Nutritional Status And Serum Zinc Level In Pre-Non-Surgically Treated Head And Neck Cancer Patients At The University College Hospital Ibadan, Nigeria

A Daniel, A A Adeosun, T N Elumelu, O G Nwaorgu

Citation

A Daniel, A A Adeosun, T N Elumelu, O G Nwaorgu. *Nutritional Status And Serum Zinc Level In Pre-Non-Surgically Treated Head And Neck Cancer Patients At The University College Hospital Ibadan, Nigeria*. The Internet Journal of Nutrition and Wellness. 2013 Volume 12 Number 1.

Abstract

Background: Deficiency of trace elements has been associated with increased incidence of head and neck cancers. There is a dearth of studies demonstrating this association in the West African sub-region.
Aim: The aim of this study is to assess the nutritional status of head and neck cancer patients and the association of this disease with the serum level of zinc.
Methods: This was a prospective hospital based case-control study at the University College Hospital, Ibadan.
Sixty five patients with Squamous cell carcinoma of the head and neck were enrolled. 65 healthy volunteers who were matched for age, sex and socioeconomic status constituted the controls. The nutritional status of these participants was assessed by anthropometry and biochemical parameters. Serum zinc level was assayed using the Atomic Absorption Spectrophotometer. Data was analysed using the Statistical package for social sciences (SPSS) Version 15 software. Statistical significance was set at $p < 0.05$.
Results: The mean age for the case group was 50.9 years (SD 15.2). Male to female ratio was 1.5:1. Commonest sites of Head and Neck Squamous Cell Carcinoma (HNSCC) were the Nasopharynx and Sinonasal regions.
Fifty five (84.6%) patients presented with advanced disease. There was no significant difference in the nutritional status when compared with the controls. Serum zinc levels were significantly lower in patients with HNSCC ($p=0.00$).
Conclusion: HNSCC is associated with relatively low serum zinc levels. Zinc supplements may be essential in these patients to improve their treatment outcome and survival rates.

INTRODUCTION

Malignancies of the head and neck region are the 6th commonest cancers worldwide.1 There is an increasing incidence of head and neck cancers in developing countries. The recent cancer estimates show that out of 10 million new cancer cases diagnosed annually, 0.675 million patients suffer from head and neck cancer and 60% of all head and neck cancers occur in less developed countries1. These patients have been associated with pre-morbid features which make them a more challenging group compared to those with cancers in other anatomic regions.
They have a tendency to abuse or have abused alcohol, tobacco or both; they may be less meticulous in personal habits; especially oral care, tend towards poor nutrition and have a higher incidence of personality and character disorders. They are also a less successful socio-economic group1.

Clinical trials have demonstrated that the patients' nutritional status at the time of diagnosis is prognostic both for survival and the ability to tolerate treatment2, 3, 4. Further studies have demonstrated that aggressive nutritional intervention can minimise weight loss and decrease related toxicity2.
It has recently been realised that trace elements (e.g. manganese or zinc) may be severely depleted in patients with these tumours. It has also been discovered that the level of these trace elements (zinc in particular) is more indicative of the prognosis than the serum protein and albumin levels4. Cell mediated immune dysfunctions and susceptibility to infections have been observed in zinc deficient human subjects5. Cytokines produced by T-Helper 1 cells are particularly sensitive to zinc status5. Production of interleukin-2 (IL-2) and interferon-gamma are decreased in patients with zinc deficiency.
Zinc deficiency is prevalent worldwide in developing

countries and may affect nearly two billion subjects6. Zinc is a natural component of the earth's crust; it plays an important role in the biological processes of humans. It is an essential micronutrient for human health and survival.
Serum levels of zinc, though indicative of the degree of depletion, may not entirely reflect cellular lack. Nearly sixty five percent of patients with head and neck cancer have been shown to be zinc deficient-based on cellular zinc concentrations7.
The aims of this study were to assess the nutritional status of patients with head and neck cancers seen at the University College Hospital, Ibadan and the serum level of zinc in them as compared with that of healthy participants.

PARTICIPANTS AND METHODS

The study was conducted at the outpatients' clinic and wards of the departments of Otorhinolaryngology and Radiotherapy, both of the University College Hospital (UCH), Ibadan; a tertiary health institution situated in Ibadan, Oyo state, Nigeria. The study was carried out between March, 2011 and May, 2012
It is a hospital based case-control study. Consenting consecutive patients with head and neck cancers presenting to the outpatients' clinic and those admitted to the wards constituted the case group. These patients had full clinical evaluation, general nutritional status assessment and then venepunture for blood samples for serum zinc assay.
Based on the calculation of the sample size, 65 patients with head and neck cancers were enrolled into the study while 65 healthy participants were enrolled as controls.
The controls were healthy participants within the same age group and socio-economic status. Blood samples were also obtained from them.
Study population included all patients with histological diagnosis of Head and neck cancer who presented to the aforementioned clinics and wards. These patients had no prior treatment with regards to therapeutic or curative surgical resection of the tumour, radiation therapy or chemotherapy. They however, have had biopsy of the tumours to aid diagnosis.
The control group was made up of healthy participants who were matched for age (±2 years), sex and socio-economic status with the patients with head and neck cancers. The healthy participants were recruited from all cadres of staff in the University College Hospital, Ibadan. The staff strength in this tertiary institution is over 3000 and these members of staff span all socioeconomic classes.
The socioeconomic status was estimated from the participants' level of education and occupation which was adapted from Hollingshead index of socioeconomic class.8

