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Primary Head and Neck Cancers in North -Western Nigeria

Chef primaire et du cou dans le nord-ouest du Nigeria

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ABSTRACT

BACKGROUND: **Reported epidemiological studies on oro-facial cancers in Nigeria over the last four decades showed non-standardized inclusion criteria and an overlap of study periods, resulting in conflicting findings.**

OBJECTIVE: **To document the pattern of reportable primary head and neck cancers in North-Western Nigeria and analyse**

Methods: A review of both clinical and histopathology records of head and neck cancers diagnosed by histopathology at the ABUTH, Zaria, was undertaken. Socio-demographic information and history of cancer management, which followed the pattern of the Minimum Cancer Dataset developed by the British Association of Head and Neck Oncologists, were retrieved from pathology and medical records of patients diagnosed of cancers of the head and neck at the hospital from January 1972 to December 2002.

RESULTS: **A total of 2611 cases were diagnosed, 730 (28%) occurred in children, 1775 (68%) in adults, with 64% occurring at or below 40 years of age. The eye, 564(21.6%) and the mouth, 251(9.6%) were the most commonly affected sites. Carcinomas (55%), lymphomas (23%) and retino-blastomas (10%) were the most common cancers. Cancers of viral origin constituted 18% of head and neck cancers and AIDS-defining cancers were 6%. A significant increase was noted in the occurrence of conjunctival squamous cell carinoma (SCC) and Non-Hodgkin's Lymphoma NHL when comparing the periods pre- and post- advent of HIV/ AIDS in Nigeria in 1986 ($p<0.05$). Comparing the two periods, there was a reduction in the ages of occurrence of conjunctival SCC ($p=0.024$); Non-Hodgkin's Lymphoma (NHL), Kaposis sarcoma (KS) and nasopharyngeal carcinoma ($p>0.05$), a rise in the occurrence of nasopharyngeal carcinoma ($p=0.62$) and a significant drop in the occurrence of Burkitt lymphoma ($p=0.002$).**

CONCLUSION: **Reduced age at presentation and the rising prevalence of several virus-associated cancers suggests the role of immuno-suppression in the pathogenesis of these cancers. Further studies into nutritional and viral epidemiology in the population are desirable as the implication for prevention and public health policies are profound. WAJM 2009; 28(4): 227–233.**

Keywords: Head, Neck; Cancers; Zaria; Nigeria.

RÉSUMÉ

CONTEXTE: *état d'études épidémiologiques sur les cancers oro-faciale au Nigéria au cours des quatre dernières décennies ont montré la non-inclusion des critères normalisés et un chevauchement des périodes d'études, résultant en des conclusions contradictoires.*

OBJECTIF: *Documenter le motif principal de la tête et du cou à déclarer les cancers dans le nord-ouest du Nigeria et d'analyser*

MÉTHODES: *Un examen du cancer des dossiers cliniques et histopathologiques de la tête et du cou diagnostic histopathologique à l'ABUTH, Zaria, a été entrepris. Des informations socio-démographiques et l'histoire de la gestion du cancer, qui a suivi le modèle du jeu de données minimum cancer développé par la British Association of Head and Neck oncologues, ont été extraites de la pathologie et les dossiers médicaux des patients atteints de cancers de la tête et du cou à l'hôpital à partir de Janvier 1972 à Décembre 2002.*

