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Cancer Incidence in Nigeria: A Report from Population-based Cancer Registries

Elima Jedy-Agba^{a,*}, Maria Paula Curado^{b,*}, Olufemi Ogunbiyi^{c,*}, Emmanuel Oga^{a,*}, Toyin Fabowale^{c,*}, Festus Igbinoba^{d,*}, Gloria Osubor^{d,*}, Theresa Otu^{e,*}, Henry Kumai^{e,*}, Alice Koechlin^{b,*}, Patience Osinubi^f, Patrick Dakum^a, William Blattner^{g,h}, and Clement A. Adebamowo^{a,g,h}

^aInstitute of Human Virology (IHVN), Abuja, Nigeria

^bInternational Prevention Research Institute, Lyon, France

^cUniversity College Hospital Ibadan, Nigeria

^dNational Hospital Abuja, Nigeria

^eUniversity of Abuja Teaching Hospital Gwagwalada, Nigeria

^fFederal Ministry of Health of Nigeria, Federal Secretariat, Abuja, Nigeria

^gGreenebaum Cancer Center, University of Maryland School of Medicine, Baltimore, MD 21201

^hInstitute of Human Virology, University of Maryland, Baltimore, MD 21201

Abstract

Introduction—Cancer has become a major source of morbidity and mortality globally. Despite the threat that cancer poses to public health in sub-Saharan Africa (SSA), few countries in this region have data on cancer incidence. In this paper, we present estimates of cancer incidence in Nigeria based on data from 2 population-based cancer registries (PBCR) that are part of the Nigerian national cancer registry program.

Materials and methods—We analyzed data from 2 population based cancer registries in Nigeria, the Ibadan Population Based Cancer Registry (IBCR) and the Abuja Population Based Cancer Registry (ABCR) covering a 2 year period 2009–2010. Data are reported by registry, gender and in age groups. We present data on the age specific incidence rates of all invasive cancers and report age standardized rates of the most common cancers stratified by gender in both registries.

Results—The age standardized incidence rate for all invasive cancers from the IBCR was 66.4 per 100 000 men and 130.6 per 100,000 women. In ABCR it was 58.3 per 100 000 for men and

Authors Contributions

All these authors* contributed equally to the writing of this paper. CAA obtained funding and guided all aspects of this report.

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To whom correspondence should be addressed: Dr. Elima Jedy-Agba, Office of Strategic Information, Training and Research, Institute of Human Virology, Nigeria, 252 Herbert Macaulay Way, Central Business District, Abuja, Federal Capital Territory, Nigeria, elima.jedyagba@gmail.com.

Conflicts of Interest

The authors declare no conflict of interest.

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138.6 per 100 000 for women. A total of 3 393 cancer cases were reported by the IBCR. Of these cases, 34% (1 155) were seen among males and 66% (2 238) in females. In Abuja over the same period, 1 128 invasive cancers were reported. 33.6% (389) of these cases were in males and 66.4% (768) in females. Mean age of diagnosis of all cancers in men for Ibadan and Abuja were 51.1 and 49.9 years respectively. For women, mean age of diagnosis of all cancers in Ibadan and Abuja were 49.1 and 45.4 respectively. Breast and cervical cancer were the commonest cancers among women and prostate cancer the most common among men. Breast cancer age standardized incidence rate (ASR) at the IBCR was 52.0 per 100 000 in IBCR and 64.6 per 100 000 in ABCR. Cervical cancer ASR at the IBCR was 36.0 per 100 000 and 30.3 per 100 000 at the ABCR. The observed differences in incidence rates of breast, cervical and prostate cancer between Ibadan and Abuja, were not statistically significant.

Conclusion—Cancer incidence data from two population based cancer registries in Nigeria suggests substantial increase in incidence of breast cancer in recent times. This paper highlights the need for high quality regional cancer registries in Nigeria and other SSA countries.

