Crimson Publishers
Wings to the Research

ISBN: 978-1-946628-09-1

The status of cancer in Guyana and a survey of non- herbal and herbal medication used locally and internationally to combat these diseases

Novel research in science

The Status of Cancer in Guyana and a Survey of Non- Herbal and Herbal Medication Used Locally and Internationally to Combat These Diseases

Jagessar RC, Stuart S, Bradford D and Rose O

*Corresponding author

Department of Chemistry, Faculty of Natural Sciences, University of Guyana, Guyana

Final Year Students, Department of Pharmacy, University of Guyana, Guyana

Received Date: May 20, 2022

Published Date: January 12, 2023

Abstract

Cancer is the second leading cause of death worldwide. The most prevalent cancer types affecting people all over the world are prostate, breast, cervical, bladder, esophagus, large bowel, liver, lung and pancreas. Although great advancements have been made in the treatment and control of cancer progression, significant deficiencies and room for improvement remain. The status of cancer in Guyana, for the period, 2015 to 2018 was assessed via the collection of data from the Ministry of Health. The largest number of deaths per region was recorded in region 4, 479 and the lowest of 373 in 2016. For each year, Region 4 seems to be the Region with the greatest number of deaths. Cancer deaths also showed gender and ethnical variation. For all the years, females recorded the highest number of deaths than males. In terms of ethnicity, the African race, seem to be the one that has the greatest number of deaths, whereas the Amerindians the lowest. The highest number of deaths recorded by Africans was noted for the year 2015. The number of cases recorded being 342. The highest number of deaths by cancer in region 4 is probably due to the lifestyle of the people. For the year, 2015-2018, there was a general decrease in the number of cancer death. The number decrease from 824 (2015) to 609 (2017) and then climbed again to 652. Region 4 was the most affected region with a total number of cancer related deaths to be an estimate of 1681 from 2015 to 2018.The distinct differences between these sub populations was mainly due to the demographic differences and social economic status in these regions. Current treatment for cancer in Guyana is chemotherapy. However, there is a need to use Guyana's highly bio-diversified flora as a source of herbal medicines to prevent cancer. However, there are a number of undesired side effects that can occur during chemotherapy. Natural therapies, such as the use of plant-derived products in cancer treatment, may reduce adverse side effects. However, a myriad of many plant products exist that have shown very promising anti-cancer properties *in vitro* but have yet to be evaluated in humans. Anti-cancer medicinal plants and herbs such as curcumin (Turmeric), *Annona muricta* (Sour Sop), *Saraca indica bar*k, *Momordica charantia* (Bitter melonon), *Morinda citrifola* (Noni) and *Psidium guajava* (Guava leaves) are noted. These have anti-cancer activities on breast cancer, lung cancer, head and neck squamous cell carcinoma, prostate cancer, and brain tumors. These nature products work by cell arrest and apoptosis of cancer cells.

Keywords: Anticancer; Statistics; Cytotoxicity; Assay; Natural products; Cancers; Medicinal plants

Introduction

Cancer remains one of the diseases that is responsible for a large percentage of death of the world populace. WHO estimates that 84 million people would die of cancer between 2005 to 2015 [1,2]. Cancer is characterized by the uncontrolled growth and multiplication of normal cells, leading to tumors which further invade other nearby body parts, resulting in proliferation of cancerous cells. In addition, the body defense mechanisms fail to arrest the multiplication of cancerous cells. The tumors can either be benign or metastatic [3]. Cancer has been on the increase globally of which Guyana is of no exception. It has become a green light for death worldwide. Between the year 2003-2012, Guyana recorded 6,518 cancer cases, resulting in an overall cumulative incidence rate of 867.7 per 100,000. A ten-year cancer profile (2003-2012) indicated that females were mostly affected. Within the period, breast cancer was most common site of cancer (16.7%) cases and a cumulative rate of 290/100,000 population, followed by cervix uteri (15.6%) and prostate (13.3%) and colon and rectum (6.7%) and uterus 325 (5.0%) and stomach (3.7%) and lung (3.6%) and liver 219 (3.4%) with ovary 212 (3.3%) and affected males (39.3%). Smoking is a significant risk factor for cancer, and it is the leading cause of death in Guyana. According to the Guyana Tobacco Control report, 2011 (https://www.kaieteurnewsonline.com/2011/06/01/smoking-dangers/), 27% of adult male and 6% of adult female were current users of Tobacco. The date collected also indicate that 25.3% of males and 16% of females from ages 13 to 15 were involved in the use of tobacco. The alarming issue is that the persons mostly being affected are between the ages of 15 - 39 [4]. Cancer is caused by both carcinogenic factors and also by hereditary [4]. About 30% of cancers are caused by modified behavioral and environmental risk factors such as the use of tobacco, alcohol use, dietary factors such as the insufficient regular consumption of fruits and vegetables, obesity and overweight, lack of physical exercise. the excess consumption of red and processed meat and alcohol, inadequate fruits and vegetables in your diet and physical activities, smoking and exposure to carcinogens Also, chronic infections from Helicobacter pylori, hepatitis B virus, hepatitis c virus, human papilloma virus. Also, exposure to environmental factors, such as exposure to ionizing radiation [5]. Also, genetic is another factor for the development of cancer.