Figure 1

Socio-economic status among cases and controls

Class	Education	Occupation	Income
I	College graduate and postgraduate	Major professionals	High
II	Some College	Minor professionals and administrators	Middle to High
III	High school	Clerks, sales, and technicians	Middle
IV	High school	Skilled workers	Middle to Low
V	Elementary School	Semiskilled and unskilled worker	Low

Inclusion criteria for patients' enrolment into the study group included:
a. Patents with histological diagnosis of head and neck cancer.
b. Who had not had surgical resection of the tumour or commenced chemotherapy and/or radiation therapy
c. Who were in good mental health to give reliable answers to questions
d. Who did not suffer illness before the onset of the HNSCC that warranted a change in their dietary consumption pattern.
e. Not on corticosteroid therapy.
f. Not on supplemental zinc diet.

Participants selected as controls were consenting individually matched with the cases for their age+/- 2 years, sex and socioeconomic status.
The approval of the Ethical committee of the UI/UCH Institutional Review Board (UI/UCH IRB) was obtained to conduct the study. (UI/UCH EC Registration number – NHREC/05/2008a). The study was self sponsored, at no cost to participants. Acknowledgements to staff of both Otorhinolaryngology and Radiotherapy departments, staff of International Institute of Tropical Agriculture (IITA) laboratory, and our office assistance.

Procedure
A proforma was used to collect data on the age, sex, occupation, educational status and average income of the patients and the participants in the control group. The clinical presentations (symptoms and signs) of the patients were obtained and recorded. This was aimed at identifying the location, clinical diagnosis and staging of the head and neck cancer (as developed by the American Joint Committee on Cancer [AJCC/UICC] based on the TNM system11). The

diagnosis was confirmed with the histology reports of the patients.

NUTRITIONAL STATUS

The patients' nutritional status and the control were evaluated using the conventional means.

Anthropometric measurement:

-Weight measurement: The weight was determined using a Tanita HD-314 digital weighing scale that has been standardized. Prior to measurement, shoes, heavy clothes and ornaments were removed. Weight was measured in kilograms.

-Height measurement: The height was measured in standing position bare- footed using a Seca 213 portable Stadiometer. This was measured in meters.

-The Body Mass Index (BMI): This was calculated by dividing their individual weight (Kg) by the square of the height in metres. The values obtained (Kg/m2) were recorded and compared to the reference values according to the World Health Organisation (WHO). The case and control were categorised into underweight if values obtained were < 18.5kg/m2, Adequate weight if the values obtained were between 18.5 to 24.9kg/m2, Overweight if value obtained falls between 25 to 29.9kg/m2, Moderately obese between 30 - 34.9kg/m2, Severely obese: 35 - 39.9kg/m2 and Morbidly obese > 40kg/m2.

-Mid upper arm circumference: The arm of each patient was exposed, the researcher stood on the right side of the patient and palpated for the tip of the acromium process of the right shoulder, then placed a measuring tape with the zero point at this point. The tip of the olecranon process of the same arm was also located and the tape drawn to this point and the value noted. This value was divided into two to obtain its midpoint which was marked. At the midpoint of the arm, a non-elastic measuring tape was applied to the circumference without pressure on the skin. The value obtained was recorded in centimetres (cm).

-Waist circumference: The procedure was explained to the participant. All clothing and accessories were removed from the abdominal region of the patient to remove any pressure from the abdomen. Male participants were requested to remove their upper garment. Then, the participant was asked to stand with their feet together and cross their arms over their chest in a relaxed manner. The most superior border of the iliac crest on both sides was palpated then was marked with a washable marker. The zero end of a non-elastic measuring tape was places on one of the points and then passed around the circumference of the abdomen without pressure on the skin through the other marked point on the contralateral iliac crest and aligned with the marked point. The value obtained was recorded in centimetres (cm).

Determination of serum protein and Zinc levels.

Blood collection procedure: Each patient was made to sit comfortably in a semi recumbent position, the procedure of blood collection for the investigation was explained to participant. A tourniquet was applied above the left or right antecubital fossa of the participant. The skin over the antecubital fossa was cleaned with a local antiseptic (90% alcohol). The participants were occasionally required to make a fist on the hand through which blood sample will be collected so as to make the antecubital vein prominent. After identification of the vein, a 21guage sterile needle connected to a sterile 10 millilitres (ml) syringe was gently introduced to puncture the vein. About 10ml of blood was withdrawn into the syringe under negative pressure. The tourniquet was removed, the needle withdrawn and bleeding stopped by applying digital pressure to the needle prick point with a piece of dry sterile cotton wool for 2 to three minutes. About 5 ml of the blood was immediately transferred into propylene bottles that have been coated with potassium ethylene diamine triacetic acid (K+EDTA) as the anticoagulant for serum zinc assay and the remaining 5 ml was transferred into propylene bottles that have been coated with Lithium heparin as the anti-coagulant for serum protein and albumin assay.

