Original Research *Highlight article*

Incidence and mortality of cancer in the Volta Region of Ghana

Samuel M Adadey, Sylvester Languon, Richmond Ayee, Darius NK Quansah and Osbourne Quaye

West African Centre for Cell Biology of Infectious Pathogens (WACCBIP), Department of Biochemistry, Cell & Molecular Biology, University of Ghana, Accra, Ghana

Corresponding author: Osbourne Quaye. Email: oquaye@ug.edu.gh

Impact statement

Region-specific cancer reports are essential in knowing the common cancers in specific populations. This study reports all cancer types recorded in the major hospitals in the Volta Region of Ghana, a population that is sparsely captured in the national cancer registries. The study identified the common cancers as well as the death rates in the Volta Region, hence contributing to the national effort to report cancer data. Although not comprising all the elements of a cancer registry, our data will augment the effort of the two national cancer registries in Ghana to provide the national cancer reports.

Abstract

In Ghana, majority of cancer studies have focused on only two main teaching hospitals. However, there is the need to study the disease burden from other parts of the country. This study was designed to review cancer cases recorded in major hospitals in the Volta Region of Ghana, with the aim of determining the incidence of cancers and cancer-related mortalities, and contribute to cancer data in the country. In-patient diagnosis data from 2012 to 2014 were collected from 21 hospitals in the Volta Region of Ghana. The data were entered and structured in Microsoft Excel and analyzed with IBM SPSS Statistics 20 and GraphPad Prism 6. Cervical, breast, liver, soft tissue, and prostate cancer were identified as the commonly diagnosed cancers in the Region. Socioeconomic factors such as poor educational background and occupation were associated with incidence of cancer in the study area. The incidence of cancer was determined to be approximately 9, 11, and 6 morbidities per 100,000 people in the years 2012, 2013, and 2014, respectively, with liver cancer being the leading cause of deaths. Public awareness and screening efforts are thus needed to fight against cancer in the Volta Region, and Ghana as a whole. In addition, this study is an original report of cancers in the Volta Region of Ghana and underscores the need to report ethnic/population-specific frequencies to effectively evaluate the burden of cancer in the country.

Keywords: Frequently diagnosed cancers, cancer mortality, prostate cancer, soft tissue cancer, liver cancer, breast cancer and cervical cancer

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Introduction

Cancer and its associated ailments remain a leading cause of mortality worldwide and constitute an enormous burden on societies.[1] In 2018, a total of 18.1 million new cases and 9.6 million cancer-related deaths were estimated to have occurred worldwide,[2] out of which over 1 million (5.8%) of all the new cases and about half-a-million (7.3%) of all the cancer-related deaths were projected to have occurred in Africa.[2] Using data acquired by GLOBOCAN in 2018, the World Health Organization (WHO) estimated the incidence of cancer cases in Ghana to be 22,823.[3] Demographic changes alone are anticipated to increase the number of new cancer cases per year by 70% between 2012 and 2030 in Africa.[4] The rising global burden of cancer has been attributed to several factors including aging, population growth, and the prevalence and distribution of key risk factors for cancer that are associated with socioeconomic development.[2] For instance, in rapidly growing countries, cancer burden has shifted from being poverty-related to a disease that occurs as a result of changes in lifestyle due to industrialization.[5] Other studies have also strongly associated cancer with risk factors such as smoking, overweight, physical inactivity, changing reproductive patterns, some viral infections, and uncontrollable genetic factors among others.[6,7] The incidence of cancer and its severity vary across ages and gender, with lung and stomach cancer being leading causes of cancer deaths in male adults, while breast cancer and cervical cancer lead

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similarly in female adults, in less developed countries.[8] However, in developed countries, prostate and breast cancer lead the mortality of gender-specific cancers.[6,7]

The national program on cancer control and cancer registries in Ghana is inadequate.[9] Ghana's medical report identifies cancer to be among the top 10 causes of death, and the risk of developing the disease has been found to be associated with geographical location and/or the work environment of an individual.[10,11] A number of studies conducted in Ghana are mainly from two geographical locations (Kumasi and Accra) and are based on different types of cancers[12–14] or the stages of presentation, which is not representative of the Ghanaian population.[15,16] Thus far, only one population-based study has been conducted in Ghana,[17] and therefore highlights the need for more comprehensive cancer studies focusing on populations in order to provide accurate information on the incidence of cancer in Ghana.

