate and retromolar trigone, nasopharynx, oropharynx, hypopharynx and larynx (1).

Head and neck squamous cell carcinomas (HNSCC) is a six leading cancer by incidence worldwide with male to female ratio 2:1. each year there are approximately 560,000 new cases of and 300,000 deaths due to HNC (2). In Egypt the incidence of HNSCCs is 17–20% of all cancers (2).

These cancers are more than twice as common among men as they are among women. Head and neck cancers are also diagnosed more often among people over age 50 than they are among younger people. (3).

Symptoms predominantly include a sore of the face or oral cavity that does not heal, trouble swallowing, or a change in the voice. In those with advanced disease, there may be unusual bleeding, facial pain, numbness or swelling, and visible lumps on the outside of the neck or oral cavity (4).

Treatment of oral cancer including surgery, radiotherapy and chemotherapy may have a detrimental effect on patients appearance and on functions such as swallowing or speech. These problems can have a massive negative influence on social integration, emotion, and well-being. Cancer patients also need practical support for concerns including financial issues and family matters. It can also be challenging for clinicians (5).

The aim of this study was to study of epidemiological and Clinico-Pathological Characteristics of (HNC) in Clinical Oncology Department in Zagazig University Hospital.

## **Patients and Methods**

### **A) Technical design**

This retrospective study was conducted in Clinical Oncology department in Zagazig University Hospitals by reviewing registrar's file's during the study period. All cases fulfill the inclusion and exclusion criteria were included from the year 2016 to 2021, (312 cases) as a comprehensive sample.

### **Inclusion criteria:**

All (HNC) patient's files in Clinical Oncology and Nuclear Medicine Department medical records room from (2016 to 2021).

### **Exclusion criteria:**

None of the files were excluded.

### **B) Operational design:**

**Sample size:** sample size will be all (HNC) patients diagnosed from (2016 to 2021).

Process: the basic information for Head and Neck Cancer includes data on personal identification, some demographic characteristics, date & most valid basis of diagnosis, site and morphology of tumor.

### **C) Administrative design:**

**The study will be conducted after approval of Zagazig University Institutional Review Board.**

### **• Study Parameters and their definition:**

**Major clinico-pathological parameters were systematically investigated in this study;**

- Age of patient divided in two age group ( $\leq 50$  and more than  $>50$ ).
- Smoking history.
- Symptoms mentioned according to site of tumor.
- Personal status of the patient according to ECOG system.
- Sites of the primary tumor; 1=Oral cavity 2=Nasopharynx 3=Oropharynx 4=Hypopharynx 5=Larynx 6=Nose&Nasal cavity 7=Paranasal sinus 8=Salivary glands 9=Ear 10=Unknown primary.
- Subsites of the tumor; 1=Lip 2=Buccal mucosa 3=Gingiva 4=Hard palate 5=Floor of mouth 6=Oral Tongue 7=Retromolar trigone 8=Nasopharynx 9=Soft palate 10=Anterior tonsillar pillar 11=Tonsillar fossa 12=Posterior tonsillar pillar 13=Base of tongue 14=Vallecula 12=Lateral & Posterior.
- pharyngeal wall 13=Postcricoid 14=Pyriiform fossa 15=Supraglottic 16=Glottic 17=Subglottic 18=Nose 19=Nasal cavity 20=Maxillary sinus 21=Ethmoidal sinus 22=Parotid 23=Submandibular 24=Sublingual 25=External ear 26=Middle ear 27=Unknown primary.

- Histopathological classification of the tumor; 1=Squamous cell carcinoma 2=Adenoid cystic carcinoma 3=Mucocpidermioid carcinoma 4=Acinic cell tumor 5=Undifferentiated sarcomatoid carcinoma 6=Adenocarcinoma.
- Clinical and pathological staging of the tumor according to AJCC system.
- Surgery type; radical or just biopsy.