Cancer comes in many forms and types and can affect anyone at any age. It can affect any part or organ of the human body. Some cancer types are breast, blood, pancreas, stomach, skin, and so many others. Biologically, however cancer can be divided into five types specifically - carcinoma, sarcoma, melanoma, lymphoma, leukemia. This disease is involved in abnormal cell growth with the potential to invade or spread to other parts of the body. The abnormal invading cells can spread to tissues and organs that can be difficult to treat. Consequently, because of this some patients are diagnosed with terminal cancer while, some depending on the stage of the disease have a longer prognosis. To date, there is no cure for cancer. However, cancer proliferation can be suppressed or control via psychological support, surgery, radiotherapy and chemotherapy [2,5]. Chemotherapy seems to be the most common treatment for cancer at the moment. Chemotherapy necessitates the use of alkylating agents, antimetabolites, antitumor antibiotics, platinum analogs and natural anticancer agents. However, due to the increasing number of deaths from cancer, along with the toxic side effects and radiation effects from radiation therapy, there is an urgent need to look for alternative treatments in the use of plant extracts, selected fruits, vegetables and the use of isolated natural products from plants. Natural products which have proven to have in vitro anti-cancer effects will have to go through a stage of clinical trials before they are declared as anticancer drugs. Over about 60% of anticancer drugs in use have been derived from plant based natural products [6]. Plants have a broad spectrum of natural products such as polyphenolic compounds, alkaloids, flavonoids, terpenoids, saponins that have antioxidant/anticancer activities [7]. Although Guyana is a country rich in bio-diversified flora there is little or no research on the alternative or traditional use of herbal medicines to combat cancer or to cause apoptosis of cancerous cells. Most treatments rely on chemotherapy, the use of synthetic drugs to combat cancer. Thus, the purpose of this research is to give a statistical report on the status of Guyana and to report on the synthetic and herbal treatments to date.

Herbal and non-herbal treatment

Several classes of synthetic drugs have been used in the treatment of cancer [8,9]. These include cis-Platin (Figure 1): It's a very reactive molecule that is able to form inter and intrastrain links with DNA. 5-Fluoro-uracil exerts its cytotoxic effect by inhibition of DNA synthesis or by incorporation into RNA. It inhibits RNA processing and function, (Figure 2). Alkylating agents are another broad class of anti-cancer drugs. These include the nitrogen mustards such as Mechlorethamine (Mustagen), Cyclophosphamide, Ifosfamide, Phenylalanine mustard, Chlorambucil etc. Nitrogen mustard kills cancer cell via formation of a positively charged carbonium ion that can interact with nucleophilic groups such as SH, PO43- and NH3 on nuclei acids, proteins and smaller molecules. The N7 atom of guanine is the most susceptible to alkylation and the major lesion in DNA (Figure 3). Nitrosoureas such as Carmustine (BCNU, bischloroethylnitrosourea) and Lomustine (CCNU, 1-(2-chlorethyl)-3-cyclohexyl-1-nitrosourea). These compounds are primarily alkylating agents. They showed some cross resistance with other alkylating agents (Figure 4). Triazenes such as dacarbazine (DTIC, ditriazenoimidazolecarboxamide) is a class of anti-cancer drugs and it's activated by the hepatic cyctochrome P-450 system, resulting in the generation of an alkylating agent (Figure 5). The Vinca alkaloids are another class of anti-cancer drugs. These include vinblastine, vincristine and vindesine. They exhibit their cytotoxic effects by binding tubulin, a dimeric protein found in the cytoplasm of cells and is responsible for the formation of microtubules. The latter are responsible for the formation of spindle, during which chromosomes migrate during mitosis and meiosis (Table 1). The whole plant or part of plants via plant extracts have been shown to possess anti-cancer activities and have been used internationally and in Guyana. Table 2 shows a list of plants with anti-cancer activities.

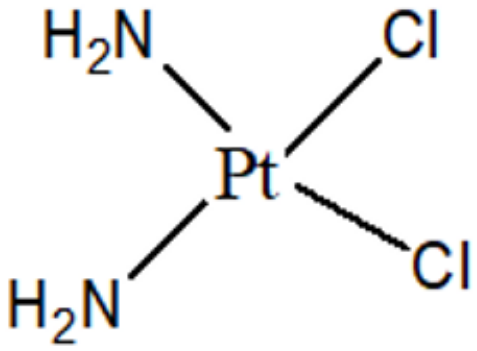


Figure 1: Cis-platin.

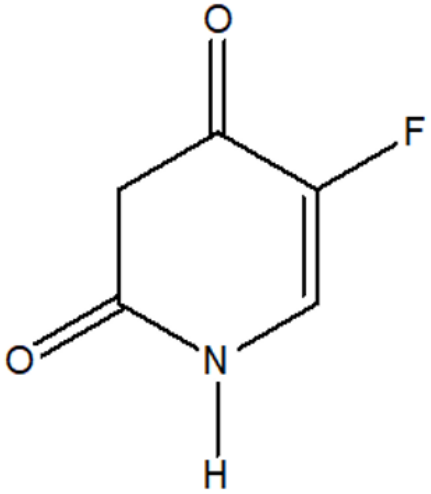


Figure 2: 5-Flurouracil.