The Volta Region of Ghana shares boundary with Togo, and is mainly made up of the Ewe ethnic group.[18,19] According to the Housing and Population Census of Ghana in 2010, the Volta Region had a population of 2,118,252 which comprised 1,019,398 males and 1,098,854 females.[20] There are limited number of cancer studies from the Volta Region of Ghana, and the few studies are mostly focused on risk factors and/or social sciences of cancer.[21–23] The current study was aimed at evaluating diagnosed data of cancer cases reported to major hospitals in the Volta Region of Ghana to determine the incidence of the disease and provide data to contribute to the national efforts towards control and prevention of cancer.

Materials and methods

The study was conducted in the Volta Region of Ghana, which lies at the eastern belt of the country and spans the three major divisions of the country: Northern, Central, and Southern divisions. In-patient hospital diagnosis data were retrieved from patient's files in 21 hospitals (Figure 1) after an administrative clearance has been obtained from the Volta Regional Directorate of the Ghana Health Services. The hospitals selected for the study provide primary, secondary, and/or tertiary healthcare services. Hospital diagnosis data were collected and entered into Microsoft Excel. In Ghana, confirmed or suspected cases of cancers are diagnosed in the Surgery, Pathology, and Medical Oncology/Radiotherapy Departments of hospitals, but in this study, the exact modes/methods of cancer diagnoses and stage of cancer were not reported because the information was not available in the hospital diagnoses data that were retrieved from patients' files. Since there was no unique patient identification system at the study sites, patient address, date of admission, and hospital names were scrutinized during data collection and analysis, in order to avoid the issue of multiple registration by the same patient. The collated data in Microsoft Excel were

