Original Article

Changing Pattern of Cancer Distribution: Experience From a Tertiary Health Institution in Nigeria and Review of Literature

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Abstract

Background: Over the years, epidemiological surveys have established that the five leading cancers in Africa (in descending order of prevalence) are cancers of the breast, cervix, prostate, liver, and colorectum.[1] However, a 10-year retrospective review of cases performed at the University of Ilorin Teaching Hospital (UITH) revealed some changes in the cancer incidence pattern in this region. **Aims:** The aim of the study was to determine the distribution of cancers managed at the UITH, a tertiary health care center in North Central Nigeria, in the past 10 years and create awareness of changing cancer prevalence patterns in this region. **Materials and Method:** This was a retrospective review of cancer epidemiology at UITH over a period of 10 years. Confirmed cancer cases within this period were extracted from the data in the Department of Anatomic Pathology and the Cancer registry. Descriptive and inferential statistics were applied to obtain rates and proportions for both sexes. **Results:** There were 2430 confirmed cases of cancer during the study period from January 2011 to December 2020. Out of these cases, 1310 (54%) were seen in females and 1120 (46%) were seen in males. The most common cancer recorded (in total) was prostate cancer, which accounted for 18% of all cases, constituting approximately one in six of all cancer cases. This was followed closely by breast cancer (16.6%). The most commonly diagnosed cancer in males was prostate cancer (four in ten cancer cases in males), whereas in females, it was breast cancer (approximately three in ten cancer cases in females). Cancers of the lungs and liver were rare in both sexes in this study. In children, the most common malignancies were retinoblastoma (38.3%), non-Hodgkin lymphomas (16.8%), and nephroblastoma (12.8%). **Conclusion:** There is a changing trend in cancer cases with some cancer cases now predominating compared to previous years. This may be because of increased awareness and/or better medical screening and diagnostic techniques.

Keywords: *Cancer distribution, changing pattern, Nigeria, UITH*

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Introduction

Cancer, a non-communicable disease, is a public health problem worldwide affecting all categories of persons. It is the second most common cause of death in developed countries and among the three leading causes of death in developing countries.[1] Globally, one in five people develop cancer during their lifetime, one in eight men and one in 11 women die from the disease, and more than 50 million people currently live with cancer.[1] According to the GLOBOCAN data in 2020, there was an estimated 19.3 million new cases and 10 million cancer deaths worldwide, with about 5.7% of new cases seen in Africa compared to 49.3% in Asia, 22.8% in Europe, and

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20.9% reported in America. The mortality rates in Asia and Africa were higher than the incidence rate.[2]

Worldwide, the ten most common cancer types accounted for more than 60% of the newly diagnosed cancer cases and greater than 70% of cancer mortality.[3] The most commonly diagnosed cancer in both sexes was female breast cancer, accounting for 11.7% of all cases. This was followed by lung (11.4%), colorectal (10.0%), prostate (7.3%), and stomach (5.6%) cancers. The leading cause of cancer mortality was lung cancer, constituting 18.0% of the total cancer deaths, followed by colorectal (9.4%), liver (8.3%), stomach (7.7%), and female breast (6.9%) cancers.[3]

In males, lung cancer (14.3%) and prostate cancer (14.1%) were the most commonly diagnosed cancers,[3] both of which are responsible for nearly one-third of all male cancers, followed closely by colorectal cancer (10%), and the leading cause of mortality was lung cancer (21.5%), followed by liver and colorectal cancer. Breast cancer was the most frequently diagnosed cancer in females, constituting one in four of all cancer cases, followed by colorectal and lung cancer (9.4% and 8.4%, respectively). Breast cancer (15.5%) also accounted for the leading cause of cancer death in females, followed by lung and colorectal cancers.[3]

In Africa, there was an estimated 1.1 million new cases and 0.7 million cancer deaths.[1] The most commonly diagnosed cancer was breast cancer, constituting 16.8% of all cases, followed by cancers of the uteri cervix (10.6%), prostate (8.4%), liver (6.4%), and colorectum (6%). In males, prostate cancer accounted for approximately one in five of newly diagnosed cases, whereas the other common cancers in descending order included cancers of the liver, colorectum, lungs, and non-Hodgkin lymphoma. In females, breast cancer was the most commonly diagnosed cancer, accounting for one-third of new cancer cases, followed by cancer of the cervix, colorectum, liver, and ovary.[1]