RÉSULTATS: *Un total de 2611 cas ont été diagnostiqués, 730 (28%) étaient des enfants, 1775 (68%) chez les adultes, avec 64% surviennent au niveau ou en dessous de 40 ans. L'oeil, 564 (21,6%) et l'embouchure, 251 (9,6%) étaient les sites les plus touchés. Carcinomes (55%), les lymphomes (23%) et rétino-blastomas (10%) sont les cancers les plus communs. Les cancers d'origine virale, représentaient 18% des cancers ORL et les cancers définissant le sida ont été de 6%. Une augmentation sensible a été notée dans la survenue de cellcarinoma squsmous conjonctivale (CSC) et de la non-Hodgkin's lymphoma LNH quand on compare les périodes pré-et post-émergence du VIH / sida au Nigéria en 1986 ($p <0,05$). En comparant les deux périodes, il ya eu une réduction de l'âge d'apparition de la conjonctive CCN ($p = 0,024$); lymphome non hodgkinien (LNH), le sarcome de Kaposi (KS) et de cancer du nasopharynx ($p> 0,05$), soit une augmentation de la fréquence du carcinome du nasopharynx ($p = 0,62$) et une baisse sensible de la fréquence des lymphomes de Burkitt ($p = 0,002$).*

CONCLUSION: *Diminution de l'âge à la présentation et la prévalence croissante du virus de plusieurs cancers associés suggère le rôle de l'immuno-suppression dans la pathogénie de ces cancers. D'autres études sur l'épidémiologie nutritionnelle et virales dans la population est souhaitable que l'implication de prévention et de politiques de santé publique sont profondes. WAJM 2009; 28(4): 227–233.*

Mots-clés: *Tête, cou, cancers, Zaria, Nigeria.*

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Abbreviations: ABUTH, Ahmed Bello University Teaching Hospital; **BAHNO,** British Association of Head and Neck Oncology; **EBV,** Epstein Barr Virus; **ENT,** Ear, Neck and Throat; **HUV-8,** Human Herpes Virus-8; **ICD-O,** International Classification of Disease – Oncology; **NHL,** Non Hodgkin Lymphoma; **NPCS,** Nasopharyngeal Cancers; **NPH,** Nasopharynx; **RCORTI,** Regional Centre for Oral Health Research and Training Initiatives; **SCC,** Squsmous cell carcinoma.

INTRODUCTION

The association that cancers of the head and neck have with certain carcinogens have been reported in the scientific literature. The reports suggest that these cancers are preventable and controllable following early diagnosis.[1-6] Since its discovery in Nigeria in the mid-80s, the rising profile of AIDS and its attendant role in immuno-suppression have been associated with certain cancers, like Kaposi sarcoma (KS), high grade non-Hodgkin's lymphomas (NHL), and more recently among Africans, conjunctival squamous cell carcinoma (SCC).[7]

Global epidemiology shows that head and neck cancers constitute between 5–50% of all cancers.[8] In Nigeria, there is no accurate incidence report for head and neck cancers, but studies from several centres have reported a yearly incidence of about 20–38 cases.[9–12] Bhatia reported an annual incidence of 24 cancers in the head and neck region at Jos, while Amusa *et al*[9] reported an annual incidence of about 33 cases at Ile-Ife. The non-standardisation of criteria for the classification of the sites in these studies, e.g. the exclusion of malignant tumours of sites like the scalp, meninges, brain, eyes and thyroid gland; and the inclusion of benign jaw tumours may also be a factor in this relatively low occurrence of head and neck cancers recorded for these areas.[9,10] These studies also showed variations in the prevalent sites of head and neck cancers (neck, nasopharynx and oral cavity respectively), which suggest the possibility of geographical variations in the aetiological factors. The extent of reporting of these cancers could also be related to the availability of specialists in the different sections of the head and neck region, with low reporting in head and neck sites in which there was no corresponding surgical specialty in the hospital from where reports emanated. Reports of head and neck cancers in Nigeria and other African countries have shown a relatively higher occurrence of these cancers among patients aged 40 years and below than in studies from developed countries.[10–13]

This study was aimed at documenting the epidemiological pattern of head and neck cancers in the entire North-West Nigeria which is served by the histopathology department of the Ahmadu Bello University Teaching Hospital, Zaria.

