Head and Neck Cancer—A Clinicopathological Study in a Tertiary Care Center

Bukola F. Adeyemi, BDS (Ib), FWACS, MSc (Ib); Lola V. Adekunle, BSc (Ife), MPH (Isr), PhD (Ib); Bamidele M. Kolude, BDS (Ib), FWACS, MSc (Ib); Effiong E.U. Akang, MBBS (Ib), FWACP, FMCPath; and Jonathan O. Lawoyin, DDS (Howard), MSc (Glasgow)

Head and neck cancers display diverse patterns of biological behavior and considerable variation in geographical distribution. This study presents an analysis of head and neck cancer in a Nigerian tertiary healthcare center. It comprises cases diagnosed at the University College Hospital, Ibadan, Nigeria, 1991–2005. Out of 1,750 head and neck tumors, 972 (55.5%) were malignant and 778 (44.5%) were benign. Cancers displayed male predominance, with a gender ratio of 1.8:1. The mean age of cancer patients was 43.8 ± 19.6 years. Carcinomas constituted 71.7% of head and neck cancers, with 2.4% occurring in children and overall mean age of 48.2 years. Squamous cell carcinoma comprised 66.7% of carcinomas and 47.8% of all head and neck cancers. Hematopoietic malignancies constituted 20.4% of head and neck cancers, and comprised mainly lymphomas, which accounted for 19.3% of all head and neck cancers. The mean age of patients with hematopoietic malignancies was 34.9 years. The most common childhood malignancy was Burkitt's lymphoma, which comprised 28.2% of pediatric head and neck cancers. Connective tissue tumors constituted 7.9% of all cancers, the most common being rhabdomyosarcoma, accounting for 44.2% of sarcomas. The mean age of patients with sarcomas was 26.5 years. There is a need for uniformity in the definition of head and neck cancer so as to permit comparison of international studies. In addition, prospective population-based studies are required to determine the national incidence and to identify risk factors for head and neck cancer in the Nigerian population.

Keywords: head ■ neck ■ cancer ■ pathology ■ Nigeria

© 2008. From the Departments of Oral Pathology (Adeyemi, Kolude, Lawoyin), Epidemiology (Adekunle), Medical Statistics and Environmental Health, and Pathology (Akang), College of Medicine, University of Ibadan, Nigeria. Send correspondence and reprint requests for *J Natl Med Assoc.* 2008;100:690–697 to: Dr. Bukola F. Adeyemi; phone: 2342410088 ext. 2468; e-mail: oluwabukolawale2003@yahoo.com

INTRODUCTION

Head and neck cancers are primary malignant neoplasms that occur in several anatomical sites in the head and neck region such as the oral cavity, ear, scalp, nasal cavities, paranasal sinuses, nasopharynx, hypopharnyx oropharynx and salivary glands.[1] They are characterized by diverse patterns of biological behavior and a well-established association with tobacco and alcohol use.[2] Other factors associated with head and neck cancer include genetic factors, nutritional deficiency and infection by oncogenic viruses.[3,4]

Head and neck cancer is the 10th most common cancer in the world.[5] It is a major global health issue, with about half a million new cases diagnosed per year,[6] and their incidence appears to be increasing in developing countries. Thus, they are an important cause of morbidity and mortality throughout the world.[7] However, the geographical distribution of head and neck cancer shows considerable variation and is site dependent.[8] For example; cancers of the nasal cavity and paranasal sinuses are slightly more common in the south than in the rest of the United States. In the Indian subcontinent, due to the high prevalence of smoking and tobacco chewing, oral cancer comprises >25% of all malignancies. Nasopharyngeal carcinoma occurs sporadically in the west but is endemic in southern China, where it is the third most common form of malignancy among men, with incidence rates of between 15–50 per 100,000.[9] There is an intermediate incidence in Alaskan Eskimos and in the Mediterranean basin. Unlike other squamous cell cancers of the head and neck, nasopharyngeal cancer does not appear to be linked to excess use of tobacco and alcohol. Factors thought to predispose to this tumor include Chinese ancestry, Epstein-Barr virus exposure and as-yet-unknown factors that result in very rare familial clusters.[10,11]