**Treatment modalities:**

- 1<sup>st</sup> surgical procedures.
  - Chemotherapeutic agent.
  - Concurrent chemoradiation.
  - Radiotherapy treatment.
- Response of the ttt; 1=CR 2=PR 3=SD 4=PD

**Results**

**Table (1): Frequency of head and neck cancer in different years**

Variable		No	%	All cancer cases	% from all cancer cases
<b>Years:</b>	2016	54	19.9	1390	3.9
	2017	80	29.5	1400	5.7
	2018	27	10	1593	1.7
	2019	23	8.5	1487	1.5
	2020	38	14	1474	2.6
	2021	49	18.1	2093	2.3
<b>Total</b>		271	100	9437	2.9

This table shows that the 19.9% of the cases were diagnosed in 2016, 29.5% in 2017, 10% in 2018, 8.5% in 2019, 14% in 2020 and 18.1% in 2021. Frequency of head and neck cancer in last 6 years was 2.9%. Highest frequency was reported in 2017 (5.7%) while least frequency was in 2019 (1.5%).

**Table (2): Demographic data of the studied cases**

Variable		(n=271)	
<b>Age: (years)</b>	<i>Mean ± Sd</i>	55.58 ± 11.64	
	<i>Range</i>	18-81	
<b>Variable</b>		<b>No</b>	<b>%</b>
<b>Age group:</b>	≤ 50 years	99	36.5
	> 50 years	172	63.5
<b>Sex:</b>	<i>Male</i>	185	68.3
	<i>Female</i>	86	31.7
<b>Residence:</b>	<i>Rural</i>	91	33.6
	<i>Urban</i>	180	66.4
<b>Smoking:</b>	<i>Non-smoker</i>	93	34.3
	<i>Ex-smoker</i>	35	12.9
	<i>Current smoker</i>	143	52.8

SD: Standard deviation

This table shows that that age of the studied cases ranged from 18 to 81 years with mean 55.58 years and 63.5% of the cases were more than 50 years old. Male represent 68.3% of the cases and also 66.4% of the cases were from urban area. And 52.8% were current smoker.

**Table (3): Clinical character of tumors among the studied cases**

Variable		(n=271)	
		No	%
<b>Site:</b>	Oral cavity	81	29.9
	Nasopharynx	41	15.1
	Oropharynx	13	4.8
	Hypopharynx	19	7.0
	Larynx	64	23.6
	Nose & Nasal cavity	10	3.7
	Paranasal sinus	9	3.3
	Salivary glands	20	7.4
	Ear	13	4.8
	Unknown primary	1	0.4
<b>Subsite:</b>	Lip	29	10.7
	Buccal mucosa	15	5.5
	Gingiva	2	0.7
	Hard palate	4	1.5
	Floor of mouth	2	0.7
	Oral Tongue	28	10.3
	Retromolar trigone	1	0.4
	Nasopharynx	41	15.1
	Soft palate	2	0.7
	Anterior tonsillar pillar	1	0.4
	Tonsillar fossa	2	0.7
	Posterior tonsillar pillar	7	2.6
	Vallecula	1	.4
	Supraglottic	18	6.6
	Glottic	24	8.9
	Subglottic	22	8.1
	Postcricoid	3	1.1
	Pyrimiform fossa	16	5.9
	Nose	7	2.6
	Nasal cavity	3	1.1
	Maxillary sinus	7	2.6
	Ethmoidal sinus	2	0.7
	Parotid	18	6.6
	Submandibular	2	0.7
	External ear	13	4.8
	Unknown primary	1	0.4

This table shows that the most frequent sites were oral cavity, larynx and nasopharynx (29.9%, 23.6% and 15.1% respectively). Most frequent subsites were nasopharynx (15.1%), lip (10.7%) and oral tongue (10.3%).