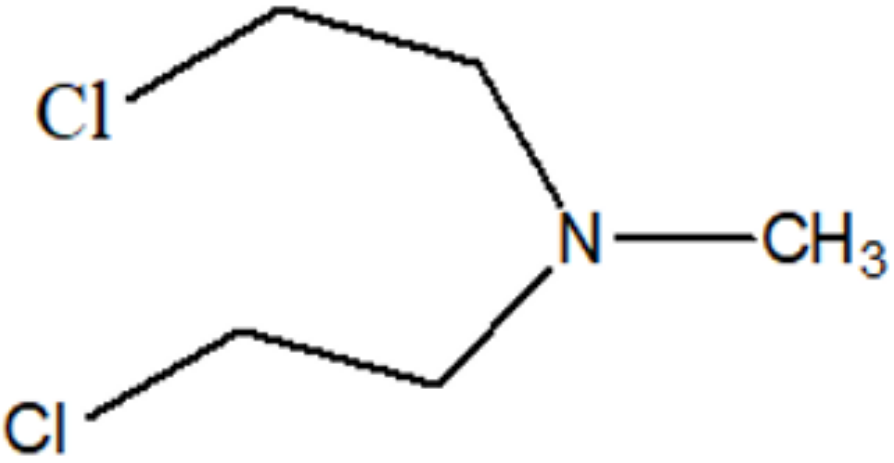


Figure 3: Mechlorethamine.

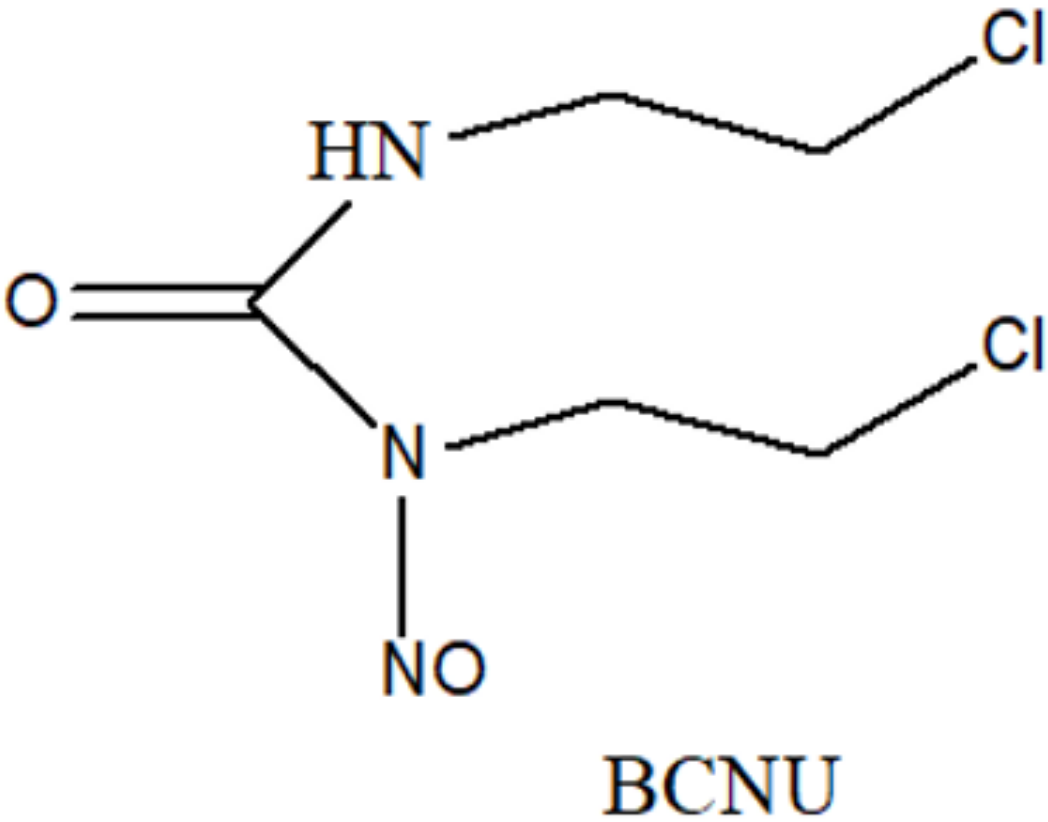


Figure 4: BCNU.

