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Burden of Cancer in Plateau State, Central Nigeria: A 27-Year Report from a Tertiary Hospital-Based Cancer Registry

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Authors' contributions

This work was carried out in collaboration between all authors. Author BMM designed the study, performed the statistical analysis, wrote the protocol, and wrote the first draft of the manuscript. Authors IE, BVK and JBM managed the analyses of the study. Authors ANM, DMA and SAO managed the literature searches. All authors read and approved the final manuscript.

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ABSTRACT

Cancer has become an emerging disease in the developing world owing to the control of infectious agents and increase longevity. The global anatomical distribution of cancer differs from developed to developing (or resource limited) countries. This article provides information on hospital based cancer registry in Jos University Teaching Hospital (JUTH), for the past 27 years.

This was a descriptive retrospective study of consecutive cases of cancer analyzed at the Histopathology Department of JUTH, Jos, between January 1987 and December 2014. All records of cancer diagnosis were extracted from the departmental cancer registry which was established by the Teaching Hospital in 1987. Cases with confirmed histological diagnosis of cancers were included while those with inadequate biodata (age and sex), and anatomical site were excluded.

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A total of 6,915 cancer cases were recorded for the period of 1987-2014 comprising of 2891 males and 4024 females; giving an annual prevalence of 256 cases per annum. Top 10 cancers accounted for 74% of all cancers, while top 5 cases accounted for 55.8% of cancers. The most frequent cancers were those of the breast, cervical, prostate, lymphoma and liver cancers.
The study showed that the most frequent cancers in JUTH are those of the breast, cervix, prostate, liver and lymphomas in decreasing order respectively. Screening should be encouraged in patients at risk to aid prevention and early detection. Allocation of resources to this end should be emphasized.

Keywords: Cancer; burden; distribution; Jos; Nigeria.

1. INTRODUCTION

Mortality rate in developing countries still revolve around infectious disease with maternal and infant mortality rate of more than 150/100,000 [1,2]. However, concerted efforts by WHO (world health organization), NGO (non-governmental organization), in the eradication of malaria, tuberculosis, HIV control and other neglected tropical diseases have resulted in the emergence of non-communicable diseases such as cardiovascular disease, diabetics mellitus and cancer [2].

Records as at 2013, showed that cancer annually, caused over 8 million deaths worldwide. In Europe and America it is the second leading cause of death after cardiovascular disease [2,3]. The Situation in the tropics is different where infection is the leading cause of death after man-made and natural disasters caused by famine, wars and terrorism. Cancer rate will continue to increase as steady improvements are made in increasing life expectancy, thereby increasing the population of people attaining old age-where cancers frequently occur [4].

Cancer is an emerging non-communicable disease in sub-Sahara Africa. The pattern of cancer distribution in developed and sub-Sahara Africa vary significantly: while lung, breast, prostate, colorectal and urinary bladder carry more than 50% of cancer burden in Europe and America, in Africa, the Sub-Sahara region showed that breast, cervical, prostate, Lymphomas, gastrointestinal cancers carry more than 60% of cancer burden [3]. This is understandable, because in tropical Africa infections such as HBV (hepatitis B virus), HCV (hepatitis C virus), H. Pylori (helicobacter pylori), HHV8 (human herpes virus 8), and high rate mycotoxin poison in poorly preserved grains have contributed to the high proportion of these cancers [5,6].

The lack of accurate data for the incidence of cancer in Nigeria like other African countries made Health planning a challenging task. In Nigeria the near absence of national, regional and state wide cancer registries has made health planning more precarious. Cancer registry is an effective source of information for Health Planning, resource allocation and research [6]. Hospital based cancer registry in resource limited countries remain a vital source of information in the absence of population base cancer registry. It also serve as centre for cancer screening, creating public awareness, and provision of data that can be used for actionable policy [7,8,9,10,11]. This article provides information on hospital based cancer registry in Jos University Teaching Hospital for the past 27 years. It has been the only hospital with histopathology services for over three decades in Plateau State.

2. METHODOLOGY

This was a descriptive retrospective study of consecutive cases of cancer analyzed at the Histopathology Department of the Jos University Teaching Hospital, Jos, between January 1987 and December 2014. The study aims to document the cases of cancers seen at the Jos University Teaching hospital, to relate this finding to age and gender, and to compare these with existing literature.

Jos University Teaching Hospital established 1982, has since been serving the old Plateau state consisting of present Plateau and Nasarawa States. Plateau state presently has 17 Local Government Areas with numerous private and government owned health facilities. The population was 3,206,531 (2006 census), projected to be 4,200,400 in 2016 [12]. The State capital has three other tertiary hospitals with no viable histopathological services.