**Table (4): pathological character among the studied cases**

Variable		(n=271)	
		No	%
<b>Pathology:</b>	Squamous cell carcinoma	251	92.6
	Adenoid cystic carcinoma	4	1.5
	Mucoepidermoid carcinoma	4	1.5
	Undifferentiated carcinoma	2	.7
	Adenocarcinoma	6	2.2
	Epithelial Myoepithelial carcinoma	4	1.5
<b>Grade:</b>	Grade I	12	4.4
	Grade II	214	79.0
	Grade III	45	16.6
<b>PNI:</b>	Absent	52	19.2
	Present	218	80.4
	N/A	1	0.4
<b>LVI:</b>	Absent	13	4.8
	Present	257	94.8
	N/A	1	0.4
<b>cT:</b>	cT1	28	10.3
	cT2	152	56.1
	cT3	57	21
	cT4	34	12.5
<b>cN:</b>	cN0	45	16.6
	cN1	154	56.8
	cN2	64	23.6
	cN3	8	3
<b>AJCC stage clinical:</b>	I	11	4.1
	II	117	43.2
	III	67	24.7
	IV A	62	22.9
	IV B	9	3.3
	IV C	5	1.8
<b>AJCC stage pathological:</b>	II	105	38.7
	III	61	22.5
	IV A	22	8.1
	IV B	1	0.4
	N/A	82	30.2

This table shows that SCC were the most frequent pathological type. Grade II was reported in 79% of the cases. PNI was present in 19.2% of the cases and LVI 4.8%. Most frequent cT was cT2 (56.1%), cN was cN2 (56.8%), AJCC clinical stage was stage II (43.2%) and pathological state was II (38.7%).

**Table (4): Outcome among the studied cases**

Variable		(n=271)	
		No	%
<b>Response to ttt:</b>	CR	53	19.6
	PR	91	33.6
	SD	24	8.9
	PD	20	7.4
	Not applied	83	30.6
<b>Response:</b>	OAR	144	53.1
	NR	43	15.9
	N/A	84	31
<b>Recurrence:</b>		(n=133)	
	Local Regional	96 83	72.2 62.4
<b>Distant metastasis:</b>		(n=266)	
	Absent Present	214 52	80.5 19.5
<b>Relapse:</b>		(n=135)	
	No Yes	30 105	22.2 77.8
<b>Progression:</b>		(n=136)	
	No Yes	22 114	16.2 83.8
<b>Mortality:</b>	Alive	130	48
	Dead	141	52

This table shows that CR was reported in 19.6% of the cases and OAR in 53.1% of the cases. Local recurrence was founded in 62.4% of the 133 cases and regional in 62.4% of them. Distant metastasis was founded in 19.5% and relapse in 77.8% of 135 cases while regression in 83.8% of 136 cases. Finally mortality rate was 52%.

**Table (5): Relation between site and outcome data of the studied cases**

Variable		N	Non-NPC (n=230)		NPC (n=41)		$\chi^2$	P
			No	%	No	%		
<b>Age group:</b>	≤ 50 years	99	79	34.3	20	48.8	3.13	0.08
	> 50 years	172	151	65.7	21	51.2		
<b>Sex:</b>	Male	185	158	68.7	27	65.9	0.113	0.72
	Female	86	72	31.3	14	34.1		
<b>Smoking:</b>	Current smoker	143	123	53.5	20	48.8	0.33	0.85
	Non-smoker	93	78	33.9	15	36.6		
	Ex-smoker	35	29	12.6	6	14.6		
<b>Pathology:</b>	Squamous cell carcinoma	251	213	92.6	38	92.7	13.37	0.02*
	Adenoid cystic carcinoma	4	4	1.7	0	0		
	Mucoepidermoid carcinoma	4	4	1.7	0	0		
	Undifferentiated carcinoma	2	0	0	2	4.9		
	Adenocarcinoma	6	5	2.2	1	2.4		
Epithelial Myoepithelial carcinoma	4	4	1.7	0	0			
<b>Grade:</b>	Grade I	12	11	4.8	1	2.4	5.79	0.06
	Grade II	214	186	80.9	28	68.3		
	Grade III	45	33	14.3	12	29.3		
<b>AJCC clinical:</b>	I	11	11	4.8	0	0	40.49	<0.001**
	II	117	110	47.8	7	17.1		
	III	67	60	26.1	7	17.1		
	IV A	62	39	17	23	56.1		
	IV B	9	5	2.2	4	9.8		
	IV C	5	5	2.2	0	0		
<b>AJCC pathological:</b>	II	105	105	45.7	0	0	---	----
	III	61	61	26.5	0	0		
	IV A	22	22	9.6	0	0		
	IV B	1	1	0.4	0	0		
	N/A							
		82	41	17.8	41	100		