Keywords

population-based cancer registries (PBCR); cancer incidence; cancer registration; sub-Saharan Africa (SSA)

Introduction

Cancer has become a major source of morbidity and mortality globally.[1] In 2008, there were 12.7 million new cases and 7.6 million cancer-related deaths.[2] Most, 56% of these newly reported cancer cases occurred in developing countries and It is projected that by 2030, 70% of all new cases of cancer will be found in developing countries.[3] Most of this increase in incidence is a result of population growth and increased life expectancy.[4]

In Nigeria, some 100 000 new cases of cancer occur every year, with high case fatality ratio. [2] With approximately 20% of the population of Africa and slightly more than half the population of West Africa, Nigeria contributed 15% to the estimated 681,000 new cases of cancer that occurred in Africa in 2008.[1] Similar to the situation in the rest of the developing world, a significant proportion of the increase in incidence of cancer in Nigeria is due to increasing life expectancy, reduced risk of death from infectious diseases, increasing prevalence of smoking, physical inactivity, obesity as well as changing dietary and lifestyle patterns.[1]

Despite the threat that cancer poses to public health in sub-Saharan Africa (SSA), few countries in this region have data on cancer incidence.[5] Most of the cancer incidence data in SSA in recent times is based on reports from registries in The Gambia, Zimbabwe and Uganda.[5] These cancer registries have consistently provided incidence data for the last 10–20 years despite the difficulties of sustaining cancer registration in developing countries.[6; 7; 8; 9; 10]

In recent times, information on cancer incidence, prevalence and mortality in Nigeria has been based on estimates from case series, medical records, mortality records, hospital based cancer registries and the Ibadan population based cancer registry (IBCR).[11] IBCR, located at the University College Hospital Ibadan and set up in 1962, is the first cancer registry in Nigeria. Cancer incidence data from this registry were published for the time periods 1960–1962, 1960–1965, and 1960–1969 in the first three volumes of Cancer Incidence in 5 Continents (CIV). However, due to logistic problems the registry suffered some setbacks from the 1970s to 2000s. [12]

Since 2009, the Nigerian Federal Ministry of Health (FMOH) and the Institute of Human Virology Nigeria (IHVN) have initiated a program of National System of Cancer Registries to strengthen existing cancer registries and establish new ones through provision of baseline training for newly established registries; continuing education for older registries; mentoring, computer hardware and software provision and support; data management and analysis. In this paper, we present estimates of cancer incidence in Nigeria based on data from 2 population-based cancer registries in the system. These registries cover defined populations and use multiple source reporting. (We discuss the data from the other Nigerian registries in a separate publication)

The Ibadan Cancer Registry is located in one of the oldest cities in Nigeria, Ibadan, a small city in Oyo state, Southwestern Nigeria. (Figure 1) The major ethnic group in this region is *Yoruba*, one of the largest ethnic groups in Africa. The common religions in this area are Islam and Christianity. The major source of income is agriculture and industries. In contrast, the Abuja Cancer Registry (ABCR) is located in the modern capital city of Abuja Nigeria which is centrally located and home to people of varied ethnic groups and religions. (Figure 1) Abuja is the more developed of the two cities and houses major multinational companies, foreign embassies, the legislative and executive arms of government, and is attractive to young people seeking job opportunities and career advancement.

Materials and Methods

We analyzed data from 2 population based cancer registries in Nigeria, the Ibadan Population Based Cancer Registry (IBCR) and the Abuja Population Based Cancer Registry (ABCR). These registries cover a combined population of 3,955,504 which is approximately 2.5% of the total Nigerian population. Ibadan is located in the South West while Abuja is in the North Central part of the country. (Figure 1) The data in this report covers the period 2009 to 2010 for both registries.

Both registries use International Classification of Disease for Oncology, 3rd Edition (ICD-O3),[13] for classification and coding and CanReg4 software for storing, checking and processing data. All quality control checks and duplication checks were performed by the individual cancer registries and repeated by the Cancer Registry Coordinator at the Institute of Human Virology, Nigeria. We checked for duplication of cases across registry databases.

We exported the data to Microsoft Excel® for analysis. We computed the ASRs for all cancers in men and women, breast, cervix and prostate cancer, mean age at diagnosis and standard deviations of the means. We calculated incidence rate ratios and 95% confidence intervals using STATA 12® (College Station, TX). Denominator population data was drawn from the 2006 census data of the National Population Commission of Nigeria.[14]

We report results by registry, gender and in 10 year age groups because of low numbers when 5 year age groups were used. The age specific incidence rates and their confidence intervals for all invasive cancers first including Non Melanoma Skin cancer (NMSC), then excluding NMSC are also reported. We computed age standardized rates of the most common cancers stratified by gender in both registries, the age specific incidence rates per 100 000 and the mean age at diagnosis of cancer in men and women. We present the five most common cancers in each registry by sex and age.