Specimens for histological analysis were received from in patient samples sent to the histopathology department and as referrals from

other hospitals. All records of cancer diagnosis were extracted from the departmental cancer registry which was established by the Teaching Hospital in 1987. Cases with confirmed histological diagnosis of cancer were included while those with inadequate biodata (age and sex), and anatomical site were excluded.

The distribution of cancer was analysed with respect to age, gender, and anatomical site. The top 10 and top 5 cancers were with respect to frequency of occurrence were identified. The data obtained was analysed using SPSS statistical software and presented in tables as single frequencies and percentages.

Table 1. Top 10 common cancers at the Jos University Teaching Hospital, 1987-2014

Ranking	Cancer type/site	Number of cases	% of Grand total (N=6915)
1	Breast	1151	16.6
2	Cervix	980	14.2
3	Prostate	727	10.5
4	NHL	525	7.6
5	Liver	478	6.9
6	Colorectal	379	5.5
7	Other Malignancies of Skin	265	3.8
8	Soft tissue	236	3.4
9	Secondary LNM	202	2.9
10	Bladder	181	2.6
11	Others combined	1791	26.0
Total		6915	100

NHL=Non-Hodgkin's lymphoma, LMN=Lymph node metastasis

Table 2. Top 10 cancers in males at the Jos University Teaching Hospital, 1987-2014

Ranking	Cancer type/ site	No Cases	% of all Male cancers
1	Prostate	727	25.1
2	NHL	295	10.2
3	Liver	271	9.4
4	Colorectal	220	7.6
5	Soft Tissue Sarcomas	141	4.9
6	Other Malignancies of Skin (other than melanoma)	138	4.8
7	Bladder	133	4.6
8	Secondary LNM	116	4.0
9	Stomach	104	3.6
10	Burkitts Lymphoma	34	1.2
11	All others combined	712	24.6
Total		2891	100

NHL=Non-Hodgkin's lymphoma, LMN=Lymph node metastasis

3. RESULTS

A total of 6,915 cancer cases were recorded at the JUTH cancer registry over a 27 year period, comprising of 2,891 males and 4,024 females, giving an annual prevalence of 256 cases per annum. Table 1 show the top 10 cancers seen in JUTH, which accounted for 74.07% of all malignancies, while the top 5 cancers accounted for 55.82% of all cancers. Table 2 show the top 10 cancers in males which accounted for 53.8% of all male cancers while the top 5 cancers in the male category represented 41.03%. Table 3, show the top 10 female cancers which accounted for 85.41% of all female cancers, while the top 5 cancers in females accounted for 70% in the female category. Breast and cervical cancers jointly accounted for 51.84% of all female cancers and 30.81% of all cancer in JUTH. The age distribution of the five most common cancers in JUTH, are presented in Tables 4, 5, 6, 7, and 8.

4. DISCUSSION

The study of cancer pattern in a population can contribute immensely in determining causes, cause-related risk factors and strategies for

cancer prevention and cure. The department of Pathology has documented cancer patterns in JUTH as reflected in the cancer registry for the past 27 years. From the analysis, the top 10 cancers in JUTH accounted for 74.07%, and five top cancers accounted for 55.82%. These top five cancers are breast, cervix, prostate, Non-Hodgkin's lymphoma and liver in descending order respectively. This pattern reflects what is seen in most Sub- Sahara region of Africa [13,14]. Other cancer registries within Nigeria showed that breast and cervical cancers are the commonest cancers although not necessarily in the order seen in this study [7,15,16,17].

In a study by Malami et al, in Sokoto, Nigeria, cancer of the bladder made the list of the top five, while liver cancer did not [17]. Another study in Kano Nigeria by Mohammed et al, showed that cancer of the colorectum and non-melanoma skin cancers ranked amongst the top five cancers, while non-Hodgkins lymphoma and liver cancer did not make the list [16]. Jedy-Agba et al, reported from Abuja-Nigeria's capital city, that non-melanoma skin cancers and ovarian cancers substituted non-Hodgkins lymphoma and liver cancer in the list of five leading cancers [7]. In the same report, colorectal cancers and non-melanoma skin cancers substituted non-Hodgkins lymphoma and liver cancer, in Ibadan (South-west, Nigeria) [7]. In yet another report from Nnewi (Nigeria) Ukah et al, found colorectal cancer displacing non-Hodgkins lymphoma from the list [15].