$\chi^2$ : Chi square test

\*: Significant (P<0.05)

\*\*: Highly significant (P<0.001)

This table shows that there was a statistical significance increase in Epithelial Myoepithelial carcinoma among NPC compare to Non NPC , also there was a statistical significance increase in Clinical AJCC Stage IVA among NPC compare to Non NPC. No cases of NPC had pathological AJCC stage.

**Table (6): Overall Survival among the studied cases according to different parameters**

Variable	Site	N	Median	95% CI	P
Age group:	≤50 years	99	78	62.31-93.69	<0.001 **
	>50 years	172	49	10.21-13.78	
Pathology	Squamous cell c	251			<0.001 **
	Adenoid cystic c	4			
	Mucoepidermoid c	4			
	Undifferentiated c	2			
	Adenocarcinoma	6			
	Epithelial Myoepithelial c	4			
AJCC stage:	Stage II	105	75	65.68-84.32	<0.001 **
	Stage III	61	42	37.73-46.27	
	Stage IVA	22	37	31.61-42.40	
	Stage IVB	1	11	11-11	
	NA	82	56	50.94-61.06	
Response to ttt	CR	53	69	62.43-75.62	<0.001 **
	PR	91	57	52.90-61.10	
	SD	24	31	23.53-38.47	
	PD	20	21	16.62-25.38	
	N/A	83	56	42.62-69.38	
Local recurrence	Absent	37	73	64.92-81.77	003*
	Present	96	57	45.01-68.99	

95%CI: 95%Confidence Interval;

P: Log-rank test;

\*: Significant (P<0.05)

\*\* highly significant: P<0.001

This table shows that there was a statistical significance increase in median overall survival among cases less than 50 years old, stage II AJCC, CR cases and cases with absent local recurrence.

## Discussion

The most common risk factors associated with HNC are tobacco and alcohol use with significant interaction observed between the two. Other observed risk factors are poor oral hygiene and the human papillomavirus (HPV) 16 in tongue, tonsil and oropharyngeal HNC and, in particular, nonsmoking cases of HNC. In South Asian countries the risk of HNC is further aggravated by smoking of bidis which increases the incidence of cancer of hypopharynx and larynx and chewing tobacco, betel quid and areca nut (6).

The aim of study was to assess epidemiological characteristics of (HNC) in Clinical Oncology and Nuclear Medicine Department in Zagazig University Hospitals.

This retrospective cross sectional study was conducted in Clinical Oncology and Nuclear Medicine Department in Zagazig University Hospitals. All old (HNC) patients files in Clinical Oncology and Nuclear Medicine Department medical records room from (2017-2021) was included in the study.

The oral cavity is the most common site due to the higher rate of exposure of the males to risk factors such smoking and the use of tobacco products.

The nose/paranasal sinuses have been reported to be a common site for HNCs in previous reports (7; 8; 9). Nasopharyngeal cancer accounted for 15.1% of all HNCs in this study. This was contradicted by the previous study, in which nasopharyngeal cancers accounted for the most common anatomical site (16.8%)

**(10).**

Salivary gland cancers with a prevalence of 7.4% of all HNCs in this study were found to be relatively low compared to other Nigerian studies **(7; 8)**.

The current study was in line with, Adisa et al. reported that concerning anatomical distribution of head and neck malignancies, respiratory tract (nose, nasopharynx, oropharynx, hypopharynx and larynx) was represented in 43.2%, maxillofacial bones in 20.5%, oral cavity in 12.5%, cervical lymph nodes in 11.2%, salivary glands in 5.4%, face and scalp in 5.3%, ear in 1.3%. and esophageal in 0.6% **(7)**.