The bottles were labelled, kept under ice pack at temperature of -5 to 100 C and transported to the Chemical pathology laboratory of International Institute of Tropical Agriculture (IITA), Ibadan.

Obtaining serum from the collected blood sample

Once the collected samples were in the laboratory, plasma was separated from blood cells by placing the specimen bottles in a centrifuge machine. This was then spun at 2000-2500 revolutions per minute (rpm) for 15-20 minutes. The resulting supernatant (plasma) was withdrawn with Pasteur pipettes and transferred into a clean container. Thereafter, the serum was separated from plasma by using a centrifuge with fractionating capillary tubes at 650 rpm for 5 minutes and transferred to another container using the Pasteur pipettes.

Serum protein and albumin levels determination

Total serum level of protein and albumin in each of the patients was determined using the Bio-Rad protein assay based on the method of Bradford. It involved adding a soluble dye to the protein solution (in this case serum) and subsequent measurement at 595 nm with a

Spectrophotometer or micro plate reader. In comparism to a predetermined standard curve, the relative measurement of protein and albumin concentrations in the serum were determined. The values were measured in grams per decilitre. The reference value for the total serum protein was 6.0 to 8.0 grams per decilitre. The serum albumin level was considered adequate if the obtained value was between 3 and 5g/dl. It is mild depletion if value is from 2.7 to 3.4g/dl, moderate depletion if from 2.1 to 2.6g/dl and severe depletion if less than 2.1 g/dl.

Serum Zinc determination/assay

To determine the Zinc level, one millilitre (1ml) of serum was deproteinized with 9ml of 10% (w/v) trichloroacetic acid (TCA) in 0.1% lanthanum solution.The deproteinized serum was diluted with 4 parts of distilled water (1:4) and aspirated into the Atomic Absorption Spectrophotometer (AAS [Buck Model 205]).

Standards and blanks were prepared by diluting with 5% glycerine using the recommended standard series of 1, 3 and 6 parts per million (ppm). The level obtained was recorded. The level was then recorded in micrograms per decilitre (μg/dl).The reference value (range) was 70 to 120 micrograms per decilitre.

The above blood collection procedure and serum Zinc level determination were also carried out on the participants in the control group.

Data analysis

Data obtained was recorded and analysed using the Statistical Package for Social Sciences (SPSS) version15. The differences in socio-demographic characteristics between cancer cases and controls were compared using t test for quantitative variables and chi square for qualitative variables. The difference in zinc levels between the groups were tested using t-test and Mann Whitney U test if the distribution of zinc levels was skewed. The comparison of zinc levels at different stages of disease was done using the Analysis of variance and kruskal Wallis tests respectively for normal and skewed data. Analysis of covariance was used to adjust for differences in baseline characteristics in the comparison of zinc levels between cases and controls. .

The level of statistical significance was set at p value <0.05.

RESULTS

Demography

Sixty five patients with HNSCC participated in this study and 65 healthy participants constituted the control group. There were 39 (60%) males and 26 (40%) females giving a male to female ratio of 1.5: 1. The control group had identical male and female distribution. The age range of the cases was 15 to 84 years with a mean age of 50.92 and standard deviation (SD) of 15.20. The mean age of the control group was 49.49 with standard deviation of 16.35. Majority (49.2%) of the patients with HNSCC belonged to the low income and low educational group (Socioeconomic class V) while 36.9% belonged to the socioeconomic class II. There is a wide disparity between the high income group and the low income group with few of the participants belonging to the middle income earning group. The control group had similar socioeconomic class distribution. This is shown in figure 1.

Figure 1

Socio-economic status among cases and controls

Class	Education	Occupation	Income
I	College graduate and postgraduate	Major professionals	High
II	Some College	Minor professionals and administrators	Middle to High
III	High school	Clerks, sales, and technicians	Middle
IV	High school	Skilled workers	Middle to Low
V	Elementary School	Semiskilled and unskilled worker	Low

Anatomical sites of HNSCC

Nasopharyngeal and the sinonasal regions were the sites most frequently involved in this disease. They each constituted 29.2% of the cases seen. One (1.5%) patient had Squamous cell carcinoma of the right parotid gland. The distribution of the anatomical sites of this disease is shown in table 1.

Table 1

Anatomical sites of Head and Neck Cancers

Sites	Frequency (N)	Percentage (%)
Larynx	17	26.2
Nasopharynx	19	29.2
Sinonasal	19	29.2
Parotid gland	1	1.5
Hypopharynx	2	3.1
Oropharynx	5	7.7
Middle ear	2	3.1
Total	65	100.0

Stage IV disease was the most common stage at presentation with thirty-six (55.4%) patients presenting in this stage. Two patients presented with stage I disease. The stages of the disease and the frequency of presentations are shown in table 2a.