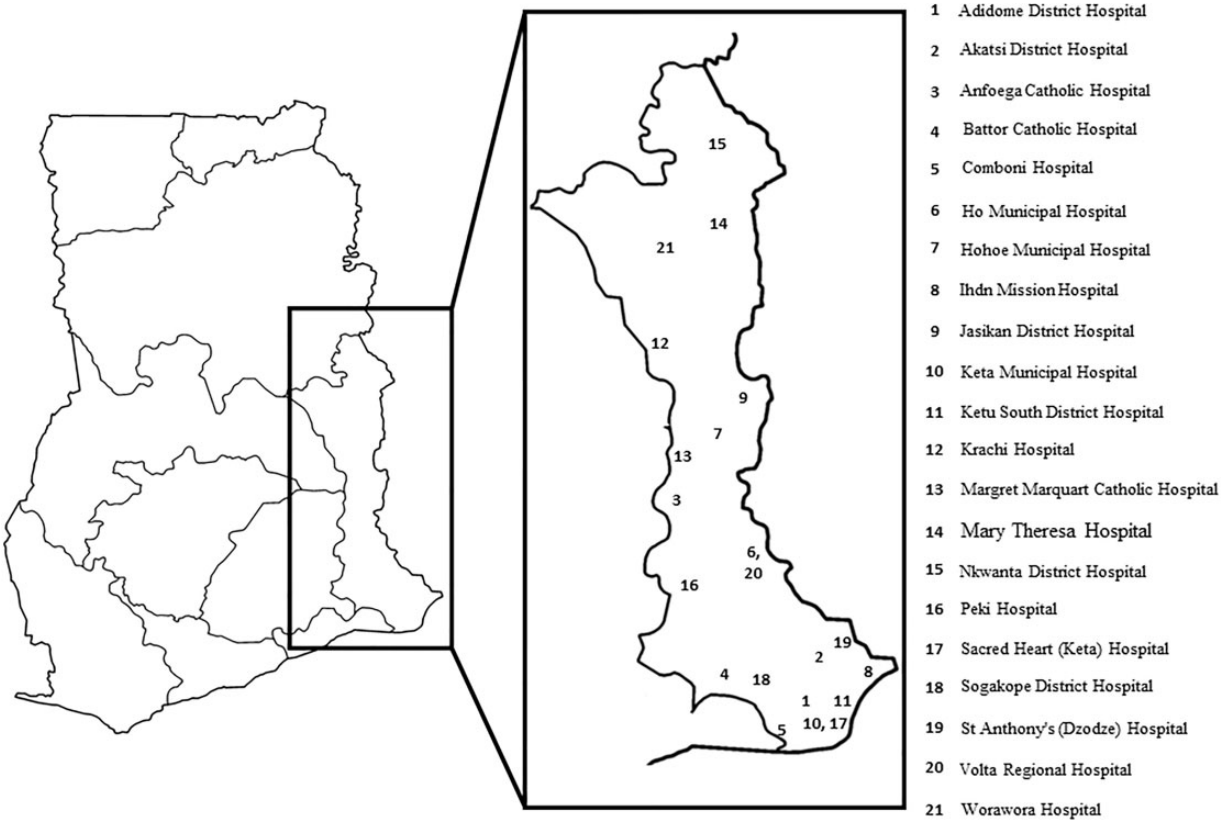

Figure 1. Map showing the distribution of health facilities used in the study in the Volta Region of Ghana.

analyzed with IBM SPSS Statistics 20 and GraphPad Prism 6. Patient demographics, frequency of cancer diagnosis, and cross tabulation analyses were performed using descriptive statistics. Shapiro–Wilk normality test was used to examine whether the data were normally distributed.

The analysis of variance (ANOVA) of number of diagnosed cancer cases from 2012 to 2014 was performed using Kruskal–Wallis test, and inter-group multiple comparisons were done using Dunn's multiple comparisons test. The age-specific mortality rates (ASMR) for each age group and cancer type were calculated by the formula below as previously described.[17,24] The population by age data was obtained from the 2010 Population and Housing Census.[20]

$$\text{ASMR} = \frac{(Number\ of\ death)}{(Respective\ population)} \times 100{,}000$$

Results

The study sought to evaluate data on diagnosed cancer cases from major hospitals in the Volta Region of Ghana. A total of 567 diagnosed cancer cases were retrieved from the records of 21 hospitals (Table 1), of which 256 (45.1%) were male and 311 (56.9%) were female (Table 2). The Volta Regional Hospital recorded the highest number of diagnosed cancer cases followed by Margret Marquart Catholic Hospital (Table 1).

Demographic characterization of patients showed that majority of cancer patients do not have formal education, and a number of the patients had up to Junior High School level of education. A large proportion of the cancer patients were either farmers or traders (Table 2). The mean age of the patients was determined to be 44.5 ± 15.5 years, and a general increase in the number of diagnosed cases was observed with age, with majority of the diagnosis made in individuals who are greater than 70 years (Table 3).

At least 26 different types of cancer cases were diagnosed in the Volta Region and majority of the cases were prostrate (16.9%), soft tissue (16.0%), liver (12.3%), breast (10.4%), and cervical (10.1%) cancers (Figure 2). For the purpose of this study, cancers that were 10% or more of the total number of diagnosed cases were considered as frequently diagnosed cancers. A number of the diagnosed cancer cases (44) did not indicate the type of cancer, and this cuts across all the age groups (Table 3).

The highest number of cancer cases was recorded in 2013 (234 cancer cases) (Figure 3). Prostate cancer was the most commonly diagnosed cancer over the three-year period, with yearly significant differences from 2012 to 2014 (Figure 3). There was a significant increase in the number of prostate cancer cases from 2012 to 2013 with a *P*-value of 0.032, but no significant difference in the number of diagnosed cervical and breast cancer cases from 2012 to 2014. The number of diagnosed liver and soft tissue cancer cases, on the other hand, decreased significantly from 2013 to 2014 with *P*-values of 0.045 and 0.019, respectively (Figure 3).

