Article published online: 2022-07-14

Original Article

Cancer Mortality Pattern in a Resource-Poor Country: A Case Study of a Teaching Hospital in the Southeast Region of Nigeria

Chinedu O. Ndukwe[1], Chinwe Chioma Ndukwe[2], Kenechi Gerald Ike[3], Uchechukwu Brian Eziagu[4]

[1]Department of Anatomic Pathology and Forensic Medicine, Nnamdi Azikiwe University, Awka, Departments of [2]Internal Medicine and [3]Histopathology, Nnamdi Azikiwe University Teaching Hospital, Nnewi, [4]Department of Anatomic Pathology, University of Uyo Teaching Hospital, Uyo, Nigeria

Abstract

Background: There are many studies on the pattern and incidence of cancer, but there are few documented works on cancer mortality (CM). Even fewer are African studies on CM that encompass all cancers and reveal the relative contributions of the various cancers to the overall burden of CM. This retrospective study was therefore performed to determine the types and patterns of cancer deaths in Nnamdi Azikiwe University Teaching Hospital, Nnewi, Southeast, Nigeria, during the 10-year period from 2010 to 2019. **Materials and Methods:** Data were collected from the death data files in the mortuary unit of the department of anatomic pathology. These death data document the cause of death as issued by the attending medical/surgical/oncology teams or the pathologist that performed an autopsy on the deceased. Data collected included the deceased's age, sex, and underlying cause and date of death. **Results:** One thousand one hundred and sixty-six deaths (representing 10.3% of all hospital deaths) were due to cancers. There were 472 (40.5%) males and 694 (59.5%) females in the series ($P < 0.001$), giving a male-to-female ratio of 1:1.5. The mean age for males was 53.2 ± 22.6 years and that of females was 48.3 ± 17.9 years. A bimodal age distribution pattern of CM was noticed with peaks in the 0–10-year and 51–60-year age groups ($P < 0.001$). The second peak occurs a decade earlier in females (51–60 years) than in males (61–70 years). In terms of type, breast, liver, and hematological malignancies were among the top three causes of cancer deaths. Cancers of the breast, liver, hematolymphoid tissues, ovary, and cervix were the largest contributors to the cancer-associated mortality burden among females. Prostate, liver, hematological, pancreas, and colorectal malignancies were the leading cause of CM among males. Hematological malignancies resulted in the death of more children and young adults younger than 31 years. Breast and liver cancers accounted for the most cancer deaths that affected patients in the 31–60-year-old age group, while deaths due to prostate cancer predominated in those above

Address for correspondence: Dr. Chinedu O. Ndukwe, Department of Anatomic Pathology and Forensic Medicine, Nnamdi Azikiwe University, Awka, Nigeria.
E-mail: chinedu.ndukwe@npmcn.edu.ng

Submitted: 08-May-2021 **Revised:** 07-Jun-2021
Accepted: 09-Jun-2021 **Published:** 30-Jun-2021

Access this article online

Quick Response Code:

Website: www.ijmbs.org

DOI: 10.4103/ijmbs.ijmbs_30_21

How to cite this article: Ndukwe CO, Ndukwe CC, Ike KG, Eziagu UB. Cancer mortality pattern in a resource-poor country: A case study of a teaching hospital in the Southeast Region of Nigeria. Ibnosina J Med Biomed Sci 2021;13:67-73.

60 years of age. **Conclusion:** Cancers have remained a vital cause of mortality in our setting. Screening for premalignant lesions, early detection, and treatment of cancers are therefore keys to improving dismal outcomes.