Table 2a

Anatomical sites and disease stage at presentation

Site	I	II	III	IV	Total
Laryngeal tumour	1	0	9	7	17
Nasopharyngeal tumour	0	4	1	14	19
Sinonasal tumour	1	2	5	11	19
Parotid Squamous cell cancer	0	0	0	1	1
Hypopharyngeal tumour	0	1	0	1	2
Oropharyngeal tumour	0	1	2	2	5
Middle ear	0	0	2	0	2
Total N (%)	2 (3.1)	8 (12.3)	19 (29.2)	36 (55.4)	65 (100.0)

HNSCC and Nutritional status

According to the Body Mass Index (BMI), sixteen patients (24.6%) with HNSCC were underweight while 21 (32.3%) patients had weight in excess of their height. This gives a total of 37(56.9%) patients with malnutrition. The control group had a higher number of participants with adequate weight for height (58.5%) and lower number of underweight participants (12.3%).

The distribution of the weight classes of both groups is shown in table 2b. The comparism is further depicted in figure 2.

There are descriptive differences in the two groups with the controls appearing to have better nutritional status than the cases however, on the average; this is not statistically significant (p= 0.524) as shown in table 3.

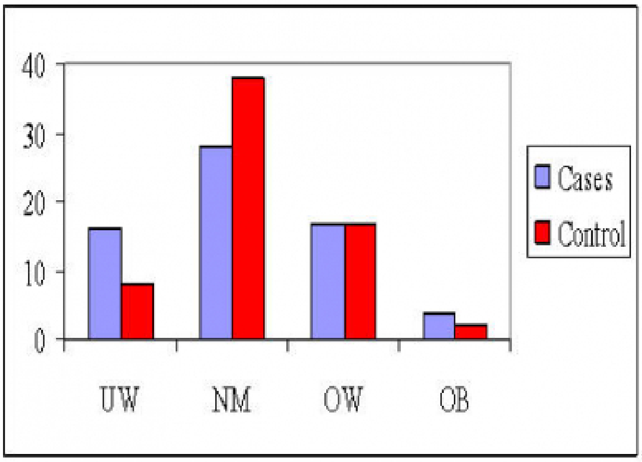
Table 2b

BMI of the cases and the controls

	Cases		Controls	
Nutritional Status	N (%)	Range	Frequency	Range
Underweight	16 (24.6)	15.5 – 18.3	8 (12.3)	15.5 – 18.2
Normal	28 (43.1)	18.9 – 24.5	38 (58.5)	19.2 – 24.5
Overweight	17 (26.2)	25.0 – 29.8	17 (26.2)	25.0 – 29.4
Obese	4 (6.2)	30.9 – 38.6	2 (3.1)	31.6 – 36.7
Total	65 (100.0)		65 (100.0)	

Figure 2

Nutritional status among the cases and controls



*UW= Underweight, NM= Normal weight, OW= Overweight, OB= Obese

Table 3

Statistical difference between the BMI of Cases and Controls

	Cases Mean ±SD	Control Mean ± SD	Df	CI	p-value
Body Mass Index (BMI)	22.66 ± 4.70	23.14 ± 3.8	128	-1.965 – 1.00	0.524

The anthropometric parameters did not reveal any statistically significant differences in the nutritional status among the disease stages in the case group. The weight (p=0.69), BMI (p=0.518), mid arm circumference (p=0.146) and waist circumference (p=0.062) did not differ significantly among the disease stages.

A similar observation was made in the nutritional status using the biochemical parameters of total serum protein (p=0.22), serum albumin (p=0.797) and serum zinc (p=0.95). These are shown in tale 4 and 5 below.

Table 4

Relationship between tumour stage and Nutritional status using Anthropometric measurements

	Stage I Mean (SD)	Stage II Mean (SD)	Stage III Mean (SD)	Stage IV Mean (SD)	p-value
Age (years)	58.00±7.07	52.50±20.83	59.21±12.22	45.81±13.79	0.013
Weight (kg)	71.50±12.02	68.13±9.70	62.61±12.04	63.90±15.35	0.691
Height (M)	1.63±0.02	1.70±0.84	1.67±0.10	1.69±0.09	0.522
BMI(kg/m^2)	27.13±5.28	23.58±3.46	22.36±3.12	22.37±5.55	0.518
MAC (cm)	32.50±2.12	28.50±3.85	26.53±3.27	27.09±4.00	0.146
WAC (cm)	99.50±14.85	83.25±7.70	79.00±8.73	80.12±11.52	0.062

Table 5

Nutritional status and disease stage using Biochemical parameters

	Stage I Mean (SD)	Stage II Mean (SD)	Stage III Mean (SD)	Stage IV Mean (SD)	p-value
Serum protein g/dl	8.05±0.49	7.8±0.31	7.28±0.73	7.25±0.87	0.224
Serum albumin g/dl	3.75±0.78	3.96±0.43	3.84±0.49	3.73±0.64	0.797
Serum zinc level μg/dl	95.74±23.07	90.28±12.05	89.51±15.83	89.59±14.05	0.949

HNSCC and Serum Zinc:

Two (3.1%) patients with advanced nasopharyngeal cancer had serum zinc levels below the reference value of zinc (Laboratory reference values 70 - 120μg/dl). There was no significant difference (p=0.95) among the different stages of the disease as shown in table 5 above. The participants in the control group had serum zinc levels that were within the reference range.

In comparing the serum zinc levels of the cases and controls, the control group had statistically significant (p=0.00) higher zinc levels in all the weight classes except in the obese (p=0.25) as shown in table 6.