SUBJECTS, MATERIALS, AND METHODS

The Histopathology Department of the Ahmadu Bello University Teaching Hospital (ABUTH) at Zaria receives biopsies from tertiary hospitals, government specialist and general hospitals, mission and private hospitals in Kaduna, Kano, Jigawa, Sokoto, Zamfara, Kebbi, Katsina states in North West Nigeria and the westerly-located Niger state in the North central zone, thereby serving a population of about 25 million people, according to the 1991 Census in Nigeria. The ethical clearance required to access data for the study was obtained from the hospital.

Socio-demographic information and history of cancer management, which followed the pattern of the Minimum Cancer Dataset[14] developed by the British Association of Head and Neck Oncologists (BAHNO), were retrieved from pathology and medical records of patients diagnosed of cancers of the head and neck at the hospital from January 1972 to December 2002.

For the purpose of this study, head and neck cancers were defined as primary malignant neoplasia of epithelial, connective or neural tissue origin or any lesion of unspecified cellular origin but showing histological features of a malignancy (M-8000/3) involving sites in the head and neck, as classified by the 3rd Edition of the International Classification of Diseases – Oncology (ICD-O).[15] This excludes metastases from known primary distant sites, benign neoplasia and reportable benign lesions of the head and neck.

A considerable number of reportable cancers diagnosed from biopsies requests sent from the ophthalmology, ENT and oral/maxillofacial out-patient clinics (as indicated in the biopsy forms) were recorded as "unspecified head and neck sites". These biopsy request forms were inadequately filled, with the terms "soft tissue" and "hard tissue" written in the field for site(s) of lesion, and with the histopathology reports and cancer registry records reflecting the same. The case notes for the affected patients were not retrievable to enable the confirmation of the actual sites of the biopsy and were thus excluded from analysis.

Subjects of ages "0–14 years" and "$>15^{+}$ years" were defined as "children" and "adults", respectively, in conformity to standards reported by the International Agency for Research on Cancer (IARC).[16] Patients aged <40 years included "children" and adults of "15–40 year old". The adults aged >40 years were exclusively adult patients. The clinical staging of cancers used in the study conformed to that developed by the American Joint Committee on Cancer (AJCC)/UICC and is based on the TNM System.[17]

The data were analyzed statistically using SPSS 11^{+} and Epi Info Version 6.0 softwares. Relationships between nominal data were determined using the Yates Corrected and Fischer's Exact Chi-square tests. The student t-test was applied to compare the mean ages of occurrence of different cancers and cancers in different time periods, i.e. the period preceding the advent of AIDS in Nigeria (1972–1985) and the period afterwards (1986–2002). A p-value of 0.05 or less was considered significant.

RESULTS

A total of 2611 primary head and neck cancers were reportable, giving an estimated yearly incidence of 84 cases (Table 1).Seven hundred and thirty cases (27.9%) were reported in children while 1775 (68%) cases were reported in adults. A total of 106 (4.1%) cases were of unspecified ages (Table 1). Carcinomas, lymphomas and retinoblastoma (55%, 23.1% and 10.2% respectively) were the most common cancers reported in the head and neck. Sarcomas, and Kaposi sarcoma constituted 217(8.3%) and 14(0.56%) of head and neck cancers respectively (Table 2). Burkitt's lymphoma constituted 11.8% of all head and neck cancers (Table 3).

Site Distribution and Age of Occurrence of Cancers (Tables 1and 3)
The most common sites of primary cancers among children and adults in this series were the eyes (21.6%), "unspeci-

Table 1: Subjects with Primary Head and Neck Cancers by Age Groups and ICD-O Sites