The leading causes of cancer mortality in females were cancers of the breast, cervix, liver, and lungs, whereas in males, prostate cancer had the highest mortality, followed by lungs and liver cancers.[2]

The data from the cancer registries in Ibadan and Abuja showed that the most common cancers in males were those of the prostate, skin (non-melanoma), and liver, whereas in women, they were the cancers of the breast, cervix, and ovary.[4] In Ilorin, over a 5-year period from 1999 to 2003, the most commonly diagnosed cancers in males were cancers of the liver, prostate, and colorectum, whereas in females, the leading causes were breast, cervix, and hepatocellular carcinoma.[5]

Materials and Methods

This was a retrospective review of all cases of cancer histologically diagnosed at the study center. The study population included all males and females who had cancer diagnosed at the Department of Pathology in the hospital during the study period. The study covered a 10-year period from January 1, 2011 to December 31, 2020. All cases of cancer seen during the study period with their biodata and clinical data were compiled from the cancer registry and compared with the departmental diagnosis register. From this list, only cases diagnosed at the Pathology Department of the hospital were selected. Rates and proportions were determined, and their 95% confidence intervals were calculated as estimates of their values in the population.

The main outcomes measured were the prevalence rate of cancer overall and prevalence rates based on the site of the malignancy in each gender.

Results

The total number of cancer cases reported over the 10-year period was 2430 (1120 in males and 1310 in females) with a ratio of 1:1.2. Prostate cancer was the most commonly diagnosed cancer overall with 441 cases, constituting 18.2%. This is followed closely by breast cancer with a record of 403 cases (16.6%) with 399 cases in females and four cases in males. The other frequently diagnosed cancers are cancers of the colorectum, 240 cases (9.9%); cervix, 181 cases (7.5%); non-Hodgkin lymphoma, 106 cases (4.4%); non-melanocytic skin cancers, 83 cases (3.4%); stomach, 78 cases (3.2%); eye, 68 cases (2.8%); bladder, 50 cases (2.0%); kidney, 48 cases (2.0%); and lungs with 35 cases, constituting 1.4%.

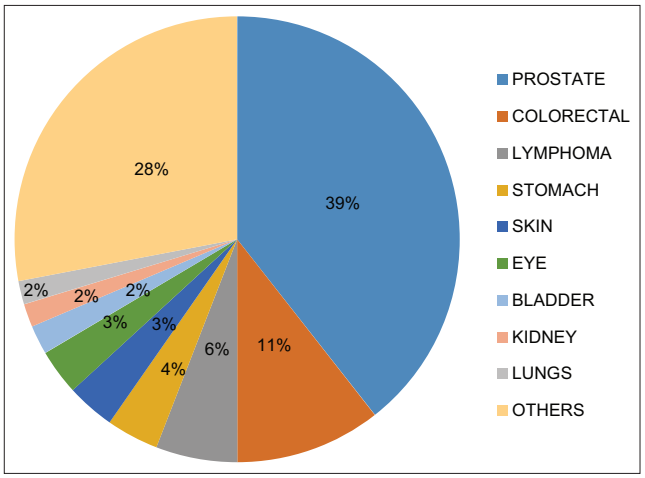

Figure 1: Distribution of Common cancers seen in males in UITH between 2011-2020

Table 1: Gender distribution of commonly diagnosed cancers in UITH between 2011 and 2020

Males			Females		
	Number of cases	Percentage of total (%)		Number of cases	Percentage of total (%)
Prostate	441	39.4	Breast	399	30.6
Colorectal	119	10.6	Cervix	181	13.9
Non-hodgkin lymphoma	66	5.9	Colorectal	121	9.
Stomach	43	3.8	Skin	44	3.4
Skin	39	3.5	Non-hodgkin lymphoma	40	3.1
Eye	37	3.3	Stomach	35	2.7
Bladder	26	2.1	Eye	31	2.4
Kidney	19	1.7	Kidney	28	2.1
Lungs	19	1.7	Bladder	24	1.6
Others	311	28.0	Lungs	16	1.2
			Others	391	29.7
Total	1120			1310	

Table 2: Distribution of commonly diagnosed childhood malignancies seen at the UITH between 2011 and 2020

