ORIGINAL ARTICLE

Cancer Incidence in South-East Nigeria: A Report from Nnewi Cancer Registry

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ABSTRACT

Background: This study is the first population based cancer incidence report from a cancer registry in south-east Nigeria.
Objective: To evaluate the incidence of some invasive cancers in southeast Nigeria.
Methodology: We collected all new cases of invasive cancers between 1st January and 31st December, 2013. We computed the age standardized incidence rate (ASRs) for all invasive cancers in men and women: prostate, breast, and cervical cancers; the mean age at diagnosis and the standard deviations of the means. The denominator population data used was that of the 2006 census conducted by the National Population Commission. We reported our results by gender and in 5 year age classes. We calculated the age-specific incidence rates per 100 000 per annum and age-standardized incidence rates per 100 000 per annum using the world standard population.
Results: We recorded a total of 722 new cases of invasive cancers, 43.8% in males and 56.2% in females. The mean age for the males was 58.9 ± 19.2 years while that of females was 53.1 ±14.7years. The five most common new cases of cancers in both males and females were cancers of breast (23.4%), prostate (15.1%), cervix (10.1%), colorectum (8.2%), and liver (6.7%).
Conclusion: We observed that the typical profile of incidence of the invasive cancers in southeast Nigeria is similar to those observed in the other zones in Nigeria earlier studied as well as those in the other parts of the world.

Keywords: *Breast Cancer, Prostate Cancer, Cervical Cancer, Nigeria*

INTRODUCTION

Cancer is a major health problem worldwide. According to Global Cancer Statistics 2012, there were 14.1 million new cases of cancers in 2012.[1] More than half of all cancers (56.8%) and cancer deaths (64.9%) in 2012 occurred in less developed regions of the world, and these proportions are projected to increase further by 2025.[1]

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.[3,4] 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.[3]

Jedy-Agba *et al*. recorded a total of 4521 new cases of invasive cancers in two cancer registries in Nigeria: one in North-Central Nigeria and the other in southwest Nigeria, between 2009 and 2010.[4]

Previous studies on cancer incidence in southeast Nigeria have either been based on estimates from hospital-based medical records, which are not as accurate as population-based cancer incidence; or studies that form part of national population-based studies. As a result, this study was borne out of the aforementioned need to publish cancer incidence in a South-East Nigeria population in a scientific journal.

METHODOLOGY

We analyzed data from Nnewi Cancer Registry (NCR) - a population-based Registry - located at Nnamdi Azikiwe University Teaching Hospital Nnewi, Anambra State in South-East Nigeria. Nigeria is divided into 6 geopolitical zones namely: South-East Zone, South-South Zone, South-West Zone, North-Central Zone, North-East Zone and North-West Zone (Figure 1). The registry started as a hospital-based cancer registry in 1997 and was upgraded to a population-based cancer registry in 2009 following a National System of Cancer Registries Initiative organized by the Federal Ministry of Health (FMOH) of Nigeria and the Institute of Human Virology of Nigeria (IHVN). Since 2009, NCR has been collecting information on all new cancer cases in Nnewi and the surrounding 10 Local Government Areas (LGAs). This Registry covers a population of two million, two hundred and fifty seven thousand five hundred and forty two (2,257,542) people - based on 2006 National Census - which is approximately 13.78% of the total South-East Zone's population.[5]

The NCR weekly obtains all new cases of cancer from all the out-patients' departments and wards of the hospitals (tertiary, general, and private) that are involved in the diagnosis and treatment of cancer patients and from other notifications sources such as pathology laboratories (both government and private owned). The data in this report covers all new invasive cancers between January 1st and December 31st, 2013.