Based on the population of the Volta Region as published in the 2010 Population and Housing Census, the incidence of cancer was estimated at 9.02/100,000 in 2012, 11.05/100,000 in 2013, and 6.70/100,000 in 2014; 8.04/100,000 in 2012, 11.48/100,000 in 2013, and 5.59/100,000 in 2014 for males, and 9.92/100,000 in 2012, 10.65/100,000 in 2013, and 7.74/100,000 in 2014 for females. The age-specific mortality rates (ASMR) of the various cancer types are summarized in Table 4 and suggest that prostate and liver cancers are the highest contributing cancers to mortality of all ages. Cancer mortality generally increased with age, and a rapid increase is observed from 40 years (Figure 4).

Table 1. Study sites and number of diagnosed cancer cases.

Hospital name	Number of cases	Percent
Adidome District Hospital	2	0.4
Akatsi District Hospital	4	0.7
Anfoega Catholic Hospital	11	1.9
Battor Catholic Hospital	3	0.5
Comboni Hospital	20	3.5
Ho Municipal Hospital	9	1.6
Hohoe Municipal Hospital	22	3.9
Ihdn Mission Hospital	9	1.6
Jasikan District Hospital	3	0.5
Keta Municipal Hospital	34	6
Ketu South District Hospital	17	3
Krachi Hospital	19	3.4
Margret Marquart Catholic Hospital	69	12.2
Mary Theresa Hospital	5	0.9
Nkwanta District Hospital	28	4.9
Peki Hospital	8	1.4
Sacred Heart (keta) Hospital	21	3.7
Sogakope District Hospital	16	2.8
St Anthony's (Dzodze) Hospital	66	11.6
Volta Regional Hospital	199	35.1
Worawora Hospital	2	0.4
Total	**567**	**100**

Table 2. Demographic characteristics of study participants.

Variable	Category	Number of cases	Percent (%)
Gender	Male	256	45.1
	Female	311	54.9
	Total	**567**	**100.0**
Educational background	No formal education	269	47.4
	Primary School	38	6.7
	Junior High School	173	30.5
	Senior High School	36	6.3
	Tertiary	44	7.8
	Technical/vocational school	7	1.2
	Total	**567**	**100.0**
Occupation	Farmer	139	24.5
	Trader	130	22.9
	Student	66	11.6
	Retired	62	10.9
	Unemployed	45	7.9
	Tradesman	31	5.5
	Civil servant	23	4.1
	Business person	3	0.5
	Unskilled labor	5	0.9
	Others	63	11.1
	Total	**567**	**100.0**

Table 3. Frequency of diagnosed cancer cases and age range of patients.

	Age range (*n*)								
	≤9	10–19	20–29	30–39	40–49	50–59	60–69	≥70	Total
Soft tissue	5	11	18	12	14	13	12	6	91
Oropharynx	0	0	1	1	1	0	0	0	3
Nervous system	2	0	2	2	1	1	0	0	8
Abdomen	1	3	6	3	1	4	4	3	25
Ovary	0	1	3	2	7	2	1	1	17
Parotid gland	5	1	0	3	1	0	1	1	12
Prostate	0	0	0	0	4	8	21	63	96
Thyroid gland	0	0	0	0	1	0	1	0	2
Bladder	0	1	0	0	0	2	4	11	18
Bone and articular cartilage	1	4	2	0	1	1	1	2	12
Breast	1	3	2	8	13	14	11	7	59
Bronchus or lung	0	1	1	2	0	1	2	2	9
Cervix	0	0	1	9	11	12	10	14	57
Colon	0	0	1	0	0	2	1	4	8
Liver	1	2	12	14	10	11	6	14	70
Skin	0	0	0	1	1	2	1	0	5
Retina	2	1	1	2	0	0	1	0	7
Stomach	0	1	0	2	1	0	2	2	8
Tonsil	0	0	0	0	1	0	0	0	1
Brain	0	0	0	0	0	1	0	0	1
Kidney	0	0	0	0	0	0	1	0	1
Non-follicular lymphoma	2	2	1	3	1	0	0	0	9
Scrotum	0	1	0	0	0	0	0	0	1
Leukemia	0	0	1	1	0	1	0	0	3
Unspecified	2	1	2	4	6	7	4	18	44
Total	**22**	**33**	**54**	**69**	**75**	**82**	**84**	**148**	**567**