Keywords: Cancer, mortality, Nigeria, Nnewi

Introduction

Cancer is the second leading cause of death worldwide and a major growing public health concern.[1] According to estimates, there were 18.1 million incident cancer cases and 9.6 million deaths from cancer in 2018, which contributed to 234 million all-age disability-adjusted life-years in 2017 globally.[1,2] Interestingly, majority (70%) of these cancer deaths occurred in low- and middle-income countries (LMICs), with Africa disproportionately burdened.[3,4]

Available statistics suggest that the burden of cancer is expected to increase to more than 22 million new patients each year, and 13 million cancer deaths are expected globally by 2030.[5] On a cheering note, statistics indicate that mortality rates from cancers are declining in many high-income countries (HICs), mainly due to efforts on cancer prevention, screening programs, and treatment in those countries. However, it is saddening to note that they are increasing in LMICs.[6] This trend has been attributed to a rapid change in lifestyle, behavioral patterns, and geographic and environmental risk factors, as well as a high burden of infection-related cancers within LMIC.[4,6]

Furthermore, health-care services for cancer have received low priority in LMICs, probably because in most LMICs, there is inadequate and unreliable data on the burden of cancer. The problem is aggravated by the overwhelming burden of communicable diseases, a shortage of both oncologists and facilities with the capacity for cancer care, and management.[4,7]

There are many studies on the pattern and incidence of cancer, but there are few documented works on cancer mortality (CM). Even fewer are African studies on CM that encompass all cancers and reveal the relative contributions of the various cancers to the overall burden of CM.[4,8-10] According to these African studies, the CM pattern observed in Africa differs from that of the rest of the world.

This retrospective study was therefore performed to determine the types and patterns of cancer deaths in Nnamdi Azikiwe University Teaching Hospital, Nnewi, Southeast, Nigeria, during the 10-year period from 2010 to 2019.

Materials and Methods

The 440-bed Nnamdi Azikiwe University Teaching Hospital, Nnewi, is one of the three federal government-owned teaching hospitals in the entire southeast region (one of the six geopolitical zones of Nigeria). It is also one of the largest hospitals in this region. Its catchment area comprises mainly Anambra State and parts of neighboring states. As per the last official census in 2006, Anambra State had a population of 4,177,821 and an annual population growth rate of 2.8%, with 35.6% of her population aged 0–14 years, 60.5% aged 15–64 years, and 3.9% aged 65+ years.

This retrospective study of deaths from cancer-related complications from January 1, 2010, to December 31, 2019, was carried out at Nnamdi Azikiwe University Teaching Hospital, Nnewi, Anambra State, southeast Nigeria. Data were extracted from the death data records in the mortuary unit of the department of anatomic pathology. These death data document the cause of death as issued by the attending medical/surgical/oncology teams or the pathologist that performed an autopsy on the deceased. Data collected included the deceased's age, sex, and underlying cause and date of death. Excluded were cancer cases, in which the individual died of noncancer-related deaths (e.g., deaths through road traffic accidents).

Data were entered into SPSS version 23 (SPSS Statistics for Windows, Version 23.0. IBM Corp.

Armonk, NY, USA) for processing and analysis. Descriptive statistics were obtained by summarizing continuous variables into mean and standard deviation, whereas categorical variables were analyzed by proportions and graphic presentations. Analysis was performed for the most common cancers in Nnamdi Azikiwe University Teaching Hospital. The Chi-square test was applied to determine associations and was considered significant when the $P < 0.05$.

Ethical approval was waived, as this was a secondary analysis of routinely collected data, without the researchers having any access to identifying information.

Results

A total of 11,282 deaths from all causes were reported in the hospital records during the 2010–2019 period. Of these, 1166 (10.3%) were due to cancers [Table 1]. There were 472 (40.5%) males and 694 (59.5%) females in the series ($P < 0.001$), giving a male-to-female ratio of 1:1.5. However, the variation in sex distribution over the 10-year period was not statistically significant ($P = 0.618$). The median age at death due to cancer was 59 years for males and 50 years for females. The mean age for males was 53.2 ± 22.6 years and that of females was 48.3 ± 17.9 years. There was no significant variation of mean age at death due to cancer throughout the study period ($P = 0.619$) [Table 1]. Irrespective of sex, a bimodal age distribution pattern of CM was noticed with peaks in the 0–10-year and 51–60-year age groups ($P < 0.001$). The second peak occurs a decade earlier in females (51–60 years) than in males (61–70 years) [Figure 1].