Diverse histological types of tumors are found in the head and neck region. More than 90% of head and neck cancers are of epithelial origin, of which squamous cell carcinoma constitutes the greatest majority.[12] About 30% of all lymphomas occur in the head and neck region. Thus, they constitute the second most common primary malignancy at this site.[13] Between 15–20% of all sarcomas are diagnosed in the head and neck region.[14] Osteogenic sarcoma, rhabdomyosarcoma, malignant fibrous histiocytoma and angiosarcoma are the commonest types.[15] Salivary gland malignancies are an important

but rare group constituting about 1% of all head and neck cancer.[16]

The clinical presentation of head and neck cancer depends on the site of origin of the tumor as well as the stage of disease. The early-stage cancer of the head and neck region often presents with vague signs and symptoms. Cancer of the oral cavity may present with indolent ulcer, erythroplakia, leukoplakia or ill-fitting dentures.[17] While that of the nasopharyngeal region may present with nasal obstruction, otalgia or epistaxis, laryngeal carcinomas presents with vocal changes. Advanced cancers of the head and neck region may present with severe pain, massive lymphadenopathy, airway obstruction, trismus, dysphagia, proptosis, diplopia or/and neuropathies.[18,19]

The standard treatment for head and neck cancer is surgery with or without radiotherapy, but cure rates are low—<30%.[20] This is due to the complex anatomy and function of this region, which makes total excision or delivery of radiation high enough to achieve a cure of tumor difficult without compromise to function and/or esthetics[5,21] as well as the late presentation of most patients.[20] Chemotherapy is also getting more popular in the management of head and neck cancer, especially in the treatment of head and neck lymphoma.[22] Newer treatment modalities include gene therapy, immunotherapy and photodynamic therapy[18]

The prognosis of head and neck cancer depends on a multitude of factors, which include histological type, degree of histological differentiation of the tumor cells, clinical stage at presentation, age of patient, primary site of tumor, comorbid conditions in the patient, and neural and vascular invasion.[20,23]

In Nigeria, the true incidence of head and neck cancers is not known. However, previous hospital-based studies in Jos, Lagos, and Abuja have reported a yearly occurrence of about 20–38 cases.[24] The purpose of this study is to provide a comprehensive analysis of the pattern of occurrence of head and neck cancer in a tertiary care facility in the southwestern part of Nigeria.

MATERIALS AND METHODS

This is a retrospective study that presents an analysis of cases of head and neck cancer diagnosed at the departments of oral pathology and pathology of University College Hospital, Ibadan, Nigeria, between January 1991 and December 2005. These two departments receive patients from both primary and secondary healthcare centers within and outside Oyo state and other tertiary institutions due to availability of facilities for cancer management, provided by the radiotherapy and nuclear medicine departments of University College Hospital. For the purpose of this study, head and neck cancers included primary malignant neoplasms of the oral cavity, ear, scalp, nasal cavities, paranasal sinuses, nasopharynx, hypopharnyx, oropharynx and salivary glands as earlier defined.[1] However, we excluded neoplasms of the eye, intracranial region, thyroid, parathyroid gland, trachea and the esophagus. Patients aged <15 years were categorized as children, while those aged ≥15 years were categorized as adults.[25]

Ethical clearance for the study was obtained from the joint University of Ibadan and University College Hospital ethical review committee before the commencement of data collection. Demographic and clinical data were extracted from the patients' clinical records. Patients with incomplete demographic data or whose histological diagnosis could not be verified were excluded from the study.

The statistical significance of differences for categorical data was evaluated using the Chi-squared test. A p value of ≤5% was considered to be statistically significant. The Student's t test was used to compare the mean ages of different groups of patients. All analyses were conducted with SPSS® Version 11.0.

RESULTS

In the period under study, 1,750 head and neck tumors were histologically confirmed in the departments of oral pathology and pathology, out of which 972 (55.5%) were malignant lesions and 778 (44.5%) were benign (Table 1). This gives a hospital-based frequency of about 65 cases of malignant head and neck neoplasms per year and a ratio of malignant:benign neoplasms of 1.2:1. Of the malignant cases, 628 were males and 344 were females, with a male:female ratio of 1.8:1.