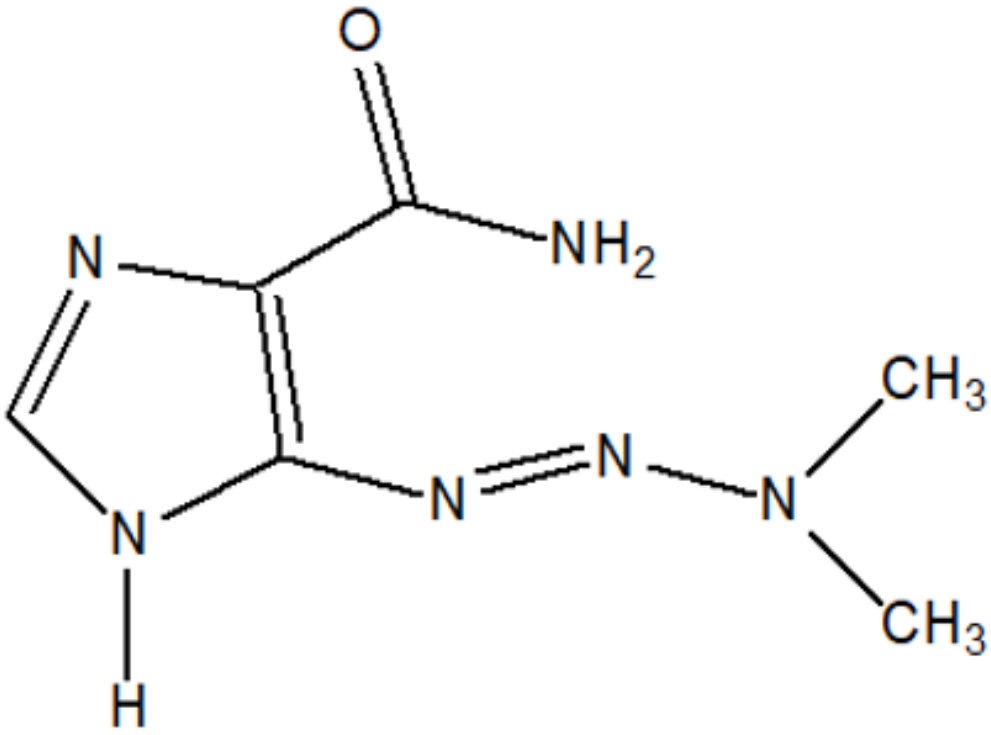


Figure 5: Dacarbazine.

Table 1: List of plants and their scientific names.

Scientific Name of Plant	Common Name	Pictures
Species: Annona muricata L. (Annonaceae)	Soursop (Fruit and leaves) Plant parts used: Fruit and leaves	
Family: Fabaceae (Leguminosae) Saraca indica L.	Ashoka Tree Plant part used: Bark	
Momordica charantia L. (Cucurbitaceae)	bitter melon, corilla Plant parts used: Fruit and vine	

Table 2: List of plants with anti-cancer activities.

Scientific Name of Plant	Common Name	Pictures
Family: Rubiaceae Species: Morinda citrifolia L.	Common Name: Noni Plant part used: Fruit	
Family: Myrtaceae Species: P. guajava	Common Name: Guava Plant part used: Leaves	

Persons affected by this receives a combination of treatment that can either be intense chemotherapy, radiotherapy and chemical drugs. Chemotherapy treatments are used at high levels to treat cancer, while keeping side effects at minimum but, the treatment does become strenuous to the body, and persons are likely to become sicker before they start to become better. The use of alternative methods to alleviate the adverse effects caused by current therapies have therefore become the window to new therapies against cancer. This research seeks to analyze both the herbal and non-herbal treatments that can be used to combat cancer as well as preventative measures.

Purpose of the study/objectives

a. To collect information from the Ministry of Health, as it pertains to the status of cancer in Guyana (morbidity and mortality) from the year 2000 to present.

b. To perform a statistical analysis of the data collected

c. To survey and document non- herbal and herbal treatment, used locally and internationally to combat cancer.

d. To make the populace aware of the status of cancers in Guyana and its possible treatment (preventative measures)

Significance of the study

The findings confer in this study will redound to the benefit in the health sector and to the general population, with the aim of utilizing alternative medical findings, in herbal and non-herbal treatments for cancer use. There is great demand for new findings to reduce the occurrence of cancer around the world more specifically Guyana. This justifies the need for more elaborate research into this topic. Research agencies and medical health sectors that utilize the recommended findings of this study will be able to satisfy the therapeutic benefit of herbal and non-herbal treatment for cancer. This research will, therefore, contribute greatly to theory and practice and will therefore serve as future reference for researchers on the subject of cancer, its status and the therapeutic benefit of herbal and non-herbal anti-cancer therapy.

Some of the research questions are:

a. What type of cancer is more dominant in the populace?

b. What region in Guyana has the highest number of cancer cases?

c. What is the leading cause of cancer in Guyana?

d. Are there specific variations in cancer types among the sub population in Guyana?

e. What are some herbs that are proven to be highly anti-cancerous?

f. Which of the 6 ethnic races has the highest recorded cancer cases and deaths?

g. And which sex is more too prone to cancer?

Figure 6: Map of Guyana.

Guyana is a sovereign state on the northern mainland of South America and is also part of the Caribbean region (Figure 6). Guyana (83,000 square miles) is bordered by the Atlantic Ocean to the north, Brazil to the south and southwest, Suriname to the east and Venezuela to the west [10], (Figure 1). Figure 2 is a map of two of the selected areas of coastal Guyana (Table 3).

Table 3: Guyana is divided into 10 democratic regions. These are listed above in table.

Region 1	Barima Waini,
Region 2	Pomeroon-Supenaam,
Region 3	Essequibo Islands-West Demerara,
Region 4	Demerara- Mahaica,
Region 5	Mahaica-Berbice,
Region 6	East Berbice - Corentyne,
Region 7	Cuyuni-Mazaruni,
Region 8	Potaro-Siparuni,
Region 9	Upper Takutu- Upper Essequibo
Region 10	Upper Demerara-Upper Berbice

Literature Review

This literature review aims to analyze and evaluate the cancer statistics internationally, regionally and locally and to discuss possible herbal and non-herbal treatment options that can be found effective.