A study performed in central Sudan found the oral cavity to be the fourth most common site (10.5%) after the upper respiratory tract (72.7%) which was the commonest site **(11)**.

Lawoyin et al, also from Ibadan, who reported that the palate was the most common intraoral site **(12)**, but is at variance with a report by Odukoya *et al* in which the mandibular gingiva, maxillary gingiva and hard palate were the most common intraoral sites (in descending order) **(13)**. Other studies showed the tongue, palate and mandibular alveolus as the most commonly affected sites (in descending order) **(14)**. In South East Asia, the buccal mucosa and retromolar areas were the most prone areas **(15)**.

In addition, Oga et al. reported that 18.31% of tumors were in nasopharynx, 16.9% in larynx, 14.79% in nasal cavity, 4.93% in cervical lymph node and mandible, and 4.23% in oral cavity **(16)**.

Adoga et al. evaluate predictors of stage of head and neck cancers at presentation and survival in a tertiary hospital. They reported that regarding tumor primary sites, 27.9% were in nasopharynx, 20.5% in larynx, 12.3% were in oropharynx, 10.7% in parotid, and 23% in nasal sinus **(17)**.

Larizadeh et al. reported that larynx was the most commonly affected site (46.76%) followed by oral cavity (15.9%) (tongue (35%) followed by lip (31%) and gingiva (17%)) **(18)**.

Concerning the pathologic characteristics in the present study, squamous cell carcinoma (SCC) was the most frequent pathological type. Grade II was reported in 79% of the cases. PNI was present in 19.2% of the cases and LVi 4.8%.

Most frequent cT was cT2 (56.1%), cN was cN2 (56.8%), AJCC clinical stage was stage II (43.2%) and pathological state was II (15.1%)

In agreement with the current study, Attar et al. reported that regarding staging, 1.32% had *In-situ*, 28.24% were localized (stage I lymphoma), 16.67% had regional-direct extension, 11.23% had regional lymph node extension, 7.81% had regional-direct extension and lymph node, 7.46% regional stage II lymphoma, 10.53% had distant stage III and IV lymphoma, and 16.58% had unknown stage **(19)**.

Nwawolo et al. reported that SCC was the most common type while, sarcomas as the second most common type **(20)**, in contrast to our study where adenocarcinoma accounted for the second most frequent type.

Adeyemi *et al* that reported carcinomas (71.7%), lymphomas (20.4%) and sarcomas (7.9%) to be the major categories **(21)**.

The current study was in line with, Amusa *et al* in a ten year review on the pattern of head and neck malignant tumours reported lymphomas (40.3%) as the predominant histological type followed by squamous cell carcinomas (25.3%), sarcomas (2.6%) and other minor variants (31.9%). The consideration of squamous cell carcinoma as the only epithelial malignancy in their study may have resulted in the perceptible dominance of lymphomas **(8)**.

Erinoso et al. reported that regarding histopathological diagnosis, 67% had carcinoma, 16.5% had lymphoma, 10.6% had sarcoma, 4% had retinoblastoma, and 1.9% had other types.

In general, carcinomas accounted for the highest number of recorded cases (67%, 726/1083), followed by lymphomas (16.5%, 179/1083) and sarcomas (10.6%, 115/1083). SCC accounted for 58% (421/726) of carcinomas recorded, while adenocarcinomas reported were 13.2% (96/726) of all carcinomas. Follicular lymphomas (48%, 86/179) were the most common histologic finding among lymphomas, with non-Hodgkin's (26.8%, 48/179) and Hodgkin's lymphomas (16.7%, 30/179). Among the sarcomas diagnosed, fibrosarcomas and liposarcomas both detailed 20.9% (9/43) each, while rhabdomyosarcoma cases were 14% (6/43). Retinoblastoma accounted for 4% (43/1083) of histologic variations seen **(22)**.

In accordance with the present findings, Adisa et al. reported that the epithelial malignancies constituted 73.4% (875 patients) of all the cases. Lymphomas and sarcomas constituted 17.5% and 8.9% of cases,



respectively. There were two neuroendocrine tumors, accounting for 0.2% of the cases (7).