Table 6

Difference in the mean serum Zinc levels between cases and controls of different nutritional status

		Mean SD	CI	Df	p-value
Underweight	Cases	82.42±17.19	-43.72 – (-24.69)	22	0.00
	Control	116.63±4.03			
Normal	Cases	89.98±12.86	-28.37- (-17.63)	64	0.00
	Control	112.98±6.54			
Overweight	Cases	92.16±9.73	-26.67 – (-15.44)	32	0.00
	Control	113.21±5.67			
Obese	Cases	108.66±8.93	-27.78 – 9.65	4	0.25
	Control	117.73±1.76			

Overall, the mean serum zinc level of the healthy participants was significantly higher statistically than those of patients with Head and Neck Squamous cell Carcinoma (p=0.000) as shown in table 7.

Table 7

Difference in the average serum zinc levels between the case and control groups

	Cases Mean ±SD	Controls Mean ±SD	Df	CI	p-value
Serum Zinc levels	89.84±14.27	113.63±6.04	86.2	-27.62 – (-19.97)	0.00

DISCUSSION

Sixty five patients with HNSCC participated in this study.

Globally there are approximately 550,000 cases of head and neck cancers every year.12 Head and neck cancers account for 3 percent of malignancies in the United States with an estimated 52,000 Americans developing it and 11,500 dying from it annually.13 Thirty eight cases annually were reported in Lagos14, Ile-Ife reported 31cases15 while 47 cases of head and neck cancers were reported annually from Jos.16

An average of 62 cases was seen annually in retrospective studies done in University College Hospital (UCH), Ibadan.17, 18 However, these studies included all types of head and neck malignancies. Patients with HNSCC diagnosed in the UCH as well as those already with histologic diagnosis referred from other centres were recruited in this study. This perhaps would account for the seemingly higher number of cases seen in this study.

Head and neck cancers in general have a male preponderance and findings in this study corroborated this. A male to female ratio of 1.5:1 was seen. This ratio is slightly lower than that reported from China and Japan where a ratio of 2.4:1 was reported in 19 and 13 year study respectively.19, 20 Abuidris found a ratio of 1.7:1 in Central Sudan.21 In a meta-analysis of 27 relevant published articles on head and neck cancers in Nigeria from 1968 to 2008 a male to female ratio of 1:1 to 2.3:1 was revealed.22

These various studies considered all head and neck malignancies together however; specific anatomical sites may provide a clearer picture of the male to female ratio. Fasunle et al.23 reported a male to female ratio of 2.15:1 in patients with sinonasal malignancies. Amusa et al.24 observed a ratio of 12:1 for laryngeal cancers while Nwaorgu et al25 reported 2.3:1 for nasopharyngeal cancers.

The mean age seen in this study was 50.9years (SD ± 15.20). This is slightly higher that had reported by Adisa et al where a mean 43.9years (SD ± 19.3) was reported for all head and neck malignancies seen in their 19 year retrospective study.18 Their study however also consisted of paediatric age group. The mean age seen in this study is similar to the mean age of 48.1years of patients with HNSCC in the retrospective study by Adisa et al.18 This may be due to the fact that HNSCC peaks in the 5th decade of life (40-49years).26 Similar mean age has been reported from central Sudan.21

Individuals with low income as well as low education (socioeconomic class V) constituted the largest group (49.2%) of patients with HNSCC. Regarding the global incidence of head and neck cancers, 60% of cases have been reported to occur in developing countries1 especially among the economically disadvantaged indigenes.1 these individuals are wont to abuse alcohol and tobacco and also posse poor dietary habits as well as poor oral and personal hygiene1. Individuals belonging to the low socioeconomic class also have poor health seeking behaviour as they are less likely to be aware of screening programmes for HNSCC.27 The preponderance of patients with HNSCC in the low socioeconomic status seen in this study is in consonance with the findings by Al-Dakkak in the United Kingdom.28 He found that a higher risk of head and neck cancer (HNC) was consistently associated with poor socioeconomic circumstances. However, when adjustments were made for alcohol consumption and tobacco smoking, the statistical significance was lost.28

Conway et al did not find a change in the statistical significance of this risk when adjustments were made for smoking, alcohol consumption and dietary behaviours in their own study.29

This study also corroborates the increased incidence of this heterogeneous group of diseases among the low socioeconomic class reported by other authors in this environment.16, 30, 31 In contrast however, there was no significant difference in the distribution of oral Squamous cell carcinoma in the high socioeconomic and low socioeconomic classes in Ibadan, Nigeria.30 These patients had no significant exposure to tobacco smoking, alcohol consumption or both.30

The nasopharynx (29.2%) and sinonasal (29.2%) regions accounted for the most common anatomical sites of HNSCC seen in this study. The larynx was next with 26.2% of the cases seen. The predilection of these tumours for the upper respiratory tract is in consonance with the overall pattern seen in Nigeria with the nasopharynx, nose and larynx being the commonest sites affected in descending order.18, 22 In central Sudan the upper respiratory tract constituted 72.7% of the sites of head and neck cancer.21 Amusa et al.15 however reported oral cavity as the commonest site in their study. Children with Burkitt's lymphoma of the jaw were grouped into oral cavity tumours in their study. This may explain the reason for the increase in the site.