Sites	ICD- 10 No.	Age Groups (Years)				Number (%) of Cancers
		0 – 14	15 – 40	41 – 75+	Unspecified	
Eye	C69	333	157	69	5	564 (21.6)
Unspecified Sites		98	128	189	5	420 (16.1)
(Jaw) Bones	C41.0-C41.1	123	88	54	8	273 (10.5)
Oral cavity	C00-C06	39	71	134	7	251 (9.6)
Lymph Nodes	C77.0	53	99	61	12	225 (8.6)
Thyroid	C73	8	81	58	25	172 (6.6)
Unknown Primaries	C80.9	5	86	61	13	165 (6.3)
Salivary Glands	C07, C08	25	59	44	8	136 (5.2)
Scalp	C44	15	32	37	6	90 (3.4)
Paranasal Sinuses	C31	3	23	31	2	59 (2.3)
Nose & Nasal cavity	C30.0	2	27	23	5	57 (2.2)
Unspecified Neck	C76.0	15	22	8	3	48 (1.8)
Nasopharynx	C11	3	20	17	1	41 (1.6)
Skin	C44.1– C44.4	1	9	22	2	34 (1.3)
Larynx	C32	–	12	12	1	25 (0.96)
Tonsils	C09	1	7	4	2	14 (0.5)
Other H&N Sites	C76.0	1	6	3	–	10 (0.4)
Pharynx	C14	1	3	5	–	9 (0.3)
Eyelids	C49.9	1	2	4	1	8 (0.3)
Ear	C49.9	3	1	–	–	4 (0.2)
Oropharynx	C10	–	2	2	–	4 (0.2)
Hypopharynx	C13	–	2	–	–	2 (0.1)
Total		**730(27.9)**	**937(35.9)**	**838(32.1)**	**106(4.1)**	**2611(0.0)**

Table 2: Distribution of Subjects by Sex, Site and Type of Cancer

Site	Cancer Type				Sex		
	Carcinoma	Sarcoma	Lymphoma	Others	Male	Female	Unspecified
Eye	208	24	57	275*	342	221	1
Unspecified Sites	246	40	117	17	281	139	-
(Jaw) Bones	64	73	124	12	169	104	-
Oral Cavity	193	10	42	6	178	71	2
Lymph Nodes	2	18	198	7	171	54	-
Thyroid	168	1	3	-	47	125	-
Unknown Primaries	153	4	-	8	107	58	-
Salivary Glands	109	4	18	5	80	55	1
Scalp	58	13	12	7	54	35	1
Nose & Nasal cavity	45	3	2	7	40	17	-
Unspecified Neck	16	10	16	6	30	18	-
Paranasal Sinuses	55	1	1	2	33	26	-
Nasopharynx	40	1	-	-	31	10	-
Eyelids	0	5	2	1	6	2	-
Larynx	23	2	-	-	20	5	-
Tonsils	7	-	4	3	11	3	-
Pharynx	6	1	1	1	8	1	-
Ear	-	4	-	-	4	-	-
Other H&N Sites	6	2	1	1	6	4	-
Oropharynx	3	1	-	-	3	1	-
Hypopharynx	2	-	-	-	-	2	-
Skin	34	-	-	-	15	19	-
Total (%)	**1438 (55.1%)**	**217 (8.3%)**	**598 (22.9%)**	**358 (13.7%)**	**1636(62.6)**	**970(37.2)**	**5(0.2)**