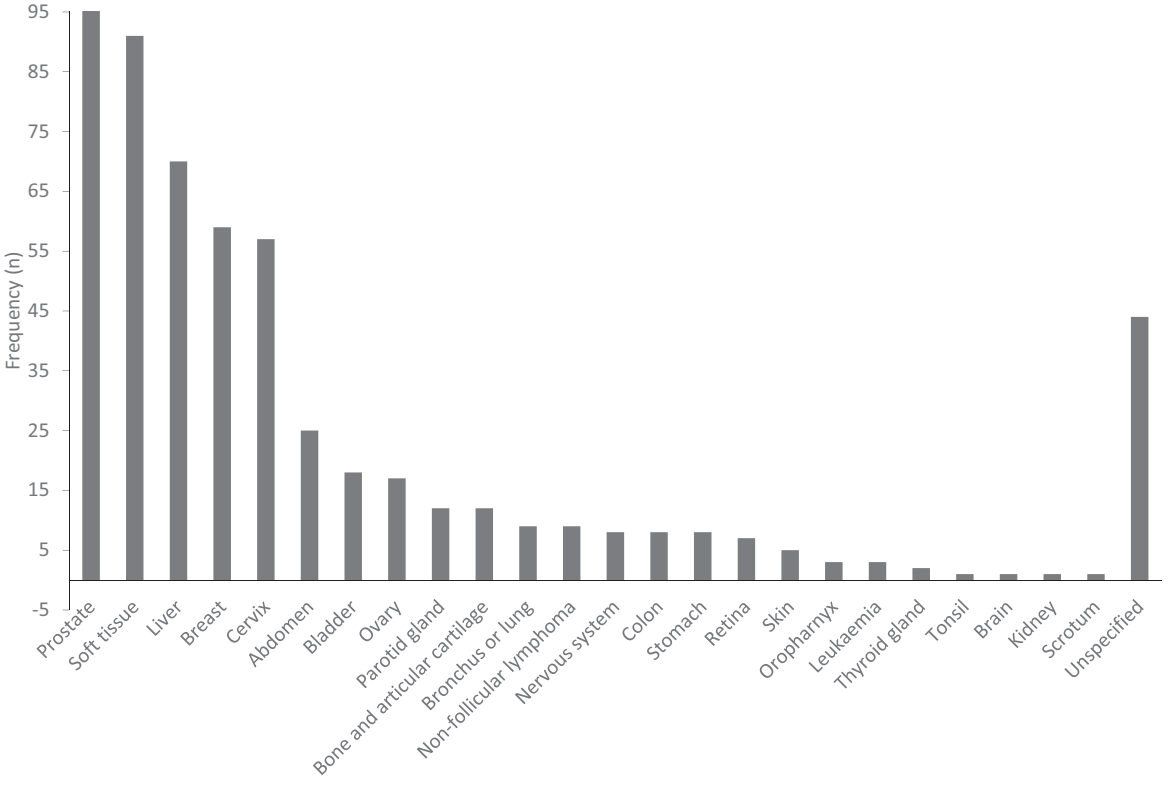

Figure 2. The different types of cancers diagnosed in the Volta Region.