The nasopharynx was the commonest site in 19,400 patients with malignant tumours of the head and neck in Guagnxi province in China.32 Consumption of smoked salted fish was implicated as the predisposing factor.33 It has been postulated that perhaps the wood smoke in ill ventilated houses, wood dust, and Epstein Barr virus infection may be the predisposing factor for this predilection of this disease for the upper respiratory tract in Africans.34

Majority (84.6%) of the patients seen in this study presented in advanced disease stage (stage III [29.2%] and stage IV [55.4%]). This is similar to the findings by Elumelu et al.31 where 81 out of 100 patients seen in their study presented with advanced disease. Similar reports were made from Ile-Ife and North Eastern Nigeria.24, 35

The larynx and maxillary sinus were the sites involved in stage I disease. These patients with laryngeal cancer presented early because her symptom (unremitting hoarseness) was affecting her ability to relay messages at work while the patient with left maxillary antral carcinoma presented early due to recurrent unilateral Epistaxis respectively. Evaluation of the paranasal sinuses with a computed tomogram revealed the mass in the lateral wall of the antrum. This patient belonged to the high socioeconomic class (class I).

Several studies done in this environment have shown that late disease stage presentation of these patients could be attributed to the socio-cultural beliefs and misconceptions which have led to the patronage of alternative medical practitioners even by highly educated and enlightened patients of the people.36 Other contributing factors to late presentation include ignorance, local taboo, poverty and poor recognition of the disease condition by primary health providers.24, 37, 38

Sixteen patients (24.6%) with HNSCC were found to be underweight in this study. This is similar to other studies where 20-30% of patients with HNSCC were found to be malnourished.39, 40 Anthropometry, especially weight changes have been shown to be the most reliable indicators of nutritional status in patients with HNSCC. Poor nutritional status in head and neck cancer patients has been shown to have a negative effect on the course of the disease, the ability of the patients to withstand the various treatment modalities, hospital stay and overall prognosis. Therefore it has been advocated that early nutritional intervention at the time of diagnosis must be commenced and it must continue during treatment and after discharge.41

Twenty one (32.3%) patients with HNSCC were found to have Body mass Index above normal (overweight [24.6%], obese [7.7%]). Obesity has been implicated as a predisposing factor to the development of cancers in various parts of the body.42, 43 In head and neck cancers obesity has been shown to cause a delay in the institution of nutritional rehabilitation as the patients tend to be misidentified as having adequate nutrition.39 Gaudet et al44 made a different observation regarding obesity and HNSCC. They observed that a BMI of 25kg/m2 and above conferred significantly higher survival rates for patients with HNSCC than those with lower BMI. However this association was found only in patients with a history of tobacco use.44

The control group had a higher proportion of participants with adequate weight (58.5%), fewer underweight (12.3%) and obese (3.1%) participants when compared with the cases.

Descriptively the control group appears to be better nourished than patients with HNSCC. However, on the average, this was not statistically significant (p = 0.52).

There was no statistically significant difference in the nutritional status in the case group among the different disease stages. This was observed in the anthropometric parameters as well as the biochemical indices (p>0.05). This is in contrast with the study done by Luis et al.45 They found a statistical significant difference in the nutritional status among patients at different stages of the disease. The patients in advanced disease stage (III and IV) were more malnourished when compared with those with less advanced disease.45 This is not the case in this present study even though, using the mean weight values for the different disease stages, descriptively/numerically that the BMI of the early disease stage is higher than that of the late stage.

The serum protein and albumin levels of the patients were within the reference range in all but two patients with advanced nasopharyngeal carcinoma and one patient with advanced sinonasal tumour (all had moderately depleted albumin levels). Marked changes in serum albumin were not observed in this study. This may be due to the fact that albumin has a long half life (approximately 20 days) and therefore does not detect early protein depletion.

The two patients with advanced nasopharyngeal cancer also had zinc serum levels below the laboratory reference values. Serum zinc levels have been reported to be better prognostic indicators than serum protein and albumin levels in patients with HNSCC.4 The role of zinc in HNSCC has been extensively studied.

There was no statistically significant difference in the serum zinc levels among the different disease stages in the patients with HNSCC (p = 0.95). However, when compared with the levels in the control group, the results show that within each nutritional status group, the zinc levels of the cases were significantly lower than the zinc levels of the controls within the same nutritional status group (p = 0.00) except in the obese where there is no significant difference between the zinc levels of the cases and the controls (p = 0.25).

The absence of significance in the obese group may be due to the fact that the number of individuals in this group is too few for accurate computation or perhaps obese patients with head and neck cancers are able to maintain serum zinc levels that are close to that of healthy individuals for a longer period.

On the average, serum zinc levels were found to be significantly higher in the 65 healthy participants than in the 65 patients with HNSCC seen in this study (p = 0.00). This is in consonance with studies done in other regions where zinc deficiency was associated with local recurrence in stage III and IV disease46, and worse prognosis in patients with HNSCC.47,48

CONCLUSION

The nutritional status of Head and Neck cancers patients can greatly influence the outcome of the disease. This preliminary research is demonstrating that there is an association between HNSCC and nutrition. Zinc serum levels have been shown to be significantly lower in these patients in spite of the value being within the reference range. This may have an impact on the overall survival of these patients.