Head and neck cancer occurred least frequently in the first decade of life and displayed a steady increase in incidence until it peaked in the sixth decade, after which the incidence declined. The mean age of these patients was 43.8 ± 19.6 years. There was no statistically significant difference between the mean ages of males and females ($t=1.29$, $df=970$, $p=0.198$)

Two-hundred-thirteen cases, constituting 12.2% of all benign and malignant head and neck tumors, were reported in children. Of this, 135 (63.4%) were benign tumors, while 78 (36.6%) were malignant lesions (Table 1). In adults, 1,530 seven head and neck tumors were diagnosed, of which 894 were malignant, and 643 were benign.

Table 2 shows the site distribution of head and neck cancers in males and females indicating the mean age at each site. The most common site was the oral cavity and oropharynx, accounting for 31.1% of cases, followed by the nasopharynx (16.4%) and the nose and paranasal sinuses (15.0%). There was a male preponderance at all locations, which was most pronounced in the hypopharynx and the larynx with a ratio of 4.3:1. The mean ages of patients with calvarial, nasopharyngeal, neck and oral cavity cancers were significantly lower, while the mean age of patients with hypopharyngeal and laryngeal neoplasms were significantly higher than those of patients with cancers in other head and neck region.

Epithelial malignancies constituted 71.7% (697

cases) of head and neck cancer cases. Only 17 (2.4%) of all epithelial malignancies occurred in children, while 97.6% occurred in adults. Figure 1 shows that the peak age incidence for epithelial malignancies was in the sixth decade of life. The mean age for patients with head and neck carcinoma is 48.2 ± 17.4 years. There was no statistically significant difference between the mean ages of males (48.6 ± 16.9 years) and females (47.4 ± 18.5 years) with carcinomas (t=0.824, df=695, p=0.410).

Table 3 shows the histological types of head and neck carcinomas. Squamous cell carcinoma was the single most common variant, accounting for 465 (66.7%) of all carcinomas. It was followed by anaplastic carcinoma (9.3%) and adenoid cystic carcinoma (8.0%).

The commonest location for malignant epithelial neoplasms was in the oral cavity and oropharynx (29.6%), followed by the hypopharynx and larynx (19.7%) and the nasopharynx (18.7%). There was a male predominance at all sites except for the facial region, which was accounted for by a predominance of basal cell carcinomas in females (Table 3).

Malignant lesions of hematopoietic origin consti-

Table 1. Age and gender distribution of patients with benign and malignant head and neck tumors

	Benign		Malignant		Total
	Male	Female	Male	Female	
Children	81	54	50	28	213
Adults	350	293	578	316	1,537
Total	431	347	628	344	1,750

Table 2. Site distribution, gender and mean age of head and neck cancer patients

Site	Mean Age ± Standard Deviation	Male	Female	Total	%
Nose/sinuses	42.6 ± 19.5	103	43	146	15.0
Nasopharynx	40 ± 17.1*	109	50	159	16.4
Hypopharynx/larynx	50.8 ± 15.9**	113	26	139	14.3
Oral/oropharynx	45.7 ± 21.5***	174	128	302	31.1
Salivary gland	44.9 ± 19.1	29	15	44	4.5
Skull/scalp	35.4 ± 16.4+	16	10	26	2.7
Neck	40.1 ± 19.8+	64	48	112	11.5
Ear	32.1 ± 10.1	5	2	7	0.7
Face	40.1 ± 20.2	15	22	37	3.8
Total	43.8 ± 19.6	628	344	972	100