Results

Overview of Ibadan and Abuja Cancer Registries

Ibadan Cancer Registry—The IBCR began in 1960 as a population based cancer registry. It covers the city of Ibadan and the surrounding 11 local government areas. The registry covers rural and urban populations with a slightly higher proportion in the rural areas. IBCR is a major unit within the department of pathology at the University College Hospital Ibadan. Proactive methods are used for data collection with over 30 sources of notification including general and specialist hospitals, pathology laboratories and privately owned clinics and hospitals. The registry ensures high quality of cancer data by emphasizing on histological diagnosis, re-abstraction and recoding of cases using ICD-O.

Abuja Cancer Registry—The Abuja Cancer Registry (ABCR) is located within the Oncology Department of the National Hospital Abuja. ABCR began in 2009 as a population based cancer registry and covers a population of 1 406 239 people. The city of the Abuja is the capital city of Nigeria with a predominantly urban population. The registry actively obtains cases from all the departments of the hospital that are involved in the diagnosis and treatment of cancer patients and from other notification sources including general hospitals and pathology laboratories outside the hospital.

Population structure of Ibadan and Abuja

The Ibadan population pyramid shows a predominantly young population with the highest proportion aged 5–9 years. The proportion of different age groups gradually reduces such that there are very few individuals in the 65 years and older group. The Abuja population pyramid shows the highest number of people in the 0–4 years age group and the proportion gradually reduce in size until an increase is again noted for the 25–29 years age group. (Figure 2) This secondary increase may be due to young people who are in Abuja in search of employment.

Cancer cases

We recorded a total of 4 521 cases of invasive cancer in both registries, 2 985 (66%) in females and 1 536 (34%) in males. Most, 3 393 (75.0%) cancers were reported by the IBCR, with 1 155 (34.0%) among males and 2 238 (66.0%) in females. In Abuja over the same period, 1 128 (25.0%) invasive cancers was reported, 381 (33.8%) in males and 747 (66.2%) in females. There was no significant difference in the distribution of cancers by sex between the 2 cancer registries (Fisher's exact test p -value = 0.89)

The mean age (SD) of diagnosis for cancers in men in Ibadan was 51.1 (20.1) years and in Abuja 49.9 (19.0) years, we found that the difference in mean age at diagnosis in men between the 2 registries was insignificant (p = 0.39). In women, mean age of diagnosis (SD) for all cancers in Ibadan was 49.1 (16.2) and 45.4 in Abuja (15.6) and the difference in means was significant (p < 0.001). Table 1 shows the number of cases by age group in each registry, and crude and age-standardized rates (ASR) for males and females respectively.

In rank order, the basis of diagnosis in Ibadan was histology of primary tumor in 42.6% of cases, clinical in 41.3%, cytology (10.3%) and others (5.9%). In Abuja the basis of diagnosis was histology of primary tumor in 68%, cytology (24%), clinical (3%) and others (5%). (Figure 3)

The combined age standardized incidence rate (ASR) for all cancers in males and females were 62.4 and 131.1 per 100 000 respectively. The ASR for all invasive cancers, including skin, in IBCR was 66.4 per 100 000 for males and 130.6 per 100,000 for females (p < 0.001).

In ABCR for males it was 58.3 per 100,000 and for females it was 138.7 per 100 000 ($p<0.001$). The highest number of cancer cases in men was seen in the 65 years and older age group in both registries. In women, the highest number of cases was found in age groups 45–54 and 35–44 in Ibadan and Abuja, respectively. (Table 1)

The most common cancers in men in Ibadan for all ages were cancer of the prostate (21.7%), colorectal (7.6%), non-melanoma skin cancer (NMSC) (6.4%), liver (6.1%) and non-Hodgkin's lymphoma (NHL) (4.8%). For women of all ages in rank order, the most common cancers in IBCR were, breast 40.8%, cervix 24%, ovary 3%, colorectal 2.9% and NMSC 2.4%. In ABCR, the most common cancers in men were prostate (28%), NMSC (8.7%), liver (7.1%), Kaposi sarcoma (6.6%) and colorectal (4.5%). Table 2 shows the proportion of the most common cancers in younger and older cohorts. In women the most common cancers were breast 50.8%, cervix 15.7%, ovary 4.2%, NMSC 3% and colorectal 2.4%. There was significant difference in the proportions of the most common cancers reported in the younger (0–44years) versus the older (45years and above) cohorts (Table 2).

When we calculated the rates for all cancers, first with non-melanoma skin cancer cases and without them, there was no change in the ASR in either of the registries. (Figure 4) There was a steady rise in incidence rate of all invasive cancers from age 0–4 years to 65 years and greater in men in both registries. Among women, the age specific incidence rate for all invasive cancers peaked at 55–64years in both registries (Figure 4).