Oga et al. reported that SCC was the most common type with 44.37% followed by nasopharyngeal carcinoma (17.61%), 4.23% with undifferentiated carcinoma, 3.52% with ameloblastoma, metastatic carcinoma, and mucoepidermoid carcinoma, 2.82% with adenoid cystic carcinoma and Kaposi sarcoma, 2.11% with anaplastic carcinoma, Burkitt's lymphoma and papillary carcinoma. Follicular carcinoma, rhabdomyosarcoma, and spindle cell carcinoma were represented in 1.41%, while other types were represented in 7.04% of cases (16).

Our findings revealed that there was a statistical significance increase in median overall survival among cases less than 50 years old, stage II AJCC, CR cases and cases with absent local recurrence (Table 13).

In accordance with the present findings, Adoga et al. reported that compared to other tumor stages at presentation, patients presenting with cancer in stage IV had an increased hazard for death (hazard ratio (HR) = 1.44; 95% CI = 1.80–2.59) (17).

In agreement with the current study, Mak et al. reported that the mean overall survival for patients with metastatic disease was 28.2 months (95% CI 19.3–37.1), while the mean OS for patients with non-metastatic N3 disease was 74.2 months (95% CI 59.2–89.2) months (23).

## Conclusion

Head and neck cancer is a major health problem in Zagazig, and its incidence is increasing. The high prevalence of tobacco consumption and HPV infection makes screening programs, and the surveillance of those patients represents a very important tool for early detection of HNC cases

## References

1. **Chow LQM.** Head and neck cancer. *New England Journal of Medicine* 2020; 382(1):60–72.
2. **Salem DA, Bahaa S, El Roubay MN, Osman YA, Bahnassy AA, Zekri AR.** Prevalence of HPV Infection in Head and Neck Cancer Patients in Egypt: National Cancer Institute Experience. 2020;1-13.
3. **Siegel RL, Miller KD, Fuchs HE, Jemal A.** Cancer statistics, 2021. *CA: A Cancer Journal for Clinicians* 2021; 71(1):7–33.
4. **Mcllwain WR, Sood AJ, Nguyen SA, Day TA (May 2014).** "Initial symptoms in patients with HPV-positive and HPV-negative oropharyngeal cancer". *JAMA Otolaryngology–Head & Neck Surgery*. 140 (5): 441–447.
5. **Kalavrezos N, Scully C.** Mouth cancer for clinicians part 9: the patient and care team. *Dent Update*. 2016;43(3):276–87.
6. **Kreimer AR, Clifford GM, Boyle P, Franceschi S.** Human papillomavirus types in head and neck squamous cell carcinomas worldwide: A systematic review. *Cancer Epidemiol Biomarkers Prev*.2005; 14(2):467–75.
7. **Adisa, A. O., Adeyemi, B. F., Oluwasola, A. O., Kolude, B., Akang, E. E., & Lawoyin, J. O.** (2011). Clinico-pathological profile of head and neck malignancies at University College Hospital, Ibadan, Nigeria. *Head & Face Medicine*, 7, 9.
8. **Amusa, Y. B., Olabanji, J. K., Akinpelu, V. O., Olateju, S. O., Agbakwuru, E. A., Ndukwe, N., Fatusi, O. A., & Ojo, O. S. (2004).** Pattern of head and neck malignant tumours in a Nigerian teaching hospital—A ten year review. *West African Journal of Medicine*, 23(4), 280–285.
9. **Ologe, F. E., Adeniji, K. A., & Segun-Busari, S. (2005).** Clinicopathological study of head and neck cancers in Ilorin, Nigeria. *Tropical Doctor*, 35(1), 2–4.
10. **Nwawolo, C. C., Ajekigbe, A. T., Oyenyin, J. O., Nwankwo, K. C., & Okeowo, P. A. (2001).** Pattern of head and neck cancers among Nigerians in Lagos. *West African Journal of Medicine*, 20(2), 111–116.
11. **Abuidris, D. O., Elhaj, A. H. A., Eltayeb, E. A., Elgayli, E. M., & Mustafa, O. E. (2008).** Pattern of Head and neck malignancies in Central Sudan-(study of 314 cases). *Sudan Journal of Medical Sciences*, 3(2), Article 2.
12. **Lawoyin, J. O., Lawoyin, D. O., & Aderinokun, G. (1997).** Intra-oral squamous cell carcinoma in Ibadan: A review of 90 cases. *African Journal of Medicine and Medical Sciences*, 26(3–4), 187–188.
13. **Odukoya, O., Mosadomi, A., Sawyer, D. R., Orejobi, A., & Kekere-Ekun, A. (1986).** Squamous cell carcinoma of the oral cavity. A clinico-pathological study of 106 Nigerian cases. *Journal of Maxillofacial Surgery*, 14(5), 267–269.
14. **Arotiba, J. T., Obiechina, A. E., Fasola, O. A., Fawole, O. I., & Ajagbe, H. A. (1999).** Oral squamous cell carcinoma: A review of 246 Nigerian cases. *African Journal of Medicine and Medical Sciences*, 28(3–4), 141–144.
15. **Johnson, N. W. (1991).** Orofacial neoplasms: Global epidemiology, risk factors and recommendations for research.