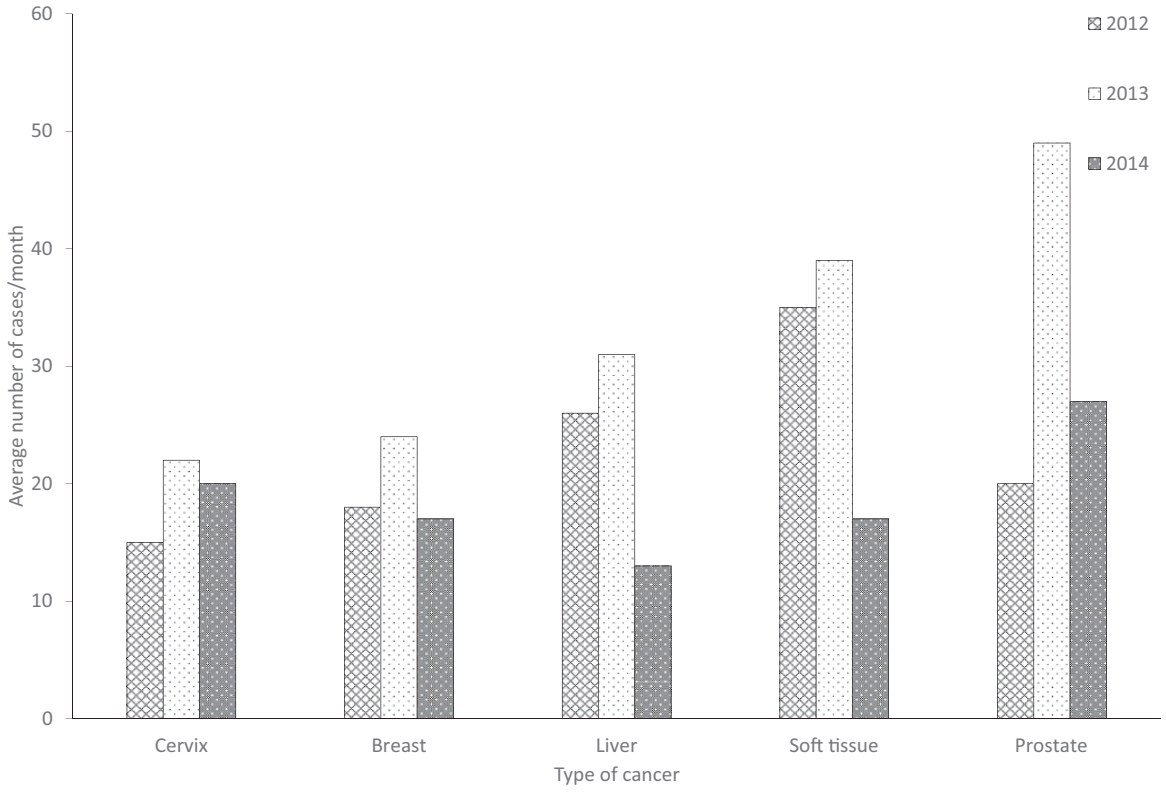

Figure 3. Annual distribution of frequently diagnosed cancers from 2012 to 2014.

Table 4. The age-specific mortality rates of the various cancer types.

Type of cancer	All ages	10–19	20–29	30–39	40–49	50–59	60–69	≥70
Soft tissue	0.05	–	–	–	–	–	–	0.96
Oropharynx	0.05	–	–	–	0.53	–	–	–
Nervous system	0.05	–	–	–	0.53	–	–	–
Abdomen	0.09	–	0.30	–	–	–	–	0.96
Ovary	0.05	–	–	–	0.53	–	–	–
Parotid gland	0.05	–	–	–	–	–	1.21	–
Prostate	0.57	–	–	–	–	–	2.42	9.63
Thyroid gland	0.05	–	–	–	0.53	–	–	–
Bladder	0.05	–	–	–	–	0.75	–	–
Breast	0.38	–	–	0.41	–	2.25	3.63	0.96
Bronchus or lung	0.05	0.21	–	–	–	–	–	–
Cervix	0.14	–	–	–	–	0.75	1.21	0.96
Colon	0.05	–	–	–	–	0.75	–	–
Liver	0.80	–	0.60	0.83	0.53	3.75	3.63	3.85
Retina	0.05	–	–	0.41	–	–	–	–
Stomach	0.09	–	–	–	–	–	1.21	0.96
Leukemia	0.09	–	–	0.41	–	0.75	–	–
Unspecified	0.38	–	–	0.41	1.06	–	–	4.82

Note: ASMR was calculated based on the number of death and the respective population size.