	Males		Females	
	No.	%	No.	%
Retinoblastoma	31	37.3	26	39.3
Non-hodgkin lymphoma	18	21.7	7	10.6
Nephroblastoma	9	10.8	10	15.2
Others	25	30.1	24	36.4
Total	83		67	

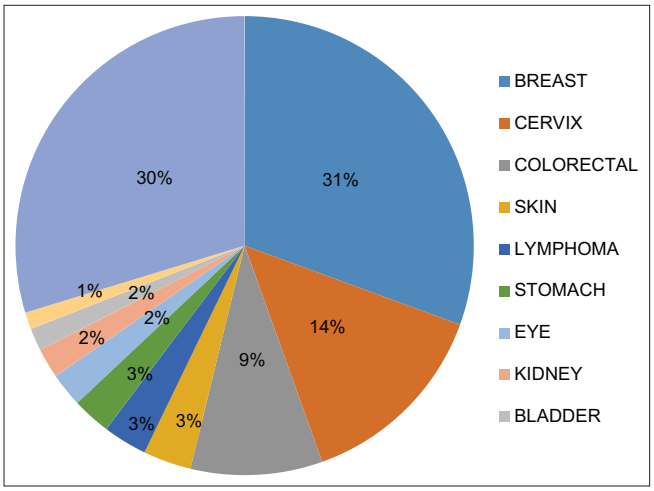

Figure 2: Distribution of Common cancers seen in females in UITH between 2011-2020

In males, prostate cancer was the most frequently diagnosed cancer (441, 39.4%), followed by colorectal cancer (119, 10.6%) and non-Hodgkin lymphoma (66, 5.9%). Others include cancer of the stomach (3.8%), non-melanocytic skin cancers (3.5%), cancer of the eye (3.3%), cancer of the urinary bladder (2.1%), cancer of the kidney (1.7%), and lung cancers, accounting for 1.7% of the cases [Table 1 and Figure 1].

Breast cancer was the most commonly diagnosed cancer among females with 399 cases seen, constituting approximately one in three cases of cancers in women. This is followed by cancer of the cervix with 181 cases (13.9%) and colorectal carcinoma with 121 cases (9.3%). Others included cancer of the skin (3.4%), non-Hodgkin lymphoma (3.1%), cancer of the stomach (2.7%), cancer of the eye (2.4%), cancer of the kidney (2.1%), and cancers of the urinary bladder (1.6%) and lungs (1.2%). In both sexes, cancers of the lungs were rare; 19 cases were seen in males, and 16 cases were seen in females [Table 1 and Figure 2].

There were 150 cases of childhood malignancy recorded in the study period with a male to female ratio of 1.2:1 [Table 2]. The most common cancers seen were retinoblastoma with 57 cases (38.3%), non-Hodgkin lymphomas with 25 cases (16.8%), and nephroblastoma with 19 recorded cases, constituting 12.8%. Other childhood malignancies seen include osteosarcoma, Ewing sarcoma, and rhabdomyosarcoma. The most common malignancy in both sexes was retinoblastoma with 31 cases diagnosed in males and 26 cases in females. The two most commonly diagnosed childhood cancers in males were non-Hodgkin lymphoma (18 cases) and nephroblastoma (nine cases). In females, these were nephroblastoma (ten cases) and non-Hodgkin lymphoma (seven cases).

Discussion

This study shows that the most commonly diagnosed cancers in this center are prostate cancer, breast cancer, and colorectal cancer. This is a change from the previous study done in this center 2 decades ago, where the most commonly reported cancers were breast cancer, cervical cancer, and hepatocellular carcinoma.[5] Furthermore,

this study shows that in males, prostate cancer was the most frequently diagnosed cancer, followed by colorectal cancer and non-Hodgkin lymphoma, while in females, breast cancer was the most commonly diagnosed cancer, followed by cancer of the cervix and colorectal carcinoma. Conversely, about 20 years ago, the most commonly diagnosed cancers in males were cancers of the liver, prostate, and colorectum, while in females, the leading causes were breast, cervix, and hepatocellular carcinoma.[5]

Similar studies across Nigeria show that prostate cancer is the most commonly diagnosed cancer in males, while in females, cancer of the breast remains the most common.[4] Rising trends of prostate cancer have also been reported in other sub-Saharan African countries such as South Africa, Kenya, Uganda, Mozambique, and Zimbabwe, with annual increases ranging from 2 to 10%.[6] This growing trend may be due to increased awareness and improvements in the health care system, leading to increasing PSA testing and in some cases increased transurethral resections.[6]