Key

* p=0.009; ** p=0.000; *** p=0.04; + p=0.03

Table 3 Histological types of epithelial neoplasms

Histological types	Male	Female	Total	Percent
Mucosal and Skin Neoplasms				
Squamous cell carcinoma	321	144	465	66.7
Anaplastic carcinoma	45	20	65	9.3
Basal cell carcinoma	6	13	19	2.7
Papillary adenocarcinoma	3	3	6	0.9
Lymphoepithelioma	5	–	5	0.7
Clear cell carcinoma	2	1	3	0.4
Spindle cell carcinoma	–	1	1	0.1
Salivary Gland Neoplasms				
Adenoid cystic carcinoma	33	23	56	8.0
Mucoepidermoid carcinoma	24	15	39	5.6
Adenocarcinoma	18	13	31	4.4
Malignant mixed tumor	1	–	1	0.1
Polymorphous low grade adenocarcinoma	1	–	1	0.1
Sebaceous carcinoma	1	–	1	0.1
Odontogenic Neoplasms				
Ameloblastic carcinoma	4		4	0.6
Total	464	233	697	100.0

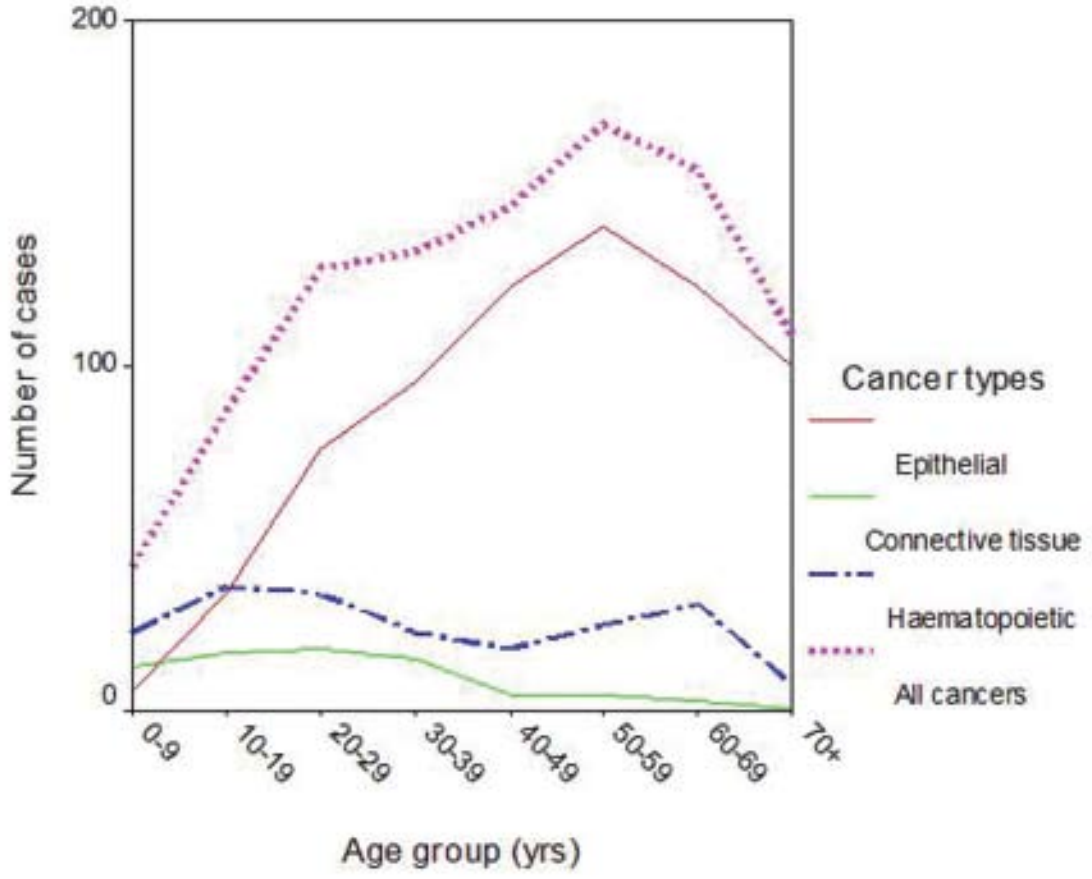
tuted 198 (20.4%) of all cases of head and neck cancer in the 15-year period. Hematopoietic malignancies displayed a bimodal age distribution with peaks in the second and seventh decades of life (Figure 1). The mean age of patients with hematopoietic malignancies was 34.9 ± 21.0 years. There is no statistically significant difference between the mean ages of males and females (t=-0.760, df=196, p=0.448). Forty-six (23.2%) of these cases were diagnosed in children, and 152 (76.8%) cases in adults. The mean age of children diagnosed of hematopoietic malignancies is 9.4 ± 3.6 years, while adults have a mean age of 42.6 ± 17.7 years.