In terms of type, breast, liver, and hematological malignancies were among the top three causes of cancer deaths. Cancers of the breast, liver, hematolymphoid tissues, ovary, and cervix were the largest contributors to the cancer-associated mortality burden among females. Prostate, liver, hematological, pancreas, and colorectal malignancies were the leading cause of CM among males [Figure 2].

When the age was categorized into 10-year age groups, the cancer profile varied considerably among age brackets. Hematological malignancies resulted in the death of more children and young adults younger than 31 years. Deaths due to bone and soft tissue cancers were also common in this age group. The spectrum of cancer deaths commonly seen among children and adolescents changed as age increased. Breast and liver cancers accounted for the most cancer deaths that affected patients in the 31–60-year-old age group, while deaths due to prostate cancer predominated in those above 60 years of age [Figure 3].

Discussion

Reports based only on hospital autopsy series, although having good diagnostic information, suffer from selective factors that operate in causing admission to a hospital and in having an autopsy.[9] This, therefore, may be unrepresentative of deaths in a population. Hence, reports based on extracts from both autopsy and death registers, as obtained in this series, are expected to give the best contemporary information on the CM pattern.

Our findings indicate a significant heterogeneity in CM rates with regard to age and sex in Nnewi. Overall, cancers accounted for about 10.3% of all deaths that occurred during the 10-year period. Similar findings have been reported from other studies here in Nigeria[11] and elsewhere in Africa.[12] The cancer death rate in this study reflects only those deaths that occurred in hospitals hence was much higher than the national CM rate of 4%[13] but lower than the worldwide CM rate of 16%.[14]

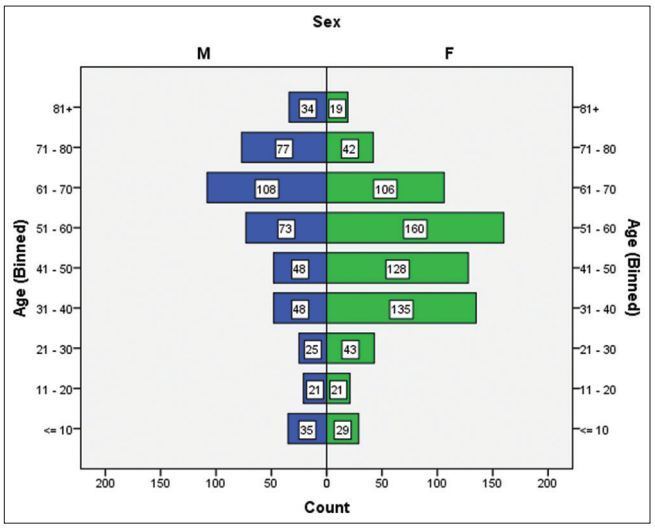

Figure 1: Cancer mortality distribution across age groups for both sexes

Akinde *et al*. in Lagos, southwest Nigeria, reported that most CM cases were seen between 51 and 60 years.[9] The majority of deaths in this study were also observed in the 51–60-year-old age category. The fact that deaths due to cancer were concentrated more among this group of adults who are relatively still in their productive years, could be due to either the age profile of the Nigerian population or actual differences in mortality rates, which calls for immediate and appropriate actions. There is, therefore, a need to strengthen awareness, diagnostic capacities, and early treatment of cancers to prevent these premature deaths.[4]

The mean age at death among males was slightly older (53.2 years) than that of females (48.3 years). Significantly, more females than males died of cancer. The fact that cancers in the current study were responsible for the deaths of more females than males has also been reported recently.[4,9,10] The reason for this female preponderance is probably due to the high prevalence and mortality of breast cancer among women.[15]

Among males and females combined, the major contributors to CM were breast, liver as well as hematological malignancies. When sex was considered, breast, liver, hematological, ovarian, and cervical malignancies contributed to more deaths among females, whereas males died more often due to prostate, liver, hematological, pancreatic and colorectal cancers. Similar cancer profiles with some slight differences in their relative positions have been reported in Nigeria[9,10,16] and other LMICs.[8]