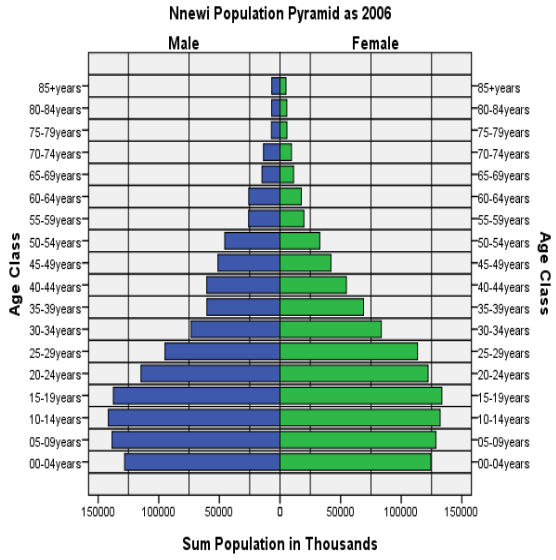
The Cancer Registry uses the International Classification of Disease for Oncology, 3rd Edition for classification and coding, and the cancer registration version-4 (CanReg-4) software for microcomputers - a configurable computer programme designed for cancer registration in population-based registries- for storing, checking and processing data.[6] All quality control checks and duplication of cases were performed by the NCR coordinator.

For this study, we exported the stored data in CanReg4 to Microsoft Excel® for analysis and subsequently to Statistical Package for the Social Sciences (SPSS) version 16.0 for further analysis. We computed the age-standardized rates (ASRs) for all cancers in men and women, ASR for invasive prostate cancer, ASR for invasive breast cancer, and ASR for invasive cervical cancer; mean age at diagnosis and standard deviations of the means of the cancers in 2013. The denominator population data was drawn from the 2006 census data of the National Population Commission of Nigeria.[5]

We reported our results by gender and in 5 year age classes. We calculated age-specific incidence rates per 100,000 per annum, age-standardized incidence rates per 100,000 per annum using the world standard population and the mean age at diagnosis of cancer in male and female for the year 2013.[7] We also present the five most common cancers by gender and age.

Figure 1. A map of showing the geopolitical zones of Nigeria

Figure 2. Population pyramid of Nnewi



RESULTS

The NCR coverage area's population pyramid (Figure 2) shows a predominantly young population with the highest numbers of people – 273,739 (12.3%) and 270,974 (12.0%) in age classes 10–14years and 15–19years in males and females respectively. The proportion of the different age groups in both genders steadily reduces such that the age class 85^{+} years constitutes only 0.5% of the total population.

Figure 3 show the basis of diagnosis in the year 2013, in descending order, with histology of primary tumour in 366 (50.7%) of cases, laboratory test in 203 (28.1%), and clinical diagnosis in 114 (15.8%), and others in 39 (5.4%).

In the year under review, we recorded a total of 722 new cases of invasive cancers, 316 (43.8%) in males and 406 in females (56.2%). The age range of the males is from 2 to 95 years with a mean of 58.9 (Standard Deviation [SD] = 19.2, Standard Error of the Mean [SEM] = 1.1) years. Table 1 shows the age class distribution of all cancers in males, with a peak (constituting 15.5% of the proportion) occurring in 65 to 69 year class and a smaller peak (constituting 13.6% of the proportion) in 60 to 64 year class. Sixty cases (19.0%) were under 45 years of age while the remaining 256 cases (81.0%) were equal to or above 45 years of age.

On the other hand, the age range of the females ranged from 16 to 99 years with a mean of 53.1years (*SD=14.7, SEM=0.7*). Table 1 also shows the age class distribution of all cancers in females with a peak (constituting 17.7% of the proportion) occurring in 50 to 54-year class and a smaller peak (constituting 13.3% of the proportion) in age class 45 to 49. One hundred and eleven cases (27.3%) were under 45 years of age while 295 cases (72.7%) were seen in individuals equal to or above 45 years of age. There was significant difference in the distribution of all the invasive cancers

by age between males and females (*p<001*, 95% confidence interval of 14.8, 19.7).

The five most common new cases of cancers were cancers of breast (23.4%), prostate (15.1%), cervix (10.1%), colorectum (8.2%), and liver (6.7%).

The age standardized incidence rate (ASR) for all new invasive cancers in males in 2013 was 41.8 per 100 000. In females, the ASR for all new invasive cancers was 62.8 per 100 000. There was no significant difference in the ASR of the new invasive cancers between males and females (*p=0.300*). The highest number of new cancer cases in men was seen in the 65-69years age class (15.5%), while in women, the highest number of cases was found in the 50 to 54-year age class (17.7%).