Figure 2 shows the specific hematopoietic neoplasms with their gender distribution. The majority of malignant hematopoietic lesions were non-Hodgkin's lymphomas (including Burkitt's lymphoma), which all together accounted for 160 (80.8%) cases. There was a male predominance for most hematopoietic neoplasms except for multiple myeloma, which showed a slight female predominance. The mean age of patients with Burkitt's lymphoma (11.5 ± 4.6 years) was significantly less than that of other hematopoietic neoplasms (t=-15.6, df=196, p=0.000). Forty-six (23.2%) hematopoietic lesions were diagnosed in children, out of whom 22 were Burkitt's lymphomas, 14 were other non-Hodgkin's lymphomas and nine were Hodgkin's lymphomas. The remaining 152 (76.8%) hematopoietic neoplasms occurred in adults, of which the majority (117 cases or 77.0%) were non-Hodgkin's lymphomas.

The majority (39.2%) of non-Hodgkin's lymphomas (excluding Burkitt's lymphoma) involved the cervical, submandibular and submental nodes in descending order of frequency. Other sites of predilection included the sinonasal region (16.9%) and nasopharynx (12.3%). Twenty-seven (90%) of Burkitt's lymphoma affected the jaw with approximately equal involvement of mandible and maxilla. All of the cases of Hodgkin's lymphoma were restricted to the cervical lymph nodes.

Tumors of connective tissue origin constituted 77 (7.9%) of all head and neck malignancies (Table 4). The most common connective tissue neoplasm was rhabdomyosarcoma, which accounted for 34 (44.2%) of all head and neck sarcomas. Other connective tissue and bone malignancies included osteogenic sarcoma (27.3%), malignant peripheral nerve sheath tumor (6.5%) and chondrosarcoma (3.9%). There was a male

Figure 1. Age distribution of patients with various head and neck cancers



predominance for rhabdomyosarcoma, chondrosarcoma and malignant fibrous histiocytoma, whereas malignant peripheral nerve sheath tumor showed a female predominance (Table 4).

The peak occurrence of sarcomas was in the first three decades of life, with only a single case presenting in the seventh decade of life (Figure 1). The mean age of the patients was 26.5 ±16.8. There is no statistically significant difference between the mean ages of males and females (t=0.797, df=75, p=0.428).

Fifteen sarcomas (19.5%) were diagnosed in children and 62 (80.5%) in adults (Table 4). Whereas sarcomas demonstrated an almost equal gender distribution in children there was a predominance of male involvement in adults (χ^2 (2)=79.6, p=0.000).