The combined ASR of breast cancer from both registries was 54.3 per 100 000. For IBCR only it was 52.0 per 100 000 in and 64.6 per 100 000 in ABCR but the difference was not significant. ($p=0.06$). The combined ASR of cervical cancer from both registries was 34.5 per 100 000. Cervical cancer ASR at the IBCR was 36.0 per 100 000 and 30.3 per 100 000 at the ABCR and these were also not significantly different ($p=0.16$). (Table 1) The age specific incidence rates for cancer of the cervix in both Abuja and Ibadan followed a similar pattern up to 55–64 years after which the rates decreased steadily in Abuja but plateaued in Ibadan (Figure 5B).

The combined ASR for prostate cancer from both registries was 19.1 per 100 000. In Ibadan it was 17.4 per 100,000 and in Abuja, 25.8 per 100,000. This difference between the 2 registries was not significant ($p=0.17$) (Table 3). The age-specific rates for prostate cancer increased steadily up to the 65 and above age group where we recorded the highest rates in both registries (Table 1 & Figure 5C).

Both registries recorded only a few cases of Kaposi sarcoma, 40 in Abuja (25 in men and 15 in women) and 19 in Ibadan (12 in men and 7 in women) The ASRs for Kaposi sarcoma in men were 1.34 per 100 000 and 2.81 per 100 000 in Ibadan and Abuja respectively and were not significantly different ($p=0.38$) (Table 3).

Discussion

Our study shows that the commonest cancers in Nigeria in 2009 to 2010 were breast and cervical cancer among women and prostate cancer among men. We found significant increase in the incidence of breast cancer compared to historical records while the incidence of cervical cancer was relatively stable. There was very little disparity in the cancer incidence reported by registries in the northern and southern parts of the country regardless of differences in ethnicity and level of urbanization.

Our data suggests that the incidence of breast cancer in Nigeria has risen significantly. The age standardized incidence rates for breast cancer in the period 1960–1969 was 13.7 per 100 000 and it rose to 24.7 per 100 000 by 1998–1999 – more or less a doubling of incidence

over 4 decades or approximately 25% increase in incidence per decade. [11] With incidence in 2009 to 2010 at 54.3 per 100 000, this represents a 100% increase in the last decade. This is supported by the literature showing rise in breast cancer incidence rates in SSA[18] In our results, the incidence rate of breast cancer in Nigeria in 2010 was higher than the GLOBOCAN 2008 estimate of 38.7 per 100 000 [2], although the GLOBOCAN estimate is for the whole country and for a different time period. The increase in cancer incidence in women may be both apparent and real. Some of the increase noted may result from improved diagnosis, better case finding and improved access to care. Despite this, some of the increase in incidence may be real due to increasing prevalence of risk factors for these cancers in populations that hitherto had low incidence.[18]

Both registries in our study reported similar proportion of cases in males and in females and women had 2 times more cancers than men. The most common cancers in Nigeria were breast, cervix and prostate cancers. Possible explanations for the higher proportion of cancers occurring in women include differences in incidence pattern of cancers that occur commonly in both sexes compared to the age structure of the population. Other reasons include the relative ease of diagnosis and more specific symptomatology of common female cancers compared with those in men (prostate and liver), more frequent contact with the health care system by women due to uptake of maternal/child health care services, greater population awareness of breast and cervical cancers, better health-seeking behavior by women compared to men.[17]

The basis of diagnosis is a measure of validity in a cancer registry. Accuracy of diagnosis is notably higher if it is more frequently based on histological verification.[21] When the basis of diagnosis with histological verification is less than 80%, this may mean that there is poor validity[22]. International recommendations support a morphological basis of diagnosis of between 80 – 90% [22]. In contrast, when the basis of diagnosis includes morphological verification of greater than 90%, this may mean that there is a lack of completeness as the registry is utilizing mostly pathology laboratories at the expense of other notification sources[21]. Basis of diagnosis using histology of the primary tumor in ABCR was about 70% and approximately 45% in IBCR. Cytology was used in the diagnosis of 24% of the cases in ABCR. Clinical diagnosis was the second most common basis of diagnosis of cancer cases in IBCR (41%). This percentage of clinical diagnosis is quite high and may be related to high prevalence of advanced stage cancers in the hospital base of the IBCR. It has been reported in the literature that high numbers of patients diagnosed clinically is an indicator of late diagnosis or lack of resources in the country [22] and advanced stage at presentation is a common finding in Nigerian cancer patients.[23; 24]