Status of cancer

The International Agency for Research on Cancer estimated 19.3 million new cancer cases and almost 10.0 million cancer deaths occurred in worldwide in 2020. Female breast cancer, with an estimated 2.3 million new cases (11.7%), followed by lung (11.4%), colorectal (10.0 %), prostate (7.3%), and stomach (5.6%) cancers. Lung cancer remained the leading cause of cancer death, with an estimated 1.8 million deaths (18%), followed by colorectal (9.4%), liver (8.3%), stomach (7.7%), and female breast (6.9%) cancers. The global cancer statistics is expected to be 28.4 million cases in 2040, a 47% rise from 2020, with a larger increase in transitioning (64% to 95%) versus transitioned (32% to 56%) countries due to demographic changes. This may be further exacerbated by increasing risk factors associated with globalization and a growing economy. Efforts to build a sustainable infrastructure for the dissemination of cancer prevention measures and provision of cancer care in transitioning countries is critical for global cancer control [11]. WHO reported that in 2020, there were 2.3 million women diagnosed with breast cancer and 685 000 deaths worldwide? At the end of 2020, there were 7.8 million women alive who were diagnosed with breast cancer in the past 5 years, making it the world's most prevalent cancer. Breast cancer occurs in every country of the world in women at any age after puberty, but with increasing rates in later life. Death from Breast cancer changed little from the 1930s through to the 1970s. Improvements in survival of breast cancer infected patients began in the 1980s in countries with early detection programmed combined with different modes of treatment to eradicate invasive disease [12]. Breast cancer is the most common malignancy in women around the world and accounts for 25.1% of all cancers. Information on the incidence and mortality of breast cancer is essential for planning health measures. A study was done to investigate the incidence and mortality of breast cancer in the world using age-specific incidence and mortality rates for the year 2012 acquired from the global cancer project (GLOBOCAN 2012). It was estimated that in 2012, 1,671,149 new cases of breast cancer were identified, and 521,907 cases of deaths resulted. Breast cancer incidence in developed countries is higher, while relative mortality is greatest in less developed countries, because of reduced comparative measures. Education of women is suggested in all countries for early breast cancer detection and treatment and is a high priority for health policy makers. It is also necessary to increase awareness of risk factors and early detection in less developed country [13].

In Guyana, the cancer registry holds a pivotal role within the Ministry of Health as a National disease surveillance system. In a local study by [14] research was based primarily on three main cancers in Guyana namely breast, cervical, and prostate. The significance of the differences in the incidence of the three main cancers according to ethnicities and age group was determined by chi squared analysis followed by Fisher exact test at the 0.05 level of significance. The results were based on all diagnoses and deaths due to cancer collected from all private and public facilities and included those who were treated in Trinidad between 2000-2006. From the data obtained Afro Guyanese males accounted for 65% of prostate cancer cases. While Afro Guyanese women had the highest number of cervical cancer case a total of 225, Indo Guyanese women had the highest record of breast cancer. Native people, the Amerindians the cases of cervical cancer were significantly higher (p 0.0001) when compared to Afro Guyanese and the Indo Guyanese registry populations. Likewise, cases of prostate cancer among Afro Guyanese males were significantly higher ($p < 0.0001$) than those of the larger ethnic groups with 49.9% overall in the male population over 70 years of age [14]. Also noted were the similar findings of prostate cancer amongst African males in Guyana to US based African Guyanese which had a higher incidence of prostate cancer when compared to native Indians. Comparatively, in Trinidad, a threefold increase in prostate cancer among African Guyanese compared to Indian descent was noted. The findings confer to the dietary role, cultural and environmental influences in the observed trends of prostate cancer. The high incidence of cervical cancer however amongst females who are native Amerindians was conclusively based on demographic characteristics such as low socio-economic status, limited access to health care. Amongst 412 women screened for HPV there was a 22.8% present in this subgroup. These factors can explain the high incidence of cervical cancer among in this ethnic subgroup. Comparative data on the female African Guyanese were not available [14-16].

Plant extracts have been used in the treatment of cancer [2,9,17]. Their main use stemmed from the fact that chemotherapy using synthetic anti-cancer drugs, induces side effects, compared with natural herbal anti-cancer agents. Some examples can be sited in the literature. The potential cytotoxic effect of the ethanolic extract of Adenosma bracteosum Bonati. and its derived fractions (chloroform, ethyl acetate, butanol, and aqueous) on human large cell lung carcinoma (NCI-H460) and hepatocellular carcinoma (HepG2) has been reported [17]. The chloroform extracts showed significant activity anticancer activity in preventing the proliferation of both cancerous cells because of the presence of bioactive compounds such as xanthomicrol, 5,4'-dihydroxy-6,7,8,3'-tetramethoxyflavone, and ursolic acid which were clearly revealed by nuclear magnetic resonance spectroscopy (1H-NMR, 13C-NMR, Heteronuclear Multiple Bond Coherence, and Heteronuclear Single Quantum Coherence Spectroscopy) analyses. 5,4'-dihydroxy-6,7,8,3'-tetramethoxyflavone compound (AB2) exhibited the highest anticancer activity on both NCI-H460 and HepG2 with IC50 values of 4.57±0.32 and 5.67±0.09μg/mL respectively, followed by the ursolic acid. These results suggest that A. bracteosum is a promising source of useful natural products to develop the novel anticancer drugs [17]. Anti-cancer activity of the methanolic extract of four selected mangrove species Bruguiera gymnorrhiza, Aegiceras corniculatum, Aegialitis rotundifolia and Lumnitzera racemosa was investigated against HepG2 cancer cell line in varying concentration, using MTT assay. The methanolic extract was prepared via Soxhlet extraction. All four plant methanolic extracts showed anticancer activity. Bruguiera gymnorrhiza showed lower IC50 value than Aegialitis rotundifolia, Lumnitzera racemose and Aegiceras corniculatum respectively [2]. A research group reported the in vitro anticancer and cytotoxic activities of the methanolic extract of fourteen (14) plants on HeLa and Vero cervical cancer cell lines. The results were compared to the normal African green monkey kidney epithelial cell line (Vero) using the MTT colorimetric assay. Dose dependent studies revealed IC50 value of 293mg/ml and >1000mg/ml for Cotinus coggygria Scop on the Hela cells. Four of the 14 plant methanolic extracts tested exhibited greater anti-cancer activities on the HeLa cell line and little activity on the Vero cell line21.