The five most common new cancers in men for all ages were: cancer of the prostate (34.8%), liver (10.8%), colorectal (9.8%), stomach cancer (5.4%) and leukaemia (4.4%). For women of all ages in rank order, the most common cancers were: breast (41.1%), cervix (18.0%), ovary (9.9%), colorectal (6.9%) and liver cancer (4.4%), as shown in Table 2.

The age range of the males with new invasive prostate cancers ranged from 44 to 95years with a mean of 70.3 (*SD=10.7, SEM=1.0*) years. Table 1 shows the age specific incidence rate distribution of new invasive prostate cancer cases with a peak (224.4 per 100,000 males per annum) occurring in age class 75 to 79years with a smaller peak (203.9 per 100000 males per annum) in males 80 to 84years; while Table 3 shows the age distribution of new invasive prostate cancer cases with a peak occurring in age class 65 to 69years with a smaller peak in males aged 70 to 74years. Only 2 new cases (1.8%) of invasive prostate cancers were seen in males less than 45years; and less than a quarter of the new cases of invasive prostate cancers (27/109; 24.8%) were seen in men less than 65years of age.

The age range of the females with new invasive breast cancers is from 24 to 99years with a mean of 51.0 (*SD=15.6, SEM=1.2*) years. Table 1 shows the age specific incidence rate distribution of new invasive breast cancer cases with a peak (173.3 per 100 000 females per annum) occurring in those aged 75–79years with a smaller peak (89.6 per 100 000 females per annum) in females aged 65 -69years. The ASR of new invasive breast cancer in the year 2013 was 23.9 per 100 000 females per annum; while Table 4 shows the age distribution of new invasive breast cancer cases with a peak occurring in those age 75 to 79years with a smaller peak in females aged 45 to 49years. Sixty new cases (35.9%) were under 45years while 133 new cases (79.6%) were under 65years.

We had no new invasive cervical cancer diagnoses in women under the age of 30. At age class 30 to 34years, the age specific incidence rate of new cases of cervical cancer was 1.2 per 100,000 females, it increased steadily to 61.0 per 100,000 females at the age class 55 to 59years. Its highest peak was 84.2 per 100 000 females at age class 70 to 74years. The ASR of cervix uteri cancer was 13.2 cases per 100 000 females. The age range of the females ranged from 33 to 85years with a mean of 60.4years (*SD=11.4, SEM=1.3*). Figure 4 shows the age distribution with a peak occurring in age class 70 to 74years, with a smaller peak in patients aged 55 to 59years. There was no new case (0.0%) under 30years, while 9 new cases (12.3%) were under 50 years and 24 (13.7%) of the new cases occurred after age 70years.

There were only 3 new cases of Kaposi sarcoma, 2 in females (ages 37 and 38,

respectively) and the remaining one in male (age 30 years). The ASR for new cases of Kaposi sarcoma in both gender was 0.13 per 100,000.

Figure 3. Most common basis of diagnosis in the year 2013

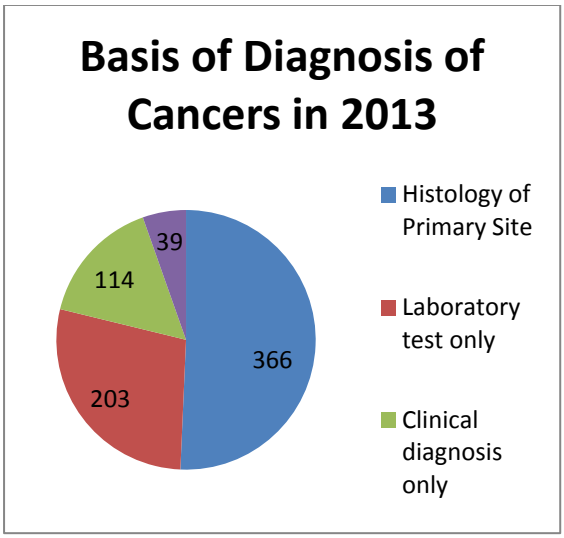


Figure 4. The age distribution of invasive cervical cancer cases in the year 2013