Cervical cancer is the most common cancer among women in most of sub-Saharan Africa [25; 26]. However in Nigeria, it is the second most common after breast cancer.[2] Our findings are also somewhat similar to the 2008 GLOBOCAN estimates for the whole country of 32.9 per 100 000 for the period 1998 to 2002.[2] This suggests that the incidence of cervical cancer has remained largely stable over time. This seemingly stable incidence of cervical cancer over time could possibly be due to poor screening coverage in Nigeria.

Prostate cancer was the overall most common cancer in both registries. However, there was no significant difference in the incidence rate of prostate cancer between both registries. (Table 3) This was surprising because we expected that Abuja would have a significantly higher incidence rate of prostate cancer due to difference in socio-economic status of the populations covered by the Ibadan and Abuja as Ibadan residents have a lower socio-economic profile than Abuja. In the literature, the biological, socioeconomic and socio-cultural determinants of prostate cancer risk including low socio-economic status are

highlighted among a population of African Americans in the US as compared with a Caucasian population.[27]

Kaposi sarcoma incidence in men from our study is low compared to Eastern Africa where the ASRs in men in Harare Zimbabwe were 47.2 per 100 000 and 39.3 per 100 000 in Kampala Uganda in 2001.[28] However our findings are similar to findings from other west African countries such as Gambia and Cote d'Ivoire who enjoy relatively low incidence of KS.[28] The total number of KS cases was higher in ABCR compared to IBCR despite the smaller population at risk in Abuja. We speculate that this difference is probably due to the higher prevalence of HIV in Abuja (8.4%) compared to Ibadan (3.9%). [29] However, the cancer registries in this report do not routinely collect data on HIV status, and so the proportion of cases associated with HIV infection could not be ascertained. Findings of higher KS incidence in HIV positive populations, has been reported from Uganda and Zimbabwe.[6; 8] However, with increasing use of highly active antiretroviral therapy, the incidence of Kaposi sarcoma is expected to decrease.[30]

Our study is limited by the fact that the ABCR is a relatively new PBCR and data reported here is for the first 2 years of the registry's existence. Underreporting could occur due to lack of access to treatment and inclusion of only microscopically verified cases in the registry database. Also it is possible that older individuals for cultural reasons may not want to look for care and so may be missed out in the registration process. However, underreporting though possible was unlikely to be high in our data given that somewhat similar findings were obtained from the ABCR compared with the older, renowned IBCR.

Conclusion

We report cancer incidence from 2 regions in Nigeria showing that the most common cancers in women were cancer of the breast and cervix; and cancer of the prostate in Nigerian men. We also report an increase in incidence of breast cancer in recent times. Our study highlights the need for high quality regional cancer registries to serve a large country like Nigeria in order to adequately inform policy and allocation of resources for cancer treatment.

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Figure 1.

a) Map of Africa showing Nigeria b) Map of Nigeria showing Ibadan and Abuja

Figure 2.
Population pyramids of Ibadan and Abuja

Figure 3.
Most common basis of diagnosis in Ibadan and Abuja cancer registries

Figure 4. Age standardized rates for all cancers in men and women including and excluding NMSC for the period 2008–2010 in ABCR and IBCR.

Age-specific rates for breast cancer

Age-specific rates for cervix cancer

Age-specific rates for prostate cancer

Figure 5.

Age Specific Incidence Rates for Breast, Cervix and Prostate Cancer.

Table 1

Number of cases and age-specific rates per 100,000 for all cancers and most common cancers (prostate, breast and cervix) by sex and registry for time period 2009–2010