Methodology

Raw data were collected from the Georgetown Public Hospital, GPHC and was placed into its various sections such as:

a. Number of deaths per region per year

b. Total number of deaths versus gender per year

c. Total number of deaths versus ethnicity

For each of the above, results were statistically analysed, and the corresponding bar graphs plotted. Also, results were displayed using bar graphs and pie-charts.

Results

Tabulated Raw Data for from 2015 to 2018

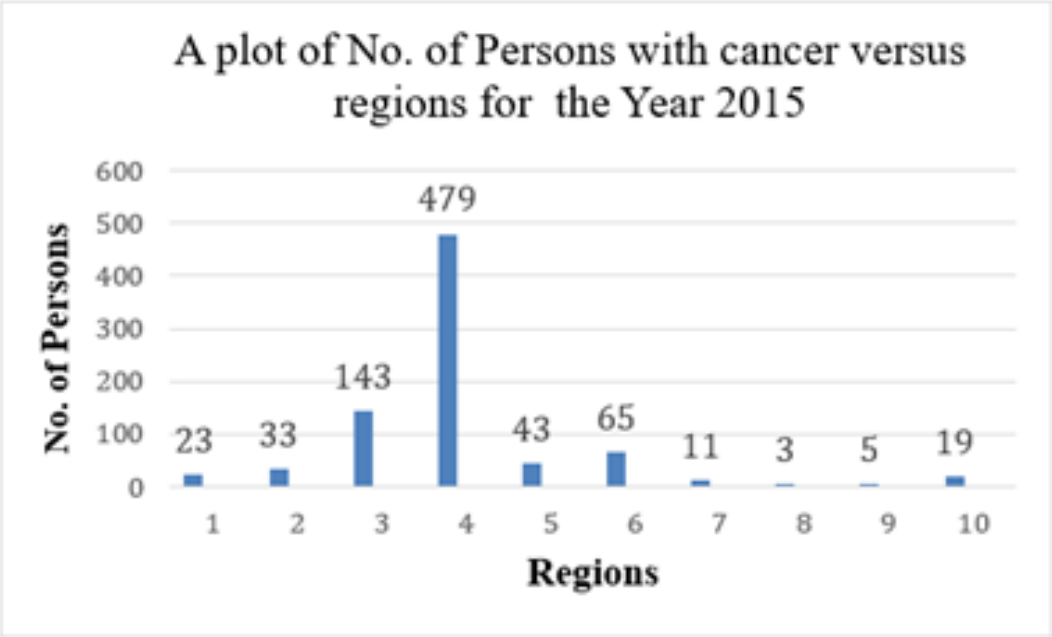
Cancer Research calculated data for 2015

Table 4

Table 4: Showing number of deaths per region in 2015.

Region	Number of Persons
1	23
2	33
3	143
4	479
5	43
6	65
7	11
8	3
9	5
10	19
Total	824
Average, X	(82.4±137.71)

Graph 1



Graph 1: Showing number of deaths per region in 2015.

Total number of deaths versus gender in 2015

Table 5

Table 5: Showing number of deaths versus gender.