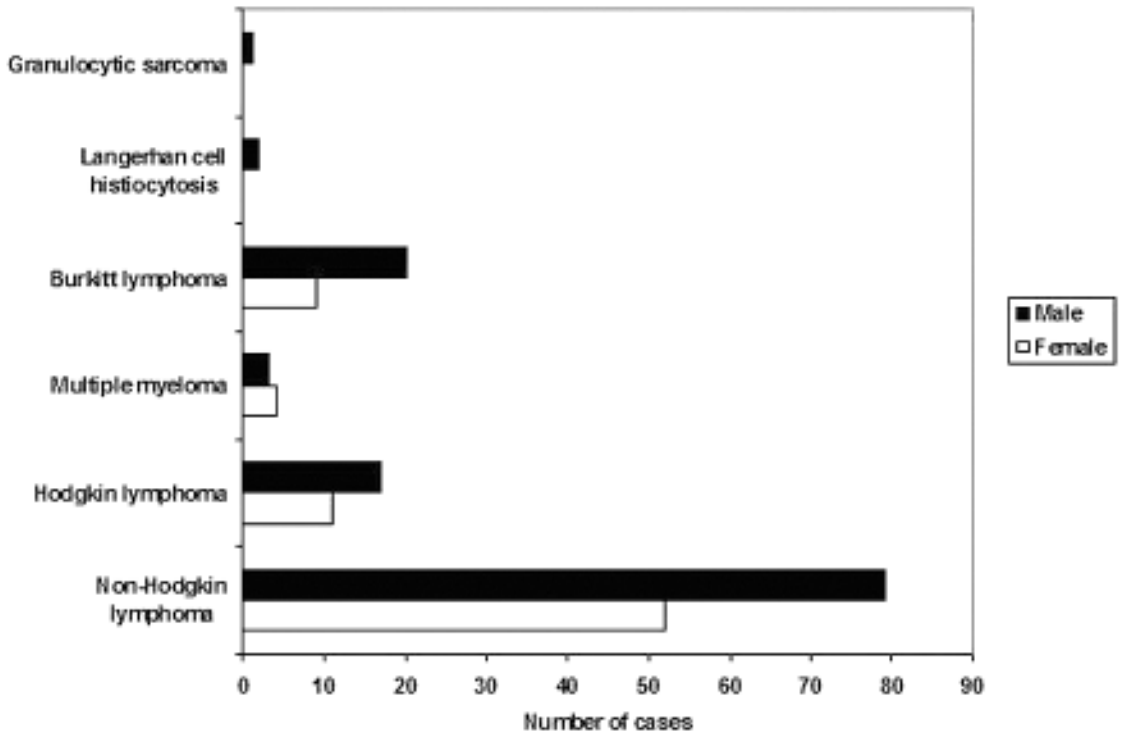
DISCUSSION

In the present study, the hospital-based frequency of head and neck cancers in Ibadan, Nigeria, was 65 cases per year. This is much higher than the frequencies reported from other tertiary hospitals in the country.[24] This could be due to the selective harvesting of patients at the University College Hospital, which is one of the few centers in Nigeria with adequate facilities for the multidisciplinary care of head and neck cancer patient.[26]

Interestingly, malignant neoplasms were more common than benign neoplasms. This is most probably due to underreporting of benign neoplasms in this environment for a number of reasons. The rapid growth and early symptoms of malignant lesions draw early attention to their presence, in contrast to many benign neoplasms. Secondly, many patients in this environment with obvious head and neck swellings do not seek treatment in conventional healthcare centers. In addition, we believe that malignant cases are more likely to be referred to our center than benign ones since they are more likely to require multidisciplinary management.

This study shows that head and neck cancers are more common in adults compared with children. This is in agreement with studies of Otoh et al.,[6] where head and neck malignancies were diagnosed in 89.3% of adults as against 10.7% in children, and Amusa et al.,[27] where only 32.9% of head and neck cancers were diagnosed in patients aged ≤20 years. In this present study, patients age <20 constitute 13.3% of the head and neck cancer population, while those age >20 were 86.7%. Head and neck malignant lesions were more common in adults, especially those age >40 years. This is because cancers arise following progressive accumulation of genetic changes over a long period of exposure to carcinogens. In this study, 73.6% of total head and neck cancers occurred in patients >40 years of age. This will be better appreciated if cognizance is taken of the fact that 44% of the Nigerian population is <15 years of age.[28]

Figure 2. Gender distribution of patients with hematopoietic malignancies



The present study also shows that all forms of head and neck cancer are less commonly seen in patients age <20 with the exception of Burkitt's lymphoma, which occurred almost exclusively in patients <20 years old. Burkitt's lymphoma forms about 28.2% of all childhood head and neck malignancies in this study. This is lower than the finding by Amusa et al.,[29] where it accounted for 39% of childhood malignancies. Lymphoma is the second most common neoplasm of the head and neck region and should be considered in the differential diagnosis of any lesion in this region, especially if the typical factors for squamous cell carcinoma are not present.[30] Burkitt's lymphoma occurs in endemic, sporadic and HIV-associated forms. Endemic Burkitt's lymphoma, as originally described by Dennis Burkitt,[31] typically presents with age-related jaw and visceral tumors of children, with a peak age incidence of seven years.