Discussion

There have been strategies to reduce the incidence of cancers in Ghana[25–27]; however, the disease remains a threat to the health of the Ghanaian populace. Our current study was designed to examine the various types of cancers reported to hospitals in the Volta Region of Ghana with the aim of contributing to the cancer data in the country. The average age of patients diagnosed with cancer in the Volta Region of Ghana is relatively lower than those in other Regions in the country. This observation was made from the mean age of 44.5 years determined from this study and compared to the mean ages of 52.3 and 51.6 years that have been previously reported for Greater Accra[8] and Ashanti Regions,[17] respectively. The mean age of patients diagnosed with cancer globally is between 40 and 50 years, with lower ages reported in developing countries compared to developed countries.[28] Although the mean age

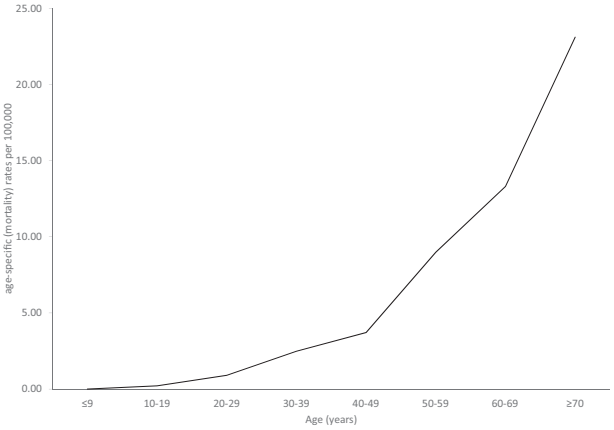

Figure 4. Age-specific mortality rates of all types of cancers.

for all cancer from our current report is within the global range and corresponds to that of developing countries, the previous studies from Ghana[8,17] reported higher mean ages compared to the global mean.

Higher incidence of cancer among females compared to males is reported in our study and consistent with previously published data in Ghana.[8,17] In contrast to our result, the GLOBOCAN data in 2018[2] and 2019[29] estimated a higher global incidence in males compared to females. However, studies among Ethiopians,[30] Asian Americans, Native Hawaiians, Pacific Islanders,[31] and African Americans[32] presented an estimate of more females living with cancer compared to males which is similar to our data.

The decrease in the number of cancer cases with increasing level of education, and the observed highest number of diagnosed cancer cases in farmers and traders suggest that socioeconomic factors influence the prevalence of cancer. Farmers and traders are among the less educated in Ghana, and the findings are consistent with a study from the Ashanti Region of Ghana that reported the largest number of diagnosed cancer cases among traders.[17] Socioeconomic factors such as level of education and occupation have also been shown to influence the prevalence of cancers in other parts of the world.[33,34]

Prostate and cervical cancers were the most diagnosed cancers in the Volta Region from 2012 to 2014. This conclusion stems from the number of cases diagnosed from the Region over the three-year period. A global report showed that lung, breast, prostate, and cervical cancer are the most frequently diagnosed cancers[2]; however, there are geographic variability across the world's regions. In Ghana, a recent study identified prostate cancer as the most common cancer among men.[2] Cancer awareness and increased screening for prostate cancer by hospitals in Ghana to facilitate early detection and treatment,[9] may account for the high number of reported cases. Even though cervical cancer has been reported as the most common cancer among women in the Greater Accra and Ashanti Regions of Ghana,[35] other studies, also from the Greater Accra and Ashanti Regions, have identified breast cancer as the most frequent cancer diagnosed among Ghanaian women.[14,17] There are therefore varied reports as to whether breast or cervical cancer is the most prevalent cancer in Ghanaian women. It has, however, been established that breast cancer is the most common female cancer globally followed by cervical cancer.[36,37]

There have been intensive public awareness and educational programs on breast cancer prevention in Ghana since 2007. The breast cancer awareness was championed by organizations such as Mammocare Ghana and the Cancer Society of Ghana.[13] The public knowledge and governmental attention given to breast cancer, possibly accounted for the decline of breast cancer cases compared to cervical cancer cases in our report. In addition, the 2011 national strategy for cancer control in Ghana adopted and implemented routine screening for HPV and HPV-induced cervical cancer in all major hospitals.[9] This possibly contributed to the increased number of cervical cancer cases recorded in our study from 2012 to 2014.