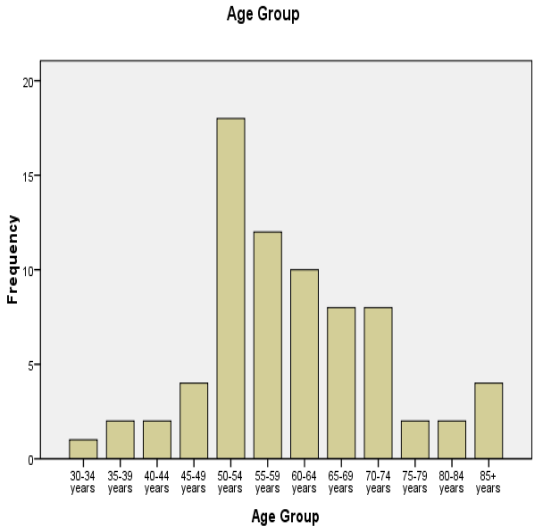


Table 1. Number of cases [and proportions (%)] and age-specific rates per 100 000 for all cancers and most common cancers (prostate, breast & cervix) by sex

Age (Years)	Sex Male Number n(%)	Rate for all Cancers	Rate for Prostate Cancer	Female Number n(%)	Rate for all Cancers	Rate for Breast Cancer	Rate for Cervical Cancer
00-4	8 (2.5)	6.2	0.0	0(0.0)	0.0	0.0	0.0
05-9	0 (0.0)	0.0	0.0	0(0.0)	0.0	0.0	0.0
10-14	4(1.3)	2.8	0.0	0(0.0)	0.0	0.0	0.0
15-19	2(0.6)	1.5	0.0	4(1.0)	3.0	0.0	0.0
20-24	6(1.9)	8.7	0.0	6(1.5)	4.9	1.6	0.0
25-29	8(2.5)	8.4	0.0	12(3.0)	10.6	7.1	0.0
30-34	10(3.2)	13.6	0.0	19(4.7)	22.7	12.0	1.2
35-39	12(3.8)	19.9	0.0	40(9.9)	58.0	31.9	2.9
40-44	10(3.2)	16.6	3.3	30(7.4)	54.8	32.9	3.7
45-49	17(5.4)	25.4	3.9	54(13.3)	128.5	71.4	9.5
50-54	28(8.9)	61.5	13.2	72(17.7)	219.2	67.0	54.8
55-59	26(8.2)	100.5	15.5	41(10.1)	208.4	56.0	61.0
60-64	43(13.6)	166.8	58.2	44(10.8)	249.7	56.8	56.8
65-69	49(15.5)	331.0	182.4	28(6.9)	250.8	89.6	71.7
70-74	26(8.2)	191.9	132.9	20(4.9)	210.4	63.1	84.2
75-79	34(10.8)	476.9	224.4	20(4.9)	346.6	173.3	34.7
80-84	21(6.6)	305.9	203.9	8(2.0)	142.6	71.3	35.6
085+	12(3.8)	176.3	117.5	8(2.0)	160.6	80.3	80.3
Total	**316(100)**	**1914.0**	**955.2**	**406(100)**	**2070.1**	**814.0**	**496.2**

Table 2. Number of cases and proportions (n %) of the 5 most frequent cancers by sex, stratified by age class

Most Common Invasive Cancers in all age	
Males	**Females**
1. Prostate 110 (34.8%)	1. Breast 167 (41.1%)
2. Liver 34 (10.8%)	2. Cervix 73 (18.0%)
3. Colorectal 31 (9.8%)	3. Ovary 40 (9.9%)
4. Stomach 17 (5.4%)	4. Colorectal 28 (6.9%)
5. Leukaemia 14 (4.4%)	5. Liver 18 (4.4%)
Most Common Invasive Cancers < 45 years	
Males	**Females**
Liver 12 (20.0%)	1. Breast 58 (52.3%)
Nasopharynx 6 (10.0%)	2. Ovary 12 (10.8)
Leukaemias ; unspecified 6 (10.0%)	3. Lymphomas; unspecified 6 (5.4%)
Lymphomas; unspecified 6 (10.0%)	4. Colorectal 4 (3.6%)
Colorectal 5 (8.3%)	5. Leukaemias; unspecified 4 (3.6%)
Most Common Invasive Cancers ≥ 45 years	
Males	**Females**
Prostate 105 (41.0%)	1. Breast 107 (36.3%)
Colorectal 26 (10.2)	2. Cervix 68 (23.1%)
Liver 20 (7.8%)	3. Ovary 28 (9.5%)
Stomach 15 (5.9%)	4. Colorectal 24 (8.1%)
Leukaemia; unspecified 10 (3.9%)	5. Liver 16 (5.4%)
P value < *0.001**	*P value* < *0.001**

Using T test, significant differences were noted in the proportions of cancer for males and females 0–44 years and 45years and above.