Head and neck cancers were found to constitute 55.5% of all head and neck tumors, of which 71.7% are epithelial in origin. There is a greater risk of developing head and neck cancer with an increase in age. It is thus of advantage if routine check-ups could be instituted such that patients age >40 years (who constitute about 60% of cases) will benefit from this avenue for early detection of the disease, as early diagnosis significantly lowers the fatality rate of head and neck carcinoma.[32]

The two most common head and neck cancers in this study were squamous cell carcinoma, which accounted for 47.8% of all cases, followed by lymphomas which accounted for 19.3% [of which non-Hodgkin's lymphomas constitute the majority (66.2%)]. By contrast, in a 10-year review carried out at the Obafemi Awolowo University Teaching Hospital Complex, Ile-Ife, Nigeria, Amusa et al.[27] found that lymphoma was the most frequently diagnosed head and neck cancer, accounting for 40.3% of head and neck cancers, whereas squamous cell carcinoma only accounted for 25% of their cases. What was responsible for this discrepancy is not clear because both centers (Ile-Ife and Ibadan) are located in southwestern Nigeria. In the study by Bhatia,[26] lymphomas were also the most frequently diagnosed head and neck cancer, constituting 27.4% of all malignancies, while squamous cell carcinoma only accounted for 20.5% of cases.

In this present study, 68.2% of oral malignancies were epithelial, of which squamous cell carcinomas accounted for 67.0%, adenoid cystic carcinoma 14.1%, mucoepidermoid carcinoma 5.8% and adenocarcinoma 4.4% of cases. In a study by Otoh et al.[6] from Maiduguri, Nigeria, carcinomas constituted 91.7% of oral cancers, while sarcomas accounted for the rest. However, these authors did not include salivary gland lesions and oropharyngeal lesions as oral malignancies in contrast to this present study. This, expectedly, would give varying figures for the proportion of cancers of specific sites, in relation to the total head and neck cancers.[6] In two independent studies from the United States[33] and Finland,[34] the majority (83%) of oral cavity and pharyngeal cancers were squamous cell carcinomas. These figures are higher than the figure of 67% from this present study. Our relatively lower figure could be due to the lower life expectancy in Nigeria compared with western countries[28] as susceptibility to cancer increases with increase in age.

In the present study, 73.5% of oral cavity and pharyngeal cancers occurred in persons ≥40 years of age. Gervasio et al.,[35] in a study among oral cancer patients in Brazil, found a peak age of occurrence to be the seventh decade of life, which is a decade higher than the peak found in this study. This could be due to the fact that their study did not include sarcomas and lymphoid neoplasms, which were included in our study.

Carcinomas constituted 98.6% of malignancies reported in the larynx and hypopharynx in this study, while a case each of hematopoietic and connective tissue malignancies were found. Otoh et al.,[6] from Maiduguri, Nigeria, found exclusively squamous cell carcinomas at these sites.

Carcinomas accounted for 74.0% of malignancies found at the sinonasal area in our study, while in the

Table 4. Sex distribution of patients with connective tissue and bone neoplasms

Histological Types	Male	Female	Total	%
Rhabdomyosarcoma	20	14	34	44.2
Osteogenic sarcoma	10	11	21	27.3
Malignant peripheral nerve sheath tumor	1	4	5	6.5
Chondrosarcoma	2	1	3	3.9
Pleomorphic sarcoma	1	–	1	1.3
Dermatofibrosarcoma protuberans	2	–	2	2.6
Malignant fibrous histiocytoma	2	1	3	3.9
Spindle cell sarcoma	1	–	1	1.3
Fibrosarcoma	1	1	2	2.6
Kaposi sarcoma	–	1	1	1.3
Leiomyosarcoma	–	1	1	1.3
Hemangiopericytoma	–	1	1	1.3
Unspecified	2	–	2	2.6
Total	42	35	77	100

study by Otoh et al.,[6] they constituted 86.0%. In a review of sino-nasal tumors, Panchal et al.[36] found that 59.2% were epithelial. In their study, squamous cell carcinoma accounted for 50.9% and salivary gland malignancies accounted for 30.6% of cases, while hematopoietic and connective tissue malignancies comprised 16.4% and 9.6% of cases, respectively. These findings are comparable to our observations in the present study.