** 267 cases of retinoblastoma were reported*

Table 3.: Mean ages at Presentation of Cancers

Site	Mean Age (Years)		
	Males	Females	Overall
Eye	18.1 ± 19.4	16.8 ± 18.0	18.3 ± 19.6
SCC Conjuctiva	33.4 ± 12.8	37.2 ± 13.9	35.1 ± 13.4
Unspecified Sites	35.7 ± 20.1	36.7 ± 20.1	40.1 ± 19.2
(Jaw) Bones	23.1 ± 19.5	24.3 ± 18.4	23.5 ± 19.0
Oral Cavity	40.7 ± 20.2	42.5 ± 19.0	41.2 ± 19.9
Lymph Nodes	28.6 ± 17.6	29.0 ± 20.8	28.7 ± 18.4
Thyroid	40.2 ± 15.4	36.2 ± 14.9	37.3 ± 15.1
Unknown Primaries	±	±	±
Salivary Glands	33.6 ± 17.0	31.1 ± 17.6	32.6 ± 17.2
Scalp	35.4 ± 21.1	40.2 ± 18.1	37.3 ± 20.0
Nose & Nasal cavity	40.2 ± 16.6	41.9 ± 16.7	40.7 ± 16.5
Unspecified Neck	24.5 ± 16.5	30.6 ± 17.2	26.8 ± 16.8
Paranasal Sinuses	50.3 ± 18.8	42.7 ± 21.7	46.6 ± 20.4
Maxillary Antrum	52.7 ± 18.0	43.2 ± 22.7	48.9 ± 19.9
Nasopharynx	33.3 ± 15.7	49.2 ± 17.1	37.1 ± 17.2
Eyelids	48.5 ± 18.0	42.4 ± 20.3	46.0 ± 15.3
Larynx	41.4 ± 11.1	40.0 ± 13.0	41.2 ± 11.1
Tonsils	36.5 ± 13.5	30.0 ± 5.65	35.4 ± 12.6
Pharynx	44.2 ± 19.6	40.0 ± SD	43.8 ± 18.5
Ear	16.6 ± 19.6	57.5 ± 3.50	30.3 ± 24.3
Other H&N Sites	43.0 ± 7.6	23.8 ± 16.1	34.4 ± 15.1
Oropharynx	43.0 ± 21.4	39.0 ± SD	42.0 ± 17.6
Hypopharynx	-	40.0 ± SD	40.0 ± SD

Of the carcinomas 3, 4 and 53 respectively were TNM stages II, III and IV respectively. All the other cancers (six) were in TNM stage IV.

fied head and neck sites" (16.1%), jaw bones (10.5%) and oral cavity (9.6%). The distribution of the "unspecified head and neck sites" according to the various out-patient clinics from which the biopsy requests came showed that 444 (96.1%), 13 (2.8%) and 5(1.1%) were from the oral/maxillofacial surgery, otorhinolaryngology and ophthalmology clinics, respectively. Lesions of unknown primary sites affecting the head and neck accounted for 6.3% of all head and neck cancers.

Although the ages at presentation of cancers varied with sites, 63.8% of cancers of the head and neck occurred at <40 years of age, with about 36% occurring in adults in the 15–40 years age range (Figure. 3). A comparison of the mean ages at presentation, among adult patients, for carcinomas of the jaws (48.7 ± 12.1 years) and oral cavity (47.8 ± 14.2 years) showed no significant difference (p=0.724).

AIDS-defining Cancers and possible effects on the prevalence of other cancers

A total of 123 AIDS-defining cancers[7] were diagnosed, constituting 4.7% of all head and neck cancers in this series. The distribution of these cancers by site and over two time-periods showed a rise in the occurrence of conjunctival squamous cell carcinoma and non-hodgkin's lymphoma (NHL) in this series (Figure 2). A comparison of the mean ages at presentation of AIDS-defining and EBV-associated cancers in the time periods preceeding 1986 and afterwards showed a significant variation, especially for squamous cell carcinoma (p=0.025) and Burkitt's lymphoma (p=0.008).

Occupation and Diet

A total of 114 retrieved case notes had information on the occupation of the patients; of which 70, 30 and 14 were patients diagnosed of carcinomas, sarcomas and lymphomas respectively. About 39% of the carcinoma patients were farmers while 31.4% were housewives who often double as farmers.