In developed nations such as the U.S.A and some European countries, the five commonest cancers are those of the lung, breast, prostate, colorectal and urinary bladder in this order. In North Africa and Western Asia, the 5 top cancers are those of the lungs, breast, colo-rectum, urinary bladder and stomach [1,8,10,11]. The commonest risk factors shared by these nations are the wide use of cigarette smoking and industrial pollutants emanating from industrial chemicals [7-11].

Table 3. Top 10 female cancers at the Jos University Teaching Hospital 1987-2014

Ranking	Cancer type/ site	No Cases	% of all Female cancers
1	Breast	1106	27.5
2	Cervix	980	24.4
3	NHL	364	9.0
4	Liver	207	5.1
5	Colorectal	159	4.0
6	Other Malignancies of the Skin(other than melanoma)	147	3.7
7	Uterus (Endometrium)	142	3.5
8	Soft Tissue Sarcoma	116	2.9
9	Ovary	115	2.8
10	Secondary LNM	101	2.5
11	All others combined	587	14.6
Total		4024	100

NHL=Non-Hodgkin's lymphoma, LMN=Lymph node metastasis

Table 4. Age distribution of female breast cancer (in years) 1987-2014

Age (range in years)	Number	Percentage (%)
< 20	17	1.54
21 – 24	32	2.89
25 – 29	43	3.89
30 – 34	143	12.93
35 – 39	172	15.55
40 – 44	247	22.33
45 – 49	186	16.82
50 – 54	147	13.29
55 – 59	62	5.61
60 – 64	36	3.25
65 – 69	9	0.81
70 – 74	12	1.08
Total	1106	100

Table 5. Age distribution of cervical cancer patients in JUTH (1987-2014)

Age (range in years)	Number	Percentage (%)
< 20	0	0.00
21 – 24	0	0.00
25 – 29	10	1.02
30 – 34	15	1.53
35 – 39	31	3.16
40 – 44	105	10.71
45 – 49	236	24.08
50 – 54	315	32.14
55 – 59	184	18.78
60 – 64	35	3.57
65 – 69	37	3.78
70 – 74	12	1.22
Total	980	100

Table 6. Age distribution of prostate cancer patients in (1987-2014)

Age (range in years)	Number	Percentage (%)
< 20	0	0.00
21 – 24	0	0.00
25 – 29	0	0.00
30 – 34	0	0.00
35 – 39	0	0.00
40 – 44	0	0.00
45 – 49	30	4.13
50 – 54	25	3.44
55 – 59	128	17.61
60 – 64	275	37.83
65 – 69	216	29.71
70 – 74	53	7.29
Total	727	100

Table 7. Age distribution of liver cancer patients in JUTH (1987-2014)

Age (range in years)	Number	Percentage (%)
< 20	0	0.00
21 – 24	0	0.00
25 – 29	0	0.00
30 – 34	15	3.14
35 – 39	55	11.51
40 – 44	65	13.60
45 – 49	94	19.67
50 – 54	65	13.60
55 – 59	70	14.64
60 – 64	54	11.30
65 – 69	45	9.41
70 – 74	15	3.14
Total	478	100

The situation is different from what obtains in countries of Eastern Asia which have high rate of upper gastrointestinal malignancies as the commonest cancers [7-11]. In these countries they share the highest rate of tobacco chewing in place of tobacco smoking. This is reflected in the high proportion of oral, pharyngeal, oesophageal and head/cancers [1,8,10,11].

In JUTH, the top 5 cancers reflect striking absence of lung, upper respiratory tract cancer and urinary bladder cancer, conditions that are

associated with heavy cigarette smoking. However, high rate of infectious agents in Nigeria as in many tropical areas may be responsible for prevalence of cancer of the cervix, liver, colorectal, Non-Hodgkin's lymphoma and stomach. These cancers are strongly associated with Human Papilloma Virus (HPV), Hepatitis B Virus (HBV), Hepatitis C Virus (HVC), Aspergillum flavus (Aflatoxin), Plasmodium species, Epstein-Barr virus, and H. pylori [4,13].

Breast cancer is acknowledged to be the commonest in women globally with high mortality rate in developing countries since most of the patients' present late [18-22].