Table 1: Proportion, age, and sex distribution of cancer deaths per year

Years	Total number of deaths	Number of cancer deaths, *n* (%)	Male cancer deaths, *n* (%)	Female cancer deaths, *n* (%)	Mean age±SD (years)
2010	667	67 (10.0)	36 (53.7)	31 (46.3)	48.2±22.4
2011	905	104 (11.5)	32 (30.8)	72 (69.2)	51.5±16.5
2012	1202	116 (9.7)	53 (45.7)	63 (54.3)	50.5±19.7
2013	1465	106 (7.2)	40 (37.7)	66 (62.3)	54.3±19.2
2014	1181	107 (9.1)	34 (31.8)	73 (68.2)	48.9±22.0
2015	890	63 (7.1)	24 (38.1)	39 (61.9)	48.2±23.1
2016	1353	167 (12.3)	70 (41.9)	97 (58.1)	51.0±19.0
2017	1208	159 (13.2)	65 (40.9)	94 (59.1)	49.6±20.6
2018	1087	127 (11.7)	48 (37.8)	79 (62.2)	49.7±19.2
2019	1324	150 (11.3)	70 (46.7)	80 (53.3)	50.1±20.6
Total	11282	1166 (10.3)	472 (40.5)	694 (59.5)	50.3±20.1

SD: Standard deviation

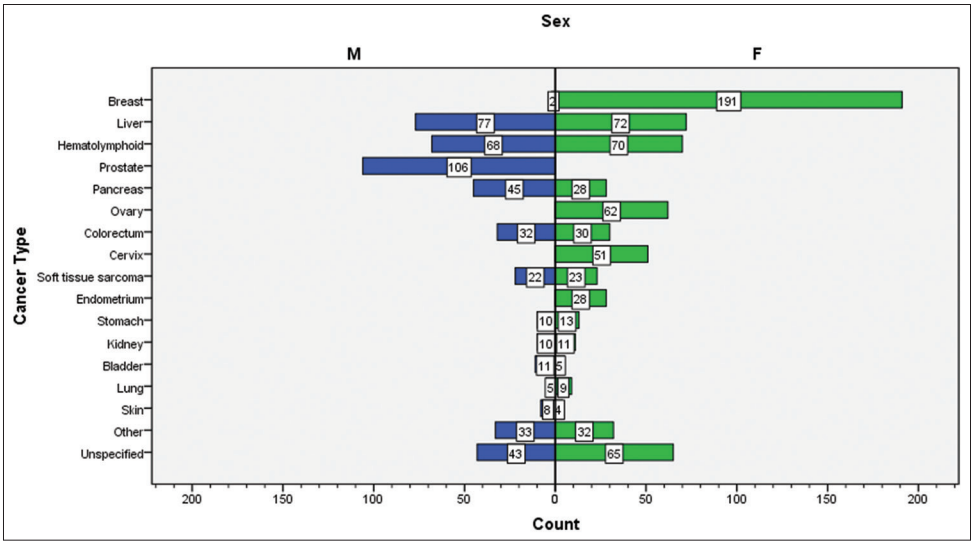

Figure 2: Different causes of cancer deaths in both sexes

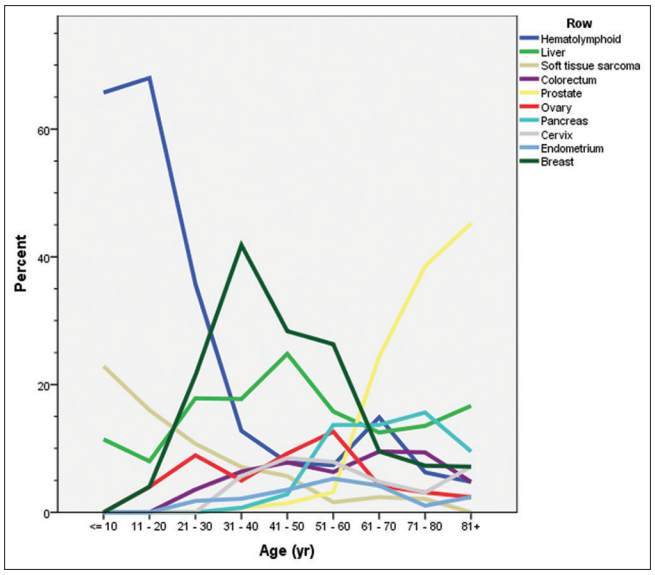

Figure 3: Distribution of the different causes of cancer death according to the age