Table 4: Cancer Journey by Site and Histological Type

Site (ICD–O)	*Interval of Symptoms to First Appointment by Histological Types				Interval of Referral to first Appointment	†Duration on Admission	†Duration to Diagnosis
	Carcinoma	*Sarcoma*	*Lymphoma*	*Overall*			
Oral Cavity (C00 – C06)	17.6 ± 24.7	2.0 ± 1.4	–	16.6 ± 24.1	17.7 ± 40.4	21.1 ± 13.8	43.7 ± 82.2
Max. Antrum (C31)	13.4 ± 14.7	–	–	13.0 ± 14.4	2.0 ± 1.4	24.9 ± 21.2	18.3 ± 15.3
Eye & Adnexa (C69)	24.0 ± SD	45.0 ± 55.1	6.3 ± 1.1	19.6 ± 29.2	–	15.7 ± 7.4	192 ± 195.1
Nose/Nasal Cavity (C30)	72.0 ± SD	–	4.5 ± 3.5	27.0 ± 39.0	1.0 ± SD	10.5 ± 0.71	11.0 ± SD
Salivary Glands (C07)	16.5 ± 13.3	–	–	16.5 ± 13.3	–	–	4.5 ± 3.5
Jaws (C41)	54.0 ± 57.0	12.2 ± 22.8	4.4 ± 2.1	15.7 ± 30.8	5.3 ± 5.2	25.9 ± 22.9	23.2 ± 30.8
Face	36.0 ± SD	3.3 ± 1.7	5.0 ± SD	9.0 ± 12.1	–	22.3 ± 6.0	19.7 ± 5.1
Oro-facial Skin	43.9 ± 39.0	–	–	43.9 ± 39.0	–	17.8 ± 6.3	11.0 ± SD
Nasopharynx	4.7 ± 1.2	–	–	4.7 ± 1.2	–	9.0 ± 1.4	7.3 ± 6.1
Cervical Lymph Nodes	12 ± SD	–	8.5 ± 4.9	9.7 ± 4.0	–	20.5 ± 7.8	13.0 ± 2.8

**Duration in months; †Duration in days*

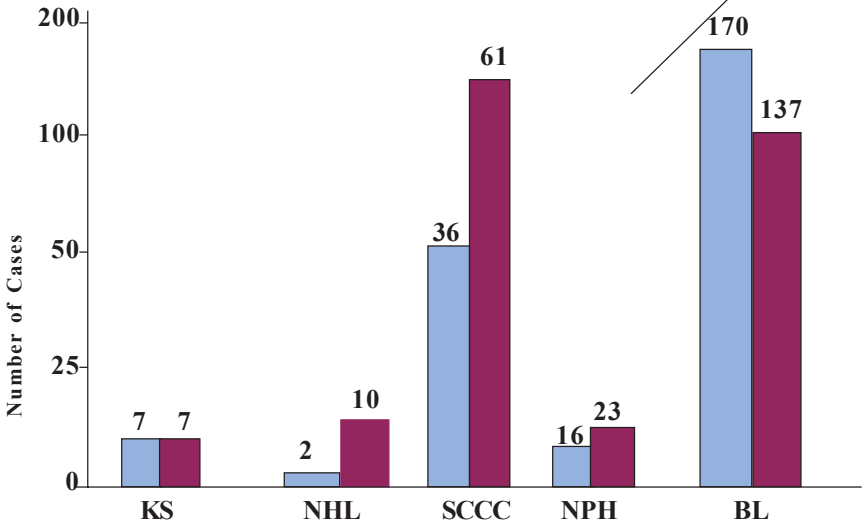

Figure 1: Distribution of AIDS-defining ( ) and EBV-associated ( ) Head and Neck Cancers in the Time Periods.

The dietary practices associated with these cancer patients are often related to their ethnic origin. Of a total of 327 patients diagnosed of carcinoma, 250 of primary north-west origin had information on their ethnic origin, 219 (87.6%) were Hausas, 10 (4%) Fulanis, 2 (0.8%) Jemmaas and 3 (1.2%) Jabbas. The Nizons and Katafs constituted 1(0.4%) each.

Tuwo, a cereal-based meal, is the staple food of the Hausas and the Fulanis.

Stages at Presentation

A total of 66 case notes with information on staging at presentation were retrieved from the oral and maxillofacial surgery clinic. The earliest presenting cancers were seen during stage II ($T_2N_0M_0$). All other cases were diagnosed at stage III ($T_3N_0M_0$ and any T, N_1, M_0) and stage IV (any T, N_2, M_0; and any T or N, M_1) of head and neck cancers. Sixty head and neck carcinomas were staged with 95% reporting in the late stages (III/IV), while 26 (89.6%) of the staged oral cancers reported in the late stages (III/IV) of cancers (Table 3).