Another frequently diagnosed cancer in the Volta Region over the period under consideration in this study was soft tissue cancer, which is a heterogenous group of different types of sarcoma. A review of cancer-related autopsies at a major referral hospital in Ghana, and a study that assessed the incidence of cancers in the Ashanti Region of Ghana, both estimated soft tissue cancer to have a prevalence of 1.7% of all cancer cases.[17,38] Our study however showed a significantly higher prevalence (16%) of diagnosed soft tissue cancer cases among cancer patients in the Volta Region of Ghana. Although inherited genetic syndromes, and chemical and radiation exposures have generally been shown to be risk factors of soft tissue cancers, the cause of soft tissue cancers in the Volta Region of Ghana is unclear. Apart from soft tissue cancer, liver cancer is also one of the frequently diagnosed cancers in the Volta Region and accounted for 12% of all the diagnosed cancer cases in this study. The percentage was however lower compared to previous studies in Ghana (21%) and Benin (23%).[39] In Nigeria, another West African country, liver cancer was found to be the least (1.4%) diagnosed cancer among other cancers,[40] with a prevalence that falls significantly below the global value.[2]

Mortality of cancer patients in the Volta Region increased with age. This observation was obtained from the ages at which the incidence of death due to cancers was diagnosed in the Region and reported in this study. The above trend was consistent with several studies and may be explained by the positive correlation between cancer mortality and age-specific rate of all cancers. Liver cancer had the highest mortality in this study. The high mortality caused by liver cancer may be due to hepatic infections and lifestyle risk factors such as smoking, diet, and radiation exposure, which are associated with the disease. The global mortality of liver cancer was estimated at 8.2%[2] and global statistics suggest that majority of liver cancer deaths can be accounted for by hepatitis B virus (HBV) (33%), alcohol (30%), and hepatitis C virus (HCV) (21%).[41] The prevention and protection against hepatitis viruses and alcoholic hepatitis would thus be important in the reduction of liver cancer mortality rate.[42] A five-year retrospective study on hepatic viruses conducted at the Volta Regional Hospital recorded a prevalence of 6.94% and 1.84% for HBV and HCV, respectively.[43]

A hepatitis B sero-prevalence study conducted among blood donors at the same regional hospital recorded an overall prevalence of 7.5%, which suggests that the Region is an intermediate to high endemic region for HBV infection.[44] Although smoking is not a major public health problem in Ghana, the risk factor has been associated with the development of liver and kidney cancers in the country.[17] Other reports from Ghana also identified breast, cervical, liver, and prostate cancers as the leading causes of cancer mortality.[8,17,25] HPV is the major cause of cervical cancer in Ghana, and the cancer accounts for about 8% of all cancer deaths in the country.[38] Globally, lung, colorectal, stomach, liver, and breast cancers result in the highest estimated deaths.[2,45]

Our study could not effectively control for inter-hospital multiple registrations of patients since there is no single patient identification code across the various hospitals used. Thus, the study considered the patient's home address and date of admission to control for the inter-hospital multiple registrations. The study did not also report on the mode or method of cancer diagnosis, the stage of cancer, and/or the method of treatment, since the information was not available in the hospital diagnosis data that were retrieved from the patients' files. Other useful general indicators of cancer such as topography and morphology were also missing from the data.

Conclusion

Prostate, soft tissue, liver, breast, and cervical cancers are the commonly diagnosed cancers in the Volta Region of Ghana from 2012 to 2014, with liver cancer being the leading cause of mortality. There was a modest effort by other researchers in Ghana to determine the incidence of the disease in the country; however, most of these studies were conducted in the Greater Accra and Ashanti Regions. This study therefore gives an alternative perspective of the incidence of cancers in Ghana and emphasizes the need for a national effort to effectively estimate the incidence and mortality of cancer in the country. We propose the set-up of PBCRs in all Regional capitals to collect data on cancers to aid in policy and decision making to curb the burden of cancers in Ghana.

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DECLARATION OF CONFLICTING INTERESTS

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ORCID iD

Osbourne Quaye https://orcid.org/0000-0002-0621-876X

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