Table 3. Frequency distribution of new invasive prostate cancer cases by age groups

Age (Years)	**Number (n %)**
40-44	2 (1.8)
45-49	2 (1.8)
50-54	4 (3.7)
55-59	4 (3.7)
60-64	15 (13.8)

DISCUSSION

The Nnewi Cancer Registry (NCR) population pyramid like those of Ibadan Cancer Registry (IBCR) and Abuja Cancer Registry (ABCR) population pyramids shows a predominantly young population; but unlike the other 2 populations with their highest proportion in the first decade of life, NCR population's highest proportion is in the second decade of life. [4]

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.[8] International recommendations support a morphological basis of diagnosis of between 80 to 90%.[9] The basis of diagnosis using histology of the primary tumour at NCR was 50.7% a value between 68% in ABCR and 42.6% in IBCR. Clinical diagnosis was the 3rd most common basis of cancer cases, (15.8%) at the NCR, a value lower than both the 24% in ABCR and 41.3% in IBCR. [4] Curado *et al.* reported that high numbers of patients diagnosed clinically

is an indicator of late diagnosis or lack of resources in the country.[9] In our case, we believe that the suboptimal microscopic basis of diagnosis is due to a combination of factors - with late presentation to orthodox health facilities, lack of resources, and very low acceptance of autopsy being top on the list.

The proportion of new cases of cancer by gender in South-East Zone (SEZ) showed that females had 1.3 times more cancers than males, a value similar to male: female ratio of 1:2 reported by Jedy-Agba *et al.,* both in South-West Zone (SWZ) and North-Central Zone (NCZ) respectively.[4] The reasons might be due to the relative ease of diagnosis and more specific symptomatology of common female cancers when compared with those in men (prostate and liver), more frequent contact with the health care system by women due to readily available maternal/child health care services, greater population awareness of breast and cervical cancers, better health-seeking behavior by women compared to men.[10]

The 3 most common new invasive cancers in our study were cancers of breast (23.4%), prostate (15.1%) and cervix (10.1%). This finding is slightly different from those reported from South-West and North-Central Zones where the three most common new invasive cancers were cancers of the breast, cervix and prostate with the cervix ranking second in these other geopolitical zones of Nigeria instead of third as reported in our study. The possible explanation is the higher proportion of the new invasive cancers occurring in females (1:2) in these zones (SWZ & NCZ) than the proportion of the new invasive cancers occurring in females (1:1.3) in the SEZ.[3]

Our finding of younger incidence age of occurrence of invasive cancers in females with mean age of 53.1years than in males with mean 58.9years compares well with SWZ observed mean age of 49.1 in females and 51.1 in males; and NCZ observed mean age of 45.4 years in females and 49.9years in males.[3]

We found that the most common invasive cancer in men for all ages in SEZ was cancer of the prostate (35.4%). This finding agrees with that observed in SWZ and the NCZ of Nigeria with prostate cancers constituting 21.7% and 28% respectively.[4] This equally agrees with that in other parts of the world.[1] The estimated worldwide incidence of prostate cancer was 1.1 million in men in 2012, while in females of all ages, the most common invasive cancer was cancer of breast (41.1%).[1] This finding also agrees with that observed in SWZ and NCZ of Nigeria with breast cancers constituting 40.8% and 50.8% respectively. Breast cancer is also the most frequently diagnosed cancer among females in 140 of 184 countries with an estimated worldwide incidence of 1.7 million in women in 2012.[1]

CONCLUSION

We observed that the typical profile of incidence of cancers in South-East zone of Nigeria is similar to those from the two other zones in Nigeria and in the other parts of the world. There is also need to improve the quality of cancer registry as it relates to validity and completeness of data.

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