DISCUSSION

Previously reported variations in the incidence of head and neck cancers in Nigeria had been attributed to different factors.[6] The yearly hospital incidence of 84 cases of head and neck cancers reported in this study is higher than that previously reported for Nigeria.[6,9,12] This could be attributed to the fact that the hospital was the only referral centre for histopathology in Northern Nigeria till the late 80s and early 90s when other teaching hospitals were established in Jos, Maiduguri, Ilorin and Gwagwalada. This finding is further corroborated by the dip in the rising trend of cancers post-1987. The dip in the trend of occurrence of cancers; specifically oral cancers, ophthalmologic cancers and otorhinolaryngological cancers, could be attributed to the inception of other teaching/specialist hospitals with facilities for the management of these cancers in the other zones of Northern Nigeria in the late 1980s and 1990s.[6,12]

The cancer registry in Zaria, along with those in Maiduguri and Jos in Northern Nigeria, recorded up to about 50% of the standard minimum information required for a cancer registry.[6,12,14] This relatively low value does not fully meet epidemiological research requirements and absolute reliance on information from cancer registries alone would reflect a much lower cancer prevalence rates than reported. This informs the need to develop a National Minimum Data Set for Head and Neck Cancers, which would be "the minimum data that all consultant surgeons, oncologists or other specialists managing patients with head and neck cancers should be expected to collect on every patient presenting with head and neck cancer".

The rather high level of cancers from "unspecified head and neck sites" in this study reflects the dearth of a uniform dataset for the request for pathological investigation of biopsies and thus underscores the need for the development of a standard dataset for biopsy requests. The breakdown of the "unspecified" cancer sites showed about 96.1% being from the oral and maxillofacial surgery out-patient clinic, thus raising the possibility of a higher prevalence of oral cancers than indicated in the results.

The high occurrence of head and neck cancers in patients aged 40 years and below and in adults aged 40 years and below agrees with findings in Northern Nigeria and other African countries, but contrasts significantly with reported findings in Western Countries.[6,12,13] In this study, there was a deviation from reported age of occurrence of cancers in the 5th and 6th decades of life, with more reports of cancers among patients in the first four decades of life. A minimum of about 50% of the cancers occurred in patients aged 40 years and below, a figure which falls to about 35% when related to adults aged 40 years and below. This reduction, which was significant in the North Central, North West and South West geopolitical zones, is partly a reflection of the higher occurrence of childhood cancers in these zones.[18]

The reported prevalence of childhood cancers is significantly higher ($p<0.05$) than the 10.4% -19% reported for other zones in Northern Nigeria.[6,9,11,12,18] This could be attributed to the prevalence of ocular and jaw cancers, common sites for childhood cancers, in this study. The prevalence of ocular cancers is significantly higher than reported for other zones in Nigeria ($p<0.05$), while the reported jaw cancers is higher than in Jos ($p<0.05$); Maiduguri and Lagos ($p>0.1$) but less than the 31% reported for Ile-Ife ($p<0.05$).[6, 9, 11, 12] This variation in the prevalence of jaw cancers in Zaria, Jos and Ile-Ife could be due to the low patient turnout for the treatment of this cancer owing to the non-availability of a maxillofacial unit at the teaching hospital in Jos and the varying inclusion criteria between this study and

the study at Ile-Ife.[6,9].This latter observation was confirmed by the 16.1% prevalence of jaw cancers found in an independent study conducted at Ile-Ife using the criteria as in this study.[18]