In contrast, globally, lung and breast cancers are the most frequently diagnosed cancers and the leading causes of cancer death in men and women, respectively.[4,14] The picture for HICs is similar to the global pattern except that lung cancer is also the most common cause of cancer death among women in these countries.[2,14]

Among females worldwide, cancer of the breast causes the greatest mortality.[14] It is the most common cancer among women in Nigeria.[15] Data from a study by Beau *et al*. showed a 20% reduction in breast CM after invitation to screening.[17] The high mortality observed in this study could be attributed to the presentation of patients in advanced stages of the disease, limited treatment options (like nonavailability of radiotherapy services in our hospital), and belief in alternative (herbal or spiritual) treatment.[10] In addition, social determinants such as limited resources for mammographic breast screening may be a hindrance to early detection and treatment. There is, therefore, a need to continually teach about the self-breast examination and the early symptoms and signs of breast cancer.[10,12]

It has been suggested that the higher mortality of liver cancer in Nigeria might be due to inadequate screening facilities. Challenges faced with early diagnosis of liver diseases, especially in LMICs, may also be a contributory factor.[16] Furthermore, surgical interventions that can prolong the lives of cancer patients at early stage diagnosis are also not readily available in this setting.[16] Most patients with liver cancer usually present at advanced stages of the disease due to illiteracy, poverty, and reliance on readily available and cheap local traditional remedies.[16] There is also an increased prevalence of risk factors of liver cancer in our communities such as aflatoxin and hepatitis B and C.[16] Deaths due to cancer of the liver in our study were relatively higher among males than females. In low-income countries, liver cancer among men is the second most frequently diagnosed cancer and second most frequent cause of cancer death.[14] Worldwide, liver cancer in men is the fifth most frequently diagnosed cancer and the second most frequent cause of cancer death.[2]

Hematological malignancies ranked third and caused 11.8% of cases. This is similar to observations in Lagos, southwest Nigeria, and Port Harcourt, south–south Nigeria, where they ranked second and fourth, respectively.[9,10] Like elsewhere in the world, hematological cancers resulted in the death of more young adults younger than 31 years of age than in other age groups.[4] Proper treatment of hematological malignancies usually depends on accurate diagnosis, which, in turn, requires immunohistochemistry, flow cytometry, and molecular diagnosis. However, in Nigeria, these facilities are almost nonexistent. Hence, the diagnosis is based on hematoxylin and eosin-stained sections coupled with limited markers for immunohistochemistry, which usually limits the specificity and accuracy of the diagnosis made. This may explain the high mortality associated with hematological malignancies in Nigeria and other LMIC when compared with HICs.

Prostate cancer ranked fourth, accounting for 9.1% of CM. This is similar to 9.2% reported in Port Harcourt but higher than 4.5% reported in Lagos. It is the second most frequent cause of CM in Port Harcourt and seventh in Lagos.[9,10] One man in nine will receive a diagnosis of prostate cancer during his lifetime.[18] The etiology of prostate cancer is not known despite being the most common cancer of males. However, advanced age, African race, a family history of the disease, and

certain genetic polymorphisms are well-established risk factors.[10] Most developed nations are having decreasing incidence and/or decreasing mortality mainly due to routine screening and advances in prostate cancer treatment (radical prostatectomy, hormonal therapy, and radiation therapy).[10] Poor availability of treatment options may be responsible for the high mortality seen in Africa.[10] Furthermore, it has been shown that better support of health-care expenditures leads to lower mortality-to-incidence ratios for prostate cancer.[19] Mortality-to-incidence ratio for prostate cancer is significantly associated with health-care disparities between countries, probably because early detection and appropriate treatments including advanced surgical intervention equipment and personalized therapies lead to huge expenditures in health-care system.[19]