On the other hand, the low rate of hepatocellular cancer (HCC) reported may be due to vaccination, the increased rate of hepatitis screening, and its subsequent reduction in the incidence of hepatitis. According to the GLOBOCAN statistics, the incidence and mortality rates are 2–3 times higher in males than females in most regions and it is the fifth most common cancer in males, with the highest rates seen mainly in transitioning countries. HCC is the most common cancer in 11 geographically diverse countries in eastern Asia (Mongolia, which has the highest rates in the world), south-eastern Asia (Thailand, Cambodia, and Vietnam), and northern and western Africa (Egypt and Niger).[3] Hepatocellular carcinoma is the fourth most common cancer in Africa (second only to prostate cancer in males and the fourth most commonly diagnosed in females).[1] A similar study carried out in this facility about 20 years ago showed that HCC was the third most frequently diagnosed cancer overall. It was the most common in males, even more than prostate cancer, and was the third most common cancer in females.[5] Also, in Abuja and Ibadan, hepatocellular carcinoma was seen frequently, especially in males, where they constituted the third and fourth most commonly reported cancers, respectively.[4]

The main risk factors for HCC vary across regions; they include chronic infection with hepatitis B virus (HBV) or hepatitis C virus (HCV), aflatoxin-contaminated foods, heavy alcohol intake, excess body weight, type 2 diabetes, and smoking.[7] In most high-risk HCC areas (such as China, the Republic of Korea, and sub-Saharan Africa), the major predisposing factors are chronic HBV infection, exposure to aflatoxin, or both. However, HCV infection is the most likely cause in other regions like Japan, Italy, and Egypt.[3]

Incidence and mortality rates of liver cancer have decreased in many high-risk countries in eastern and south-eastern Asia, including China, Taiwan, the Republic of Korea, the Philippines, and Italy.[8] This is likely due to reduced seroprevalence of HBV and HCV and also reduction in the exposure to aflatoxins. Furthermore, the vaccination program against HBV has drastically reduced the prevalence of HBV infection and therefore the incidence of HCC in high-risk countries in eastern Asia.[9]

HBV vaccine has been introduced to the national infant immunization programs in 189 countries as of 2019, and the global coverage with three doses of hepatitis B vaccine was estimated at 83% (72% in Africa, 85% in south-east Asia, and 95% in western Pacific).[10] The global coverage of hepatitis B vaccine at birth within the first 24 hours of life is 42% (only 6% in WHO African region compared to 84% in the WHO western Pacific region).[11]

In contrast to HCC, the prevalence of colorectal cancer increased in both sexes in this study as compared with the previous study in this center. However, the prevalence rates were low in Ibadan, where it constituted 7.6% of male cancers and 2.9% of female cancers.[4] Also in Abuja, it was just 4.5% of cancers reported in males and 2.4% in females[4] as opposed to 10.6% and 9.3% in males and females, respectively, in this study. Incidence rates of colorectal cancer have been steadily rising in many countries in eastern Europe, south-eastern and south central Asia, South America, and sub-Saharan Africa.[12,13] The increase in these transitioning nations is mostly due to changes in lifestyle factors and diet, such as increased intake of animal-source foods and a more sedentary lifestyle, leading to decreased physical activity and increased prevalence of excess body weight, which are independently associated with colorectal cancer risk.[14] Other risk factors include heavy alcohol consumption, cigarette smoking, and consumption of red or processed meat, whereas calcium supplements and adequate consumption of whole grains, fiber, and dairy products appear to decrease risk.[3] These factors are existent in the study area with an increase in alcohol consumption and consumption of red meat.