Burkitt's lymphoma was the most commonly reported childhood cancer in this study. Studies have reported that early age of Epstein Barr Virus (EBV) infection and a lower social economic status are related to an increase in EBV-associated burkitt's lymphoma in developing countries.[19] The observed prevalence of childhood cancer could be attributed to the effects of malnutrition in children in the zone. The predominant diet among the main ethnic Hausa population is "tuwo". This is a meal made of fermented cereal from maize, millet, guinea corn or rice whose processing involves the loss of essential micro-nutrients and anti-oxidant factors, as have been previously reported.[20] Intra-uterine growth retardation and low birth-weight, which results from maternal factors such as low pregnancy body weight, young age, malnutrition, especially micronutrient deficiencies; anaemia, infections (particularly malaria) with a resultant compromise of the "programming" of the endocrine axes during foetal development and consequent cellular immune deficits, has been reported in the study zone.[21]

The finding of prevalent ocular cancers in this study (retinoblastoma, squamous cell carcinoma, and Burkitt's lymphoma) agrees with previously reported findings from Africa and Pakistan.[22–26] The high occurrence of Burkitt's lymphoma, of ocular and other head and neck sites, could be attributed to the common geographical location and distribution of certain infections (especially malaria fever) in both regions, a characteristic that has been identified as most defining of all features of the tumour.[19]

A comparison of the prevalence of cancer in the era preceding the advent of AIDS in Nigeria and afterwards showed a higher occurrence of oral cancers and cancers of unspecified head and neck sites, with a reduction in the occurrence of cancers of the jaws, salivary gland and thyroid gland. The reduction could be attributed to the establishment of a histopathology unit at Jos and a maxillofacial unit at Maiduguri.

A comparison of the prevalence of AIDS-defining cancers in the periods before and after the advent of AIDS in Nigeria showed a significant increase ($p<0.05$) in the occurrence of non-Hodgkin's lymphoma and conjunctival squamous cell carcinoma.

A similar comparison of the prevalence of human herpes virus-8 (HHV-8) virus and EBV -associated cancers in the same time periods showed a rise in the occurrence of nasopharyngeal carcinoma ($p=0.62$), an approximately equal occurrence of Kaposi sarcoma and a significant fall ($p=0.002$) in the occurrence of Burkitt's lymphoma. The increase in the incidence of nasopharyngeal cancer agrees with the reported findings in Ibadan between 1981–2000.[27] Virus-cell interactions are reportedly reciprocal in nasopharyngeal cancers (NPCs).[28] A small fraction of the genes that are encoded by the EBV genome are consistently transcribed in NPC cell, several of which are involved in the maintenance of malignant phenotype in association with cellular gene alterations; with certain cellular factors in lymphoid cells reported to exert active inhibition on the rest of the viral genes. Immuno-deficiency related to HIV could greatly deplete the level of the lymphoid cells and alter EBV-specific immune control by reducing the inhibition of the viral genes, thus favouring EBV reactivation.[28,29]

There was also a reduction in the mean ages of patients with non-hodgkin's lymphoma, Kaposi sarcoma, nasopharyngeal carcinomas and conjunctival squamous cell carcinoma ($p=0.025$) and a significant rise in the mean ages of those with Burkitt's lymphoma in the comparison of the two time periods. The reduction in the ages of occurrence and the rising occurrence of these cancers and the rising occurrence of Burkitt's lymphoma in the older age groups could suggest a possible influence of HIV/AIDS on these cancers. There is a need for further studies to confirm or refute this possibility.

The late stage and the decreasing age of cancer patients, at presentation suggests an unusual hastening of the progression of cancers in the study population by possible factors (immunological, genetic, diet/nutrition, environmental) which need to be researched extensively.

Conclusion

The observed reduction in the age at presentation and the rising prevalence of several virus-associated cancers suggests the role of immuno-suppression possibly from poor intra-uterine development, nutritional deficiencies and the influence of HIV infection in the pathogenesis of these cancers. Whilst further studies, particularly of nutritional and viral epidemiology in the population, are desirable to confirm this, the implications for prevention and public health policy are profound.

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