In this study, head and neck malignancies were more common in males compared with females overall. This includes even head and neck cancers, such as lymphomas and sarcomas, which are not known to have association to smoking habits and the use of alcoholic beverages that are established risk factors of head and neck carcinomas. This finding is corroborated by findings in developed countries as well as in other developing countries.[12,17,26,35]

The male:female ratio in this study was 1.8:1, which is very similar to the 2:1 ratio obtained by Onyango et al.[37] among head and neck cancer patients in Kenya and differs from the slight female preponderance (1:1.02) observed by Ologe et al.[12] Among our patients, laryngeal cancer had the highest male:female ratio, which is also supported by the study of Maier et al.,[38] where oral and laryngeal cancers have the highest tobacco-associated risk values. In the Nigerian population, smoking and the use of tobacco products is more prevalent among males as compared with females. Nwawolo et al.[39] from Lagos, Nigeria, found a male:female ratio of 10.5:1 for laryngeal cancers. Haque et al.[40] found that cancers of the tongue and the larynx are more common in male patients age >50 years. This could be attributed to the fact that some of the habits that have been associated with the occurrence of head and neck cancer, such as smoking and use of alcoholic beverages, are strongly associated with male gender.[41]

Malignant salivary gland neoplasms accounted for 4.5% of all head and neck cancer in this study. This falls within the 3–5% range given by Speight and Barret.[42] A study by Ologe et al.[12] in another tertiary care center in Nigeria found that salivary gland neoplasms constituted only 1.1% of the head and neck cancers studied. This disparity may be due to the small sample size used by these authors and the difference in the definition of head and neck cancer in the two studies. Malignant salivary gland tumors in our study demonstrated a peak age of occurrence in the sixth decade, which agrees with the findings of an earlier study from this center (Kolude et al.)[43] and peak in the sixth or seventh decade of life among Caucasians.[44,45]

Carcinomas of the external auditory canal and the middle ear are rare and considered to have a poor prognosis.[46] In this study, they accounted for only 0.7% of total head and neck cancers. In a study of head and neck cancers by Bhatia in 1990[26] at a tertiary hospital in Nigeria, no case of cancer was diagnosed in this region in the three years study period.

Sarcomas are relatively uncommon tumors, accounting for 1% of all malignancies, and approximately 15–20% of sarcomas occur within the head and neck. Approximately 80% of all head and neck sarcomas originate from soft tissues, while 20% arise from bone.[14] In the present study, about 31% of sarcomas arose from bone and 69% from soft tissues of the head and neck. The paranasal sinuses and neck are the most frequent sites of origin of soft-tissue sarcomas. Unlike the development of squamous cell carcinoma, the development of sarcoma is unrelated to smoking and alcohol use. Approximately 80% of head and neck sarcomas occur in adults, and 10–20% occurs in children, which is in consonance with our findings in the present study.[14]

Presently, a diversity of cancers of anatomical sites is included under the broad group "head and neck cancer" by various authors. For example, Onyango et al.[37] included eye and thyroid cancers. Davies and Welch[47] included cervical esophageal cancers and thyroid cancers but eye malignancies were excluded, while Nwawolo et al.[39] included neither cervical esophageal, thyroid nor eye malignancies in this group of lesions. This wide variation has posed a great problem in the comparison of studies on head and neck cancer from various authors. It is therefore advocated that international bodies such as the World Health Organization and all professional associations involved in the management of patients with head and neck cancer should mandate researchers to adhere to a unified classification of head and neck tumors.[24]

Finally, it would be of great benefit if a population-based study were undertaken to determine the national incidence of head and neck cancer in Nigeria. Most of the data available in the literature are based on hospital studies that are difficult to relate to the general population. Prospective studies are also needed to identify possible risk factors for the development of cancer of the head and neck region in our population. This is very important as some studies, such as that by Lawoyin et al.,[48] showed no association between oral cancer and the well-established risk factors of head and neck cancer.

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