Age (years)	Males, all invasive						Females, all invasive						Prostate						Breast						Cervix											
	Ibadan			Abuja			Ibadan			Abuja			Ibadan			Abuja			Ibadan			Abuja			Ibadan			Abuja			Ibadan			Abuja		
	No.	Rate		No.	Rate		No.	Rate		No.	Rate		No.	Rate		No.	Rate		No.	Rate		No.	Rate		No.	Rate		No.	Rate		No.	Rate				
0-14	79	8.11	14	2.65	59	6.26	10	1.8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
15-24	49	9.48	17	6.80	55	10.4	36	12.5	0	0	1	0.40	7	1.33	11	3.82	1	0.19	3	1.04																
25-34	99	26.8	54	16.9	251	56.1	126	43.3	0	0	0	0	110	24.6	64	21.9	22	4.91	5	1.72																
35-44	150	56.1	65	31.9	493	173	218	166	1	0.04	3	1.47	273	95.7	142	108.1	87	30.5	23	17.5																
45-54	232	118	64	60.0	572	320	152	288	24	1.34	15	14.1	297	166.3	84	159.6	139	77.9	30	57.0																
55-64	210	200	69	191	422	442	121	612	60	4.58	25	69.3	143	149.8	50	253.0	145	151.8	35	177.1																
65 and >	336	326	96	403	372	397	84	418	166	11.4	63	265	88	93.8	29	144.1	146	155.7	21	104.3																
Total	1150	-	379	-	2224	-	747	-	251	-	107	-	918	-	380	-	540	-	117																	
Crude rate	45.4		25.8		86.6		55.5		9.92		7.30		35.8		28.2		21.03		8.69																	
ASR (W)	66.4		58.3		131.0		138.7		17.4		25.9		52.0		64.6		36.0		30.3																	
Mean age at diagnosis	51.1		49.9		49.1		45.4		68.2		66.0		47.5		44.8		56.1		52.3																	

* 5 cases in men and 14 cases in women with age unknown were excluded from Ibadan analysis and 3 cases in men and 9 cases in women of age unknown were excluded from the Abuja analysis

Table 2

Number of cases and proportions (n(%)) of the 5 most frequent cancers in each registry by sex, stratified by age group. (NMSC: Non Melanoma skin cancer; NHL: non-Hodgkin's lymphoma)

Most Frequent Invasive Cancers < 45 years			
<u>Ibadan</u>		<u>Abuja</u>	
Males	Females	Males	Females
1. Liver 30 (8)	Breast 390 (45.5)	NMSC 22 (14.5)	Breast 217 (55.6)
2. NMSC 27 (7.2)	Cervix 110 (12.8)	Kaposi sarcoma 21 (13.8)	Cervix 31 (8)
3. NHL 27 (7.2)	Ovary 33 (3.8)	Liver 15 (9.8)	NMSC 17 (4.4)
4. Connective & soft tissue 26 (7)	Thyroid 27 (3.1)	Connective & soft tissue 11 (7.2)	Ovary 16 (4.1)
5. Nasopharynx 26 (7)	NMSC 20 (2.3)	Nasopharynx 8 (5.2)	Kaposi sarcoma 14 (3.6)
<i>Most Frequent Invasive Cancers = and > 45 years</i>			
<u>Ibadan</u>		<u>Abuja</u>	
Males	Females	Males	Females
1. Prostate 250 (32.1)	Breast 527(38.2)	Prostate 103 (46.1)	Breast 163 (45.7)
2. Colorectal 63 (8.1)	Cervix 430 (31.2)	Colorectal 12 (5.4)	Cervix 86 (24.1)
3. NMSC 47 (6)	Colorectal 47 (3.4)	Liver 12 (5.4)	Ovary 16 (4.2)
4. Liver 40 (5)	Corpus uteri 36 (2.6)	NMSC 11 (5)	Colorectal 12 (3.4)
5. Larynx 35 (4.5)	Ovary 35 (2.4)	NHL 8 (3.6)	Unspecified site 6 (1.7)
<i>P value <0.001</i>	<i>P value <0.001</i>	<i>P value <0.001</i>	<i>P value < 0.001</i>

* Using Fisher's exact test, significant differences were noted in the proportions of cancer in Ibadan and Abuja for males and females 0–44 years and 45 years and above.

Table 3

Standardised incidence rate ratios with 95% CI of all cancers and most common cancers in Ibadan and Abuja

Cancer Site	ASR per 100 000 (Ibadan)	ASR per 100 000 (Abuja)	Incidence Rate Ratio (IRR) with 95% CI
All Cancers Men	66.4	58.3	1.13 [0.79;1.65]
Prostate Cancer	17.4	25.9	0.65 [0.33;1.25]
All Cancers Women	130.6	138.7	0.94 [0.74;1.21]
Breast Cancer	52.0	64.6	0.78 [0.53;1.13]
Cervix Cancer	36.0	30.3	1.20 [0.72;2.02]

* Ibadan was used as a reference because it is the oldest cancer registry in Nigeria. Values greater than 1.0 indicate higher risk in Ibadan and values less than 1.0 indicate higher risk in Abuja