Sex	Total Number
Females	828
Males	826

Figure 7

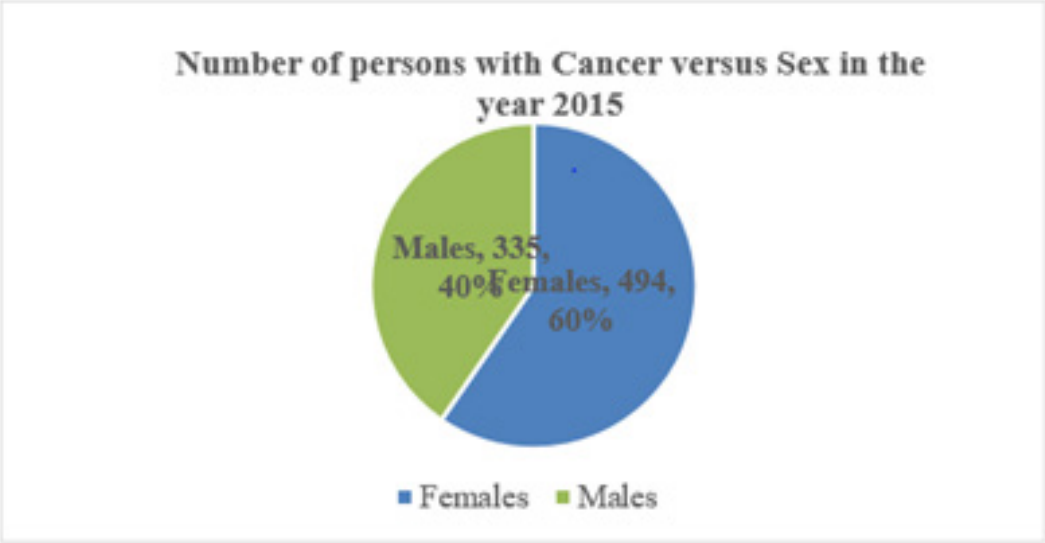


Figure 7: Graph showing number of deaths versus sex in 2015.

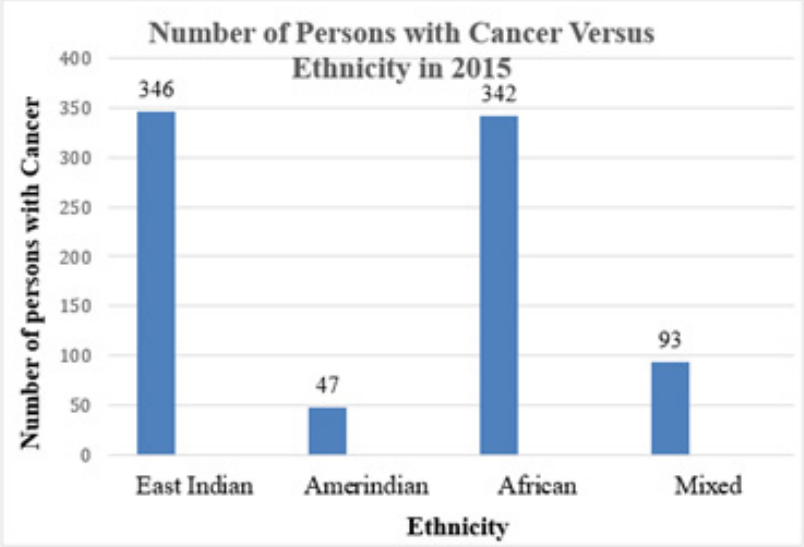
Total Number of Deaths versus Ethnicity

Table 6

Table 6: Showing number of deaths versus ethnicity.

Ethnicity	Total Number of Persons with Cancer
East Indian	346
Amerindian	47
African	342
Mixed	93
Total	828
Average, X	20.7±159.31

Graph 2



Graph 2: Showing number of deaths with respect to ethnicity in 2015.

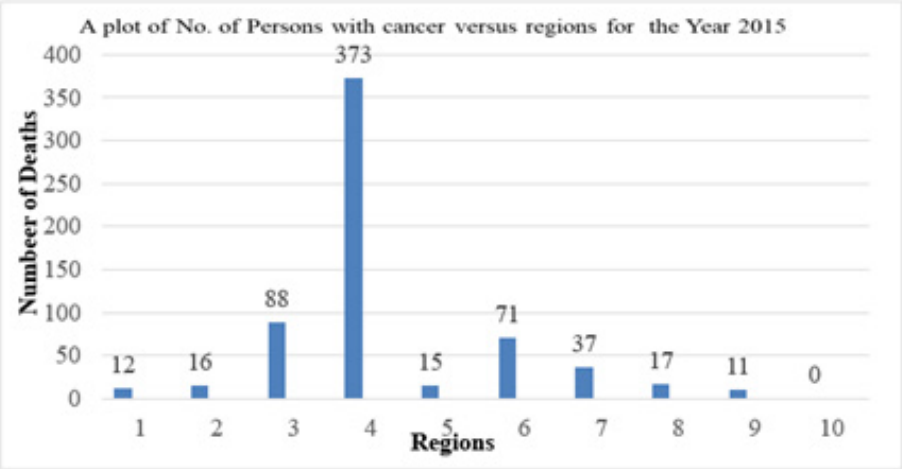
Cancer Research calculated data for 2016

Table 7

Table 7: Showing number of deaths per region in 2016.

Region	Number of Persons
1	12
2	16
3	88
4	373
5	15
6	71
7	37
8	17
9	11
10	14
Total	654
Average	65.4 ±111.43

Graph 3



Graph 3: Showing number of deaths versus region in 2016.

Table 8

Table 8: Number of persons with cancer versus males/females in the year 2016.