International Dental Journal, 41(6), 365–375.

16. **Oga, E. A., Schumaker, L. M., Alabi, B. S., Obaseki, D., Umana, A., Basse, I.-A., Ebughe, G., Oluwole, O., Akeredolu, T., Adebamowo, S. N., Dakum, P., Cullen, K., & Adebamowo, C. A. (2016).** Paucity of HPV-Related Head and Neck Cancers (HNC) in Nigeria. *PLoS ONE*, 11(4), e0152828.
17. **Adoga, A. A., Kokong, D. D., Ma'an, N. D., Mugu, J. G., Mgbachi, C. J., & Dauda, A. M. (2018).** The predictive factors of primary head and neck cancer stage at presentation and survival in a developing nation's tertiary hospital. *SAGE Open Medicine*, 6, 2050312118792416.
18. **Larizadeh, M. H., Damghani, M. A., & Shabani, M. (2014).** Epidemiological Characteristics of Head and Neck Cancers in Southeast of Iran. *Iranian Journal of Cancer Prevention*, 7(2), 80–86.
19. **Attar, E., Dey, S., Hablas, A., Seifeldin, I. A., Ramadan, M., Rozek, L. S., & Soliman, A. S. (2010).** Head and Neck Cancer in a Developing Country: A Population-Based Perspective Across 8 Years. *Oral Oncology*, 46(8), 591–596.
20. **Nwawolo, C. C., Ajekigbe, A. T., Oyeneyin, J. O., Nwankwo, K. C., & Okeowo, P. A. (2001).** Pattern of head and neck cancers among Nigerians in Lagos. *West African Journal of Medicine*, 20(2), 111–116.
21. **Adeyemi, B. F., Adekunle, L. V., Kolude, B. M., Akang, E. E. U., & Lawoyin, J. O. (2008).** Head and neck cancer—A clinicopathological study in a tertiary care center. *Journal of the National Medical Association*, 100(6), 690–697.
22. **Erinosa, O., Okoturo, E., Gbotolorun, O., Effiom, O., Awolola, N., Soyemi, S., & Oluwakuyide, R. (2016).** Emerging Trends in the Epidemiological Pattern of Head and Neck Cancers in Lagos, Nigeria. *Annals of Medical and Health Sciences Research*, 6(5), 301–307.
23. **Mak, H. W., Lee, S. H., Chee, J., Tham, I., Goh, B. C., Chao, S. S., Ong, Y. K., Loh, K. S., & Lim, C. M. (2015).** Clinical Outcome among Nasopharyngeal Cancer Patients in a Multi-Ethnic Society in Singapore. *PLoS ONE*, 10(5), e0126108.