4.1 Breast Cancer

A total of 1106 cases of breast cancer were seen. A closer look shows that the highest peak prevalent (73.6% of cases) is between 35 and 60 years of age and significant proportion of these cancers (8.3% of case) were also seen at ages below 30 years. The proportion of those with breast cancer increased with age and decline sharply after 60 years. The decline in age range is due to fewer people that reach this age group since the life expectancy in Nigeria is relatively low- 54.5 years [23]. Like most cancers, the exact cause of breast cancer is not known, but however a number of risk factors have been established to increase breast cancer in certain women [3,19,24,25,26]. Hereditary factor is known to cause breast cancer in about 5 – 10% of cases seen in families and the risk increases with first degree relatives [27]. It is also known that age plays a significant role in breast cancer like other cancers. Breast cancer risk rises throughout a woman's lifetime, peaking at the 70 to 80 years [3]. The cancer tends to be more aggressive in young women than the elderly. Other risk factors are environmental in origin, such as exposure to radiation, diet, and obesity and unidentified risk factors [3,19,24,25,26].

It is to be noted that this study show that breast cancer has been recorded in women less than 20 years of age. This young age group is frequently associated with triple negative breast cancers, an aggressive subtype of the malignancy [28,29]. Triple negative breast cancer is the commonest molecular subtype of breast cancer in Jos, [30] a finding that was corroborated by other Nigerian reports [31,32].

4.2 Cervical Cancer

Cervical cancer was the second most common cancer in women in this study. In some centres in the country, they constitute the commonest in women [6,7]. The figures showed that cervical cancer occurs mainly in reproductive age group from 3rd decade and peaks at 6th decade. This is one cancer that was a leading cause of cancer death in America and Europe fifty years ago. There is no cancer that better documents the remarkable benefit of effective screening, early diagnosis and curative therapy than cervical cancer. This achievement is due to Pap smear screening, which detects both infectious and early signs of cervical cancer.

Unfortunately, due to lack of national policy on cancer screening, most women in developing countries present to doctors when the disease has reached an advanced stage with cure rate decreasing significantly.

Table 8. Age distribution of colorectal cancer patients in JUTH (1987-2014)

Age (range in years)	Number	Percentage (%)
< 20	1	0.26
21 – 24	3	0.79
25 – 29	11	2.90
30 – 34	15	3.96
35 – 39	13	3.43
40 – 44	11	2.90
45 – 49	21	5.54
50 – 54	15	3.96
55 – 59	58	15.30
60 – 64	93	24.54
65 – 69	123	32.45
70 – 74	15	3.96
Total	379	100

Cancer of the cervix is a sexually transmitted disease. Therefore, the prevalence and incidence increase with multiple sexual partners and other sexually transmitted infection (STI). The infectious agent most commonly implicated is Human Papilloma Virus, discovered in the early 80s as a causative agent in genital tumour. Patients who have other genital infections, ulcers and Human Immunodeficiency Virus (HIV) have higher risk of cervical cancer. The virus is believed to integrate with cellular genome and cause transformation of the normal cell into a cancerous cell. However, with early detection of precursor cells or early cancer cells through pap smear screening, prevention or 100% cure is achievable respectively [6,21,22].

4.3 Prostate Cancer

Prostate cancer is the most common cancer in adult men and carries a significant health challenge worldwide in the elderly [3,5,6]. In this study it was the most frequent male malignancy accounting for 25.1% of all male cancers, corroborating findings globally [4,13,14]. Prostate cancer occurs early in blacks and African-Americans but earlier in Asian countries [3]. The incidence increases with advance in age. Based on autopsy studies, its' incidence increases from 20% in men in their 50s to approximately 70% in men between the ages of 70 and 80 years [3]. In our centre, the highest age proportion is in the 6th and 7th decade of life. The prevalence dropped lower after 70 years of age because of lower proportion of adult males in that age group [20,23].

As with other cancers, our knowledge of the cause of prostate cancer is limited. Several factors have been speculated to cause or decrease incidence of prostate cancer. However, what is clear is that it is more common in African blacks and African-Americans [2,3,33]. This cancer is sometimes observed to be a disease of men which they are more likely to die with it than from it. This is because with advancing age, there are often competing morbidities, and prostate cancer has a slow progression which enables the patient to live with the condition long enough. The disease is curable when localized within the prostate. However, a few proportion of prostate cancers have aggressive biological behaviour and may kill the patient early [34,35].