Colorectal cancer is the second-most common cause of CM after lung cancer.[2] A large randomized trial with over 30 years of follow-up observed positive correlations between age, male sex, and body mass index with long-term colorectal CM.[20] Lowest rates are seen in Africa and southern Asian countries.[2] However, the incidence is rising in many LMICs due to rapidly changing diet, activity pattern, and increased smoking.[10] Colorectal CM is also increasing in these countries due to none availability of screening programs and lack of proper treatment modalities. In this series, colorectal cancer accounted for 5.3% of cases. Akinde *et al*. also reported 5.3% in Lagos, while Obiorah *et al*. reported 7.3% in Port Harcourt.[9,10] This calls for increased awareness on screening, healthy living. Although colonoscopy is the most sensitive screening test, its use in our environment is limited due to its high cost.

Globally, cervical cancer is the fourth most common cancer among women and it also ranks fourth as a cause of CM among women.[14] The cancer is strongly linked to human papillomavirus (HPV).[4] The current fraction of CM due to cervical cancer in this study (4.4%) is comparable to observations in Port Harcourt (5.7%).[10] Cervical rates in Nigeria are still relatively high probably due to low uptake of both HPV vaccine and cervical cancer screening.

The proportion of deaths due to unknown cancers provides important information on health-seeking behavior, cancer diagnosis, and treatment. A significant proportion of cancer patients present in late stages with metastatic disease that require modalities such as immunohistochemistry, positron emission tomography scan, and other high-end imaging modalities to determine their origin. These are not readily available in most hospitals in the country, and when available, they are unaffordable to many patients. In addition, while the primary site of a cancer may be determined during postmortem examination, there is poor acceptance of autopsy in our environment by deceased relatives. These may explain the relatively high proportion of cancer of unknown origin in this study.

CM rates are largely determined by the prevalence of risk factors, access to quality health care, socioeconomic status, and death certification practices.[12] Depending on the type of cancer, some modifiable risk factors include smoking, alcohol intake, obesity, sun exposure, and unsafe sexual practices.[12] Cancer patients in our environment do not live long due to the lack of health insurance for most of the populace or partial health insurance for government employees only and lack of sufficient and affordable treatment options.[10] More worrisome is the fact that the National Health Insurance Scheme in Nigeria categorically excluded cancer care.[10] In view of the budgetary challenges facing the public health sector in Nigeria and other LMIC, the focus needs to be on early identification of cancer (where appropriate) to reduce cancer deaths. Hence, raising awareness of risk factors and screening for cancer in the population and improved access and quality of health care are important.[12]

One major limitation of this study is the fact that it is hospital based rather than population based. However, in the absence of a standard population mortality registry, a hospital-based CM data like the index study can give some vital information, concerning a locality, regardless of its shortcomings.[10] Therefore, this study provides an evidence-based platform for health-care intervention, planning, and evaluation.

Conclusion

Cancers have remained a vital cause of mortality in our setting. Breast, liver, hematological, and

prostate cancers were the largest contributors to CM in Nnewi. Breast cancer constitutes the majority of the deaths in females, while the prostate is largely responsible for cancer deaths among males. Screening for premalignant lesions, early detection, and treatment of cancers are therefore keys to improving dismal outcomes.

Author 's contribution

Chinedu O. Ndukwe conceived the research idea, analyze the data and wrote the manuscript. Chinwe C. Ndukwe collected the data and helped with manuscript writing. Kenechi G. Ike helped in data collection, reviewed the manuscript and approved the final article. Uchechukwu B. Eziagu reviewed the manuscript and approved the final version.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

Compliance with ethical principles

Ethical approval was waived, as this was a secondary analysis of routinely collected data, without the researchers having any access to identifying information.