Further research into the dietary habits and adequacy of Zinc intake in the diet of the general population is required to determine if relative depletion of this trace element is a predisposing factor to an increased incidence of this disease in our environment.

References

1. GLOBOCAN 2000. Cancer incidence, mortality and prevalence worldwide, Lyon. IARC Press;2001(s)
2. Dewys WD, Begg C, Lavin PT et al. Prognostic effect of weight loss prior to chemotherapy in cancer patients. Eastern Cooperative Oncology Group. American Journal of Medicine. 1980; 69: 491-497
3. .Hammerlid E, Wirblad B, Sandin C et al. Malnutrition and food intake in relation to quality of life in head and neck cancer patients. Head and neck. 1998; 20; 540-548.
4. Kutscher AH, Schoenberg B, Carr AC et al. The terminal patient; Oral care. Foundation of Thanatology, Distributed by Colombia University press, 1973.
5. Beck FW, Prasad AS, Kaplan J, Fitzgerald JT, Brewer GJ. Changes in Cytokine production and T cell subpopulations in experimentally induced zinc- deficient humans. Am J Physiol. 1997; 272: 1002-1007.
6. Saltman DC, Booth B, van Weel C. Quality of care and standard setting in general practice. Aust Fam Physician.1993; 22: 1109-1110.
7. Prasd AS, Beck FW, Snell DC, Kucuk O. Zinc in Cancer Prevention. Nutr Cancer. 2009; 61: 879-887.
8. Hollingshead A. Two factor index of social position. New Haven, CT: Yale University Press, 1957.
9. Lwanga SK and Lemeshow S. Sample Size Determination