Sex	Number of Persons with Cancer
Females	389
Males	267
Total	656

Figure 8

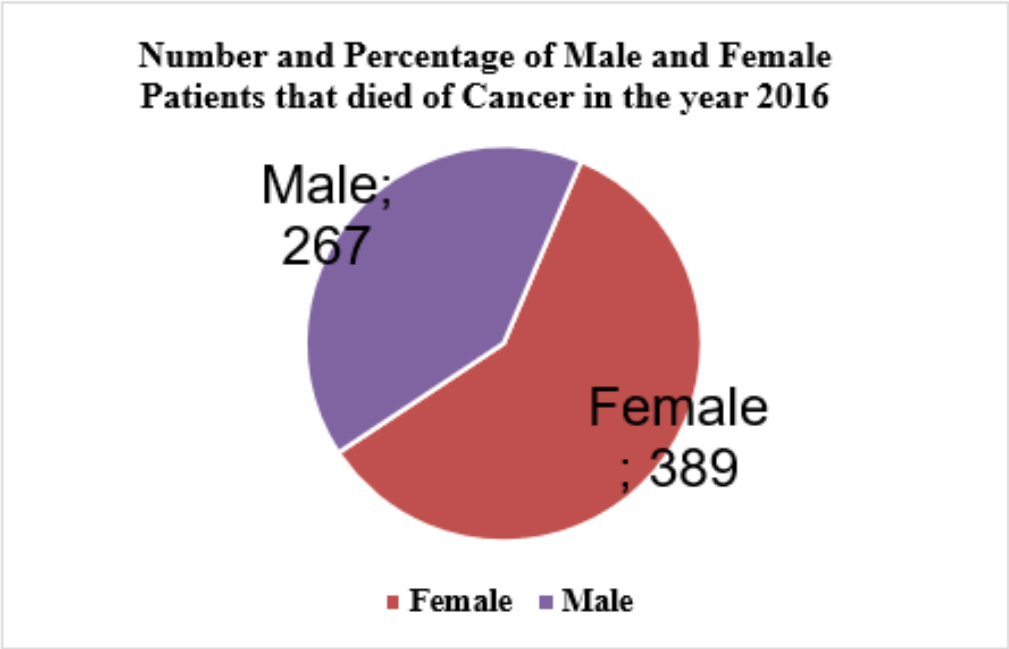


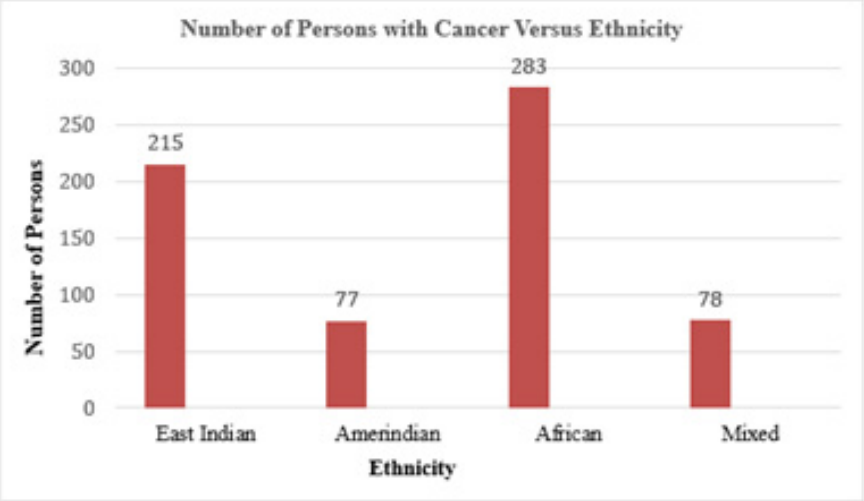
Figure 8: Pie chart showing the number and percentage of males and female deaths in 2016.

Table 9

Table 9: Showing number of persons with cancer versus ethnicity in 2016.

Ethnicity	Number of Persons
East Indian	215
Amerindian	77
African	283
Mixed	78
Total	653

Graph 4



Graph 4: Showing number of persons with cancer with respect to ethnicity in 2016.

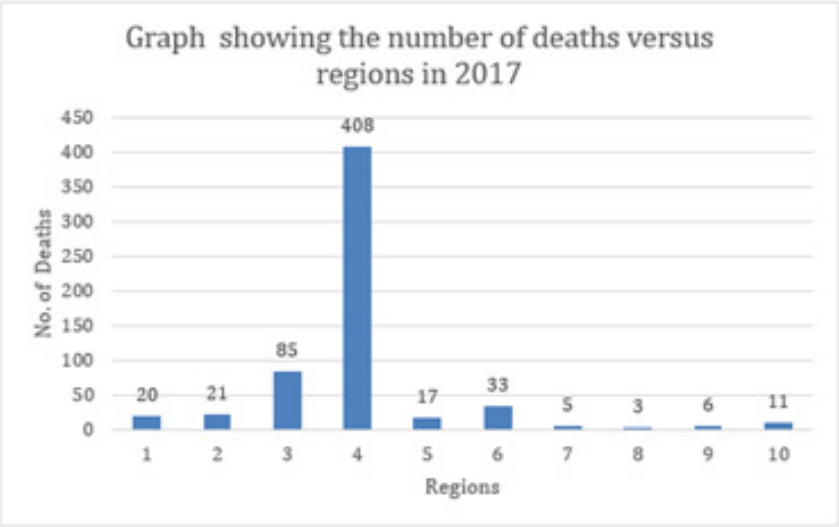
Cancer Research tabulated data 2017

Table 10

Table 10: Showing number of cancer deaths in each region

Regions	Number of Death
1	20
2	21
3	85
4	408
5	17
6	33
7	5
8	3
9	6
10	11
Total	609
Average	60.9±117.91

Graph 5



Graph 5: Graph showing the number of deaths per region in 2017.

Table 11

Table 11: Number of cancer deaths between male and female in 2017.

Gender	No. Cancer Deaths
Male	245
Female	373
Total	618

Figure 9