Female breast cancer is the most common cancer in females worldwide. This is similar to the findings in this study and also the previous study conducted in this center. It is also similar to studies in other parts of the

country and most countries in Africa.[3,4] However, notable exceptions in Africa include the Democratic Republic of Congo, Angola, Zambia, Zimbabwe, Tanzania, Madagascar, and Mozambique, where cancer of the cervix is the most commonly diagnosed cancer among females. Also, in South America, Bolivia was the only country where cancer of the cervix was diagnosed more than breast cancer.[3] There is a rising incidence of breast cancer in LMIC as seen in South America, Africa, and Asia. Most of the rapid rises are reported in sub-Saharan Africa with incidence rates increased by greater than 5% per year in Malawi (Blantyre), Nigeria (Ibadan), and Seychelles and by 3–4% per year in South Africa (eastern Cape) and Zimbabwe (Harare) between the mid-1990s and the mid-2010s.[15] This may be due to changes in both hormonal and lifestyle factors. The hormonal factors include early age at menarche, late menopause, advanced age at first birth, fewer children, infrequent breastfeeding, menopausal hormone replacement therapy, and oral contraceptives, and lifestyle risk factors include intake of alcohol, obesity, and physical inactivity. The incidence has also increased due to increased detection through mammographic screening.[3]

Cervical cancer, the fourth most frequently diagnosed cancer in women in 2020 globally and the second in Africa, is the second most commonly reported cancer in this study, which was also the second most common cancer 20 years ago in our center. This is also similar to other regions in Nigeria.[4] In contrast, few countries in Africa report cervical cancer as the leading cause of cancer in females. These nations include Malawi, the Democratic Republic of Congo, Angola, Zambia, Zimbabwe, Tanzania, Madagascar, and Mozambique. This is also the case seen in Bolivia, a South-American country.[3] The incidence has declined in most regions of the world in the past few decades, and this has been associated with either increasing average socioeconomic levels or reducing the risk of persistent infection with high-risk HPV as a result of improved genital hygiene, reduced parity, and a diminishing prevalence of the sexually transmitted disease.[16]

Cervical cancer screening programs have also heightened the fall in the incidence upon their implementation in Europe, northern America,[3] countries in the Caribbean, and Central and South America.[17] However, due to the defective screening programs, there has been rising incidence in sub-Saharan African countries, including Gambia, Kenya, Malawi, Seychelles, South Africa, Uganda, and Zimbabwe.[18] Cervical cancer is nearly completely preventable due to the effective primary (HPV vaccine) and secondary (screening) prevention measures. However, these measures are predominant mostly in HIC with more than 80% of nations implementing these measures as opposed to less than 30% of LMICs.[19] Greater than 60% of women have been reported to have been screened for cervical cancer, while only about 44% of women in LMICs have ever been screened.[3]

Lung cancer, which is the second most commonly diagnosed cancer in 2020, representing approximately one in ten (11.4%) cancers,[3] is rare in this study, accounting for 1.4% of all cancers in both sexes and also in the previous study in this center as well as other parts of the country.[4,5] Lung cancer is the tenth most common cancer in males and also females in this study. The incidence rate of lung cancer is reported to be 3–4 times higher in transitioned countries than in transitioning countries; however, this pattern is expected to change as in 2016, 80% of smokers aged 15 years and above resided in LMICs.[3] Lung cancer is the most commonly diagnosed cancer in 36 countries, which include Russia, China, Kazakhstan, Turkey, Syria, Iraq, Algeria, and Libya. However, in Africa, the incidence rates remain generally low.[3]

Other cancers common in certain regions include non-melanoma skin cancer, the most frequently diagnosed cancer in Australia and New Zealand and the sixth most common in this study. Liver cancer, although rare in this study, was the third most frequently diagnosed cancer in this center 2 decades ago. Liver cancer is the most common cancer in countries in eastern Asia (Mongolia, which has rates far exceeding any other country), south-eastern Asia (Thailand, Cambodia, and Vietnam), and northern and western Africa (Egypt and Niger).[3] Bladder cancer is the tenth most commonly diagnosed cancer worldwide,[3] similar to this study. It is more common in men than in women, accounting for the seventh and ninth most common cancers in males and females, respectively. The rates in both sexes are the highest in southern Europe (Greece, Spain, and Italy), western Europe (Belgium and the Netherlands), and North America.[3] Infection with *Schistosoma haematobium* in parts of north and sub-Saharan Africa may be the major cause in these regions.[20]

Conclusion

There is a changing trend in cancer cases with prostate cancer, breast cancer, and colorectal cancer, now the most commonly reported cancers in this facility as compared to those 2 decades ago, when the predominant malignancies were cancers of the breast, cervix, and liver. This may be due to factors such as increased awareness, better medical screening and diagnostic techniques, and increased HBV vaccination among others.

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Conflicts of interest

There are no conflicts of interest.

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