in Health Studies: A Practical Manual. Geneva: World Health Organization 1991.
10. Kirkwood BR, Sterne JAC. Chapter 35: Calculation of required sample size. In Essential Medical Statistics. Second Edition. Blackwell Publishing 2003: 413-428.
11. Pate LSG, Shah JP. TNM staging of cancers of the Head and Neck: Striving for Uniformity Among Diversity. CA Cancer J Clin 2005; 55: 242-254
12. Parkin DM, Bray F, Ferlay J, Pisani P. Global Cancer Statistics, 2002. CA Cancer J Clin 2005; 65: 74.
13. Siegel R, Naishadham D, Jemal A. Cancer Statistics, 2012. CA Cancer J Clin 2012; 62: 10-29.
14. Nwawolo CC, Ajekigbe AT, Oyeneyin JO, Nwankwo KC, Okeowo PA. Pattern of head and neck cancers among Nigerians in Lagos. West Afr J Med 2001; 2:111-116.
15. Amusa YB, Olabanji JK, Akinpelu VO, et al. Pattern of head and neck malignant tumours in a Nigerian teaching hospital--a ten year review. West Afr J Med 2004; 23: 280-285
16. Otoh EC, Johnson NW, Mandong BM, Danfillo IS. Primary head and neck cancers in Jos, Nigeria: a re-visit. West Afr J Med 2006; 25: 92-100.
17. Adeyemi BF, Adekunle LV, Kolude BM, Akang EEU, Lawoyin JO. Head and neck cancer - a clinicopathological study in a tertiary care centre. J Natl Med Assoc 2008; 100: 690-697.
18. Adisa AO, Adeyemi BF, Oluwasola AO, Kolude B, Akang EE, Lawoyin JO. Clinic-pathological profile of head and neck malignancies at University College Hospital, Ibadan, Nigeria. Head and Face Medicine 2011; 9: 7
19. Anyu W, Xuedong Z, Long C, et al. Analysis of 26,826 patients with tumours in the head and neck. Chinese J Cancer Res 1993; 5: 153-156.
20. Takahiro O, Satoshi H, Masahiro K, Katsuro S, Sugata T, Fumio I. Head and neck malignant tumours in Niigata prefecture- the first report: demographics in 4,053 cases. J Otolaryngol Jap 2003; 106: 164-172.
21. Abuidris DO, Elhaj AH, Eltayeb EA, Elgayli EM, Mustafa OM. Pattern of head and neck malignancies in Central Sudan- (study of 314 cases). Sudan J Med Sci 2008; 3: 105-108.
22. Lilly-Tariah OB, Somefun AO, Adeyemo WL. Current evidence on the burden of head and neck cancers in Nigeria. Head Neck Oncol 2009; 1: 1-14.
23. Fasunla AJ, Lasisi AO. Sinonasal Malignancies; A 10-year Review in a Tetiary Health Institution. Journal of National Med Asso. 2007; 99: 1407-1410.
24. Amusa YB, Badmus A, Olabanji JK, Oyebamiji EO. Laryngeal carcinoma: experience in Ile-Ife, Nigeria. Niger J Clin Pract. 2011; 14: 74-78.
25. Nwaorgu OG, Ogunbiyi JO. Nasopharyngeal Cancer at the University College Hospital Ibadan Cancer Registry: an update. West Afr J Med. 2004; 23: 135-138.
26. Kurtulmaz SY, Erkal HS, Serin M, Elhan AH, Cakmak A. Squamous cell carcinomas of the head and neck: descriptive analysis of 1293 cases. J Laryngol Otol 1997; 111: 531-535.
27. Johnson S, McDonald JT, Corsten M. Oral cancer screening and socio-economic status. J Otolaryngol Head and Neck Surg. 2012; 4: 102-107.
28. Al-Dakkak I. Socioeconomic status and head and neck cancer. Evid Based Dent. 2010; 11: 57-58.
29. Conway DI, McKinney PA, McMahon AD, et al. socioeconomic factors associated with risk of upper aerodigestive tract cancer in Europe. Eur J Cancer. 2010; 46: 588-598.
30. Adeyemi BF, Olusanya AA, Lawoyin JO. Oral Squamous cell carcinoma, socioeconomic status and history of exposure to alcohol and tobacco. J Natl Med Assoc. 2011; 103: 498-502.
31. Elumelu TN, Adenipekun AA, Bojude AD, Campbell OB. Quality of life in patients with head and neck cancer on radiotherapy treatment at Ibadan. Researcher 2011; 3: 1-10.
32. Anyu W, Xuedong Z, Long C, Zhenquiang L,et al. Analysis of 26,826 patients with tumours in the head and neck. Chinese J Cancer Res 1993; 5: 153-156.
33. Ning JP. Consumption of salted fish and other risk factors for nasopharyngeal carcinoma (NPC) in Tianjin, a low-risk region for NPC in the People's Republic of China. J Natl Cancer Inst 1990; 82: 291-296.
34. Clifford P, Bulbrook RD. Environmental studies in African males in nasopharyngeal carcinoma. Lancet 1967; 1:1228.
35. Otoh EC, Johnson NW, Danfillo IS, Adeleke OA, Olasoji HO. Primary head and neck cancers in North Eastern Nigeria. West Afri J. Med. 2005; 24: 92-100.
36. Udosen AM, Otei OO, Onuba OO. Role of traditional Bone Setters in Africa: Experience in Calabar, Nigeria. Annals of African Medicine.2006; 5: 170-173.
37. Umana A, Offio ME, Mgbe RB, Adekanye AG, Bassey I, Ebughe G. Cancer of the larynx - Management challenges in Calabar, south-south Nigeria. The internet Journal of Third World Medicine. 2011; 9: DOI: 10.558o/a7f.
38. Iseh K. Total laryngectomy for laryngeal cancer in a Nigerian tertiary health center: prognosis and outcome. J Surg Tech case report. 2011; 3: 23-30.
39. Pressoir M, Desne S, Berchery D, et al. Prevalence, risk factors and clinical implications of malnutrition in French Comprehensive Cancer Centres. Br J Cancer. 2010; 102:966-971.
40. Godwin WJ jr, Byers PM. Nutritional management of the head and neck cancer patient. Med Clin North Am. 1993; 77:597-610.
41. Paccagnella A, Morello M, DaMosto MC, et al. early nutritional intervention improves treatment tolerance and outcomes in head and neck cancer patients undergoing concurrent chemo radiotherapy. Support care cancer. 2010; 18: 837-845.
42. Pujol P, Calter-Dereure F, Bringer J. Obesity and breast cancer risk. Hum Rep 1997; 12: 116-125.
43. Larsson SC, Wolk J. Obesity and colon and rectal cancer risk: a meta-analysis of prospective studies. Am J Clin Nutr 2007; 86: 556-565.
44. Gaudet MM, Patel AV, Sun J, et al. Prospective studies of body mass index with head and neck cancer incidence and mortality. Cancer Epidemiol Biomarkers Prev. 2012; 21: 497-503.
45. De Luis DA, Izaola O, Aller R. Nutritional status in head and neck cancer patients. Eur Rev Med Pharmacol Sci. 2007; 11: 239-243.
46. Prasad AS, Beck FWJ, Doerr TD, et al. Nutritional and zinc status of Head and Neck Cancer Patients: An interpretive Review. Journal of the American College of Nutrition. 1998; 17: 409-418
47. Abnet CC, Lai B, Qiao YL, et al. Zinc concentration in Oesophageal biopsy specimens measured by x-ray fluorescence and Oesophageal cancer risk. J Natl Cancer Inst.2005; 97: 301-306
48. Goyal MM, Kalwar AK, Vyas RK, Bhati A. A study of serum zinc, selenium and copper levels in carcinoma of the oesophagus patients. Indian Journal of Clin BIochem. 2006; 21: 208-210.

Author Information

A Daniel
Dept. of Otorhinolaryngology, College of Medicine, University of Ibadan
Ibadan, Nigeria

A A Adeosun
Dept. of Otorhinolaryngology, College of Medicine, University of Ibadan
Ibadan, Nigeria

T N Elumelu
Dept. of Radiotherapy, College of Medicine, University of Ibadan
Ibadan, Nigeria
telumelu@com.ui.edu.ng

O GB Nwaorgu
Dept. of Otorhinolaryngology, College of Medicine, University of Ibadan
Ibadan, Nigeria