4.4 Liver Cancer

Liver cancer is the commonest visceral malignancy in Nigeria with high prevalence amongst men [7,36]. In this study it is one of the five leading cancers. The age distribution shows that it is a disease that occurs in late adolescence to 6th and 7th decades worldwide. It accounts for 5% of all cancers with highest toll in Africa and Asia [5,37,38]. More than 85% of cases of liver cancer occur in countries with high rate of chronic HBV infection, and aflatoxin toxicity [4,13,14]. In this study, the peak age range for liver cancers was in the 4th and 5th decades of life. The highest incidence occurs in Asia and sub-Sahara Africa countries [13]. In these areas, the transmission of HBV occurs early in life especially via mother to child. The type of liver cancer in this early age is devoid of liver cirrhosis, unlike what is seen in 5th and 6th decades. The important risk factors in liver cancer are viral infections (HBV, HCV), toxins/chemicals from aflatoxins and chronic alcohol consumption [4,13]. These risk factors are highly endemic in Nigeria as in other sub-Saharan African countries [1,2,3,10,11]. However, with the recent introduction of vaccination against HBV, it is expected that the incidence of liver cancer in Nigeria will decrease.

4.5 Colorectal Cancer

Colorectal cancer was once believed to be rare in Africans, but our study, and those from other parts of Africa have shown that the cancer is not only common, but occurs in younger age group [6,39,40]. As with other cancers, the risk of colorectal cancer increases with advancing age. Colorectal cancer is the third leading cause of cancer death in America and Europe [2,3,5]. In Nigeria however, the commonest cause of cancer deaths are from those of the breast, cervix, prostate, white blood cells and then colorectal cancer [5,6,7].

The dietary factors most closely associated with increased risk of colorectal cancer are low intake of un-absorbable vegetable fibres and high intake of refined carbohydrate and saturated fat mainly from animal sources [3]. It is theorized that reduced fibre content leads to decrease stool bulk and altered composition of the intestinal flora. This change may lead to potentially toxic by-products of bacterial metabolism which would be expected to remain in contact with colonic mucosa for longer period of time as a result of reduced stool bulk. High fat

intake enhances hepatic synthesis of cholesterol and bile acid which can be converted into carcinogens by intestinal bacteria [3,5,39,40].

Other risk factors include familial adenomatous polyp, chronic ulcerative colitis and sedentary lifestyle. Africa and some Asian countries have demonstrated the presence of schistosoma ova in the colon of patients with colorectal cancers [42,43]. Whether these are causal or coincidental is not yet ascertained [41,42].

4.6 Non-Hodgkin Lymphoma

Non-Hodgkin lymphoma (NHL) appears as a common malignancy in both sexes. This is one of the curable cancers and some patients may undergo complete remission [43]. It featured amongst the top five cancers in this study. This was corroborated by a report in Sokoto, Nigeria [17]. However, in other Nigerian reports, it is fell short of the top five [7,15,16]. Non-Hodgkins lymphoma is a heteregenous group of malignancies [43]. The disease has been associated with risks factors, among which is EBV (Ebstein Barr virus) [44]. In some parts of Africa where where Burkitts Lymphoma (a subtype of NHL) has high incidence, almost all cases have been shown to have EBV DNA, or nuclear antigen in cancer cells [44]. Malaria infection a serious public health concern in our locality has also been strongly associated with the disease [45].

4.7 Cancer Screening

From the foregoing cancer burden can be substantially reduced by vigorous educational campaign on the various risk factors and screening programs such as those for breast, prostate, cervical and colorectal cancers. It is known fact that cervical cancers can be eliminated with regular PAP screening which not only detect early premalignant lesion, but infectious agents that may predispose to cervical cancer. This program has almost eliminated cervical cancer in America and Europe, where screening is mandatory for all females in reproductive age. With the introduction of mammogram in the early 80s breast cancer prevalence and death from breast cancer has been reduced substantially. This program is not undertaken routinely in our environment and in fact most people are unaware of the screening benefits of mammogram [46]. There is no specific program in our Centre for colorectal cancer screening, except in the private clinics, and with near absence of national health insurance, it becomes increasingly difficult for most patients in a poor resource environment like ours to access colonoscopy facility [46-58].

5. CONCLUSSION

The study showed that the most frequent cancers in JUTH are those of the breast, cervix, prostate, liver and lymphomas, respectively in decreasing order. Screening for the commonest three-which accounted for 41.3% of cases- is available locally and should be encouraged in patients at risk. This would help in prevention and early detection of these malignancies, to curb the rising incidence of mortality from these diseases. Allocation of resources to this end should be emphasized and solicited from government, cooperate bodies and philanthropist. This would aid in procurement of equipment, human capacity building, and public campaigns.

CONSENT

It is not applicable.

ETHICAL APPROVAL

It is not applicable.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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