References

1. Zhang YB, Pan XF, Chen J, Cao A, Zhang YG, Xia L, *et al.* Combined lifestyle factors, incident cancer, and cancer mortality: A systematic review and meta-analysis of prospective cohort studies. Br J Cancer 2020;122:1085-93.
2. Bray F, Ferlay J, Soerjomataram I, Siegel RL, Torre LA, Jemal A. Global cancer statistics 2018: GLOBOCAN estimates of incidence and mortality worldwide for 36 cancers in 185 countries. CA Cancer J Clin 2018;68:394-424.
3. Busolo DS, Woodgate RL. Cancer prevention in Africa: A review of the literature. Glob Health Promot 2015;22:31-9.
4. Lyimo EP, Rumisha SF, Mremi IR, Mangu CD, Kishamawe C, Chiduo MG, *et al.* Cancer mortality patterns in Tanzania: A retrospective hospital-based study, 2006-2015. JCO Glob Oncol 2020;6:224-32.
5. Torre LA, Bray F, Siegel RL, Ferlay J, Lortet-Tieulent J, Jemal A. Global cancer statistics, 2012. CA Cancer J Clin 2015;65:87-108.
6. Torre LA, Siegel RL, Ward EM, Jemal A. Global cancer incidence and mortality rates and trends--An update. Cancer Epidemiol Biomarkers Prev 2016;25:16-27.
7. Rubagumya F, Greenberg L, Manirakiza A, DeBoer R, Park PH, Mpunga T, *et al.* Increasing global access to cancer care: Models of care with non-oncologists as primary providers. Lancet Oncol 2017;18:1000-2.
8. Wiredu EK, Armah HB. Cancer mortality patterns in Ghana: A 10-year review of autopsies and hospital mortality. BMC Public Health 2006;6:159.
9. Akinde OR, Phillips AA, Oguntunde OA, Afolayan OM. Cancer mortality pattern in Lagos University Teaching Hospital, Lagos, Nigeria. J Cancer Epidemiol 2015;2015:842032.
10. Obiorah CC, Nwafor CC. Cancer mortality in the Niger Delta Region of Nigeria: A case study of the University of Port Harcourt Teaching Hospital. Niger Med J 2019;60:268-72.
11. Obiorah CC. Cause specific and trends of mortality in Nigeria : A six-year study of a tertiary hospital. Int J Med Med Sci 2020;12:1-7.
12. Made F, Wilson K, Jina R, Tlotleng N, Jack S, Ntlebi V, *et al.* Distribution of cancer mortality rates by province in South Africa. Cancer Epidemiol 2017;51:56-61.
13. World Health Organization. Noncommunicable Diseases (NCD) Country Profiles. Geneva: World Health Organization; 2018.
14. American Cancer Society. Global Cancer Facts and Figures 4th ed. Atlanta: American Cancer Society; 2018.
15. Nigeria Source: Globocan; 2018. Available from: https://gco.iarc.fr/today/data/factsheets/populations/566-nigeria-fact-sheets.pdf. [Last accessed on 2020 Oct 26].
16. Silas OA, Musa J, Afolaranmi TO, Sagay AS, Evans CT, Achenbach CJ *et al.* Predictors of mortality from a Population-Based Cancer Registry Data in Jos, Nigeria : A resource-limited setting. Front Med (Lausanne) 2020;7:227.
17. Beau AB, Andersen PK, Vejborg I, Lynge E. Limitations in the effect of screening on breast cancer mortality. J Clin Oncol 2018;36:2988-94.
18. Goodman PJ, Tangen CM, Darke AK, Lucia MS, Ford LG, Minasian LM, *et al.* Long-term effects of finasteride on prostate cancer mortality. N Engl J Med 2019;380:393-4.
19. Chen SL, Wang SC, Ho CJ, Kao YL, Hsieh TY, Chen WJ, *et al.* Prostate cancer mortality-to-incidence ratios are associated with cancer care disparities in 35 countries. Sci Rep 2017;7:40003.
20. Shaukat A, Dostal A, Menk J, Church TR. BMI Is a risk factor for colorectal cancer mortality. Dig Dis Sci 2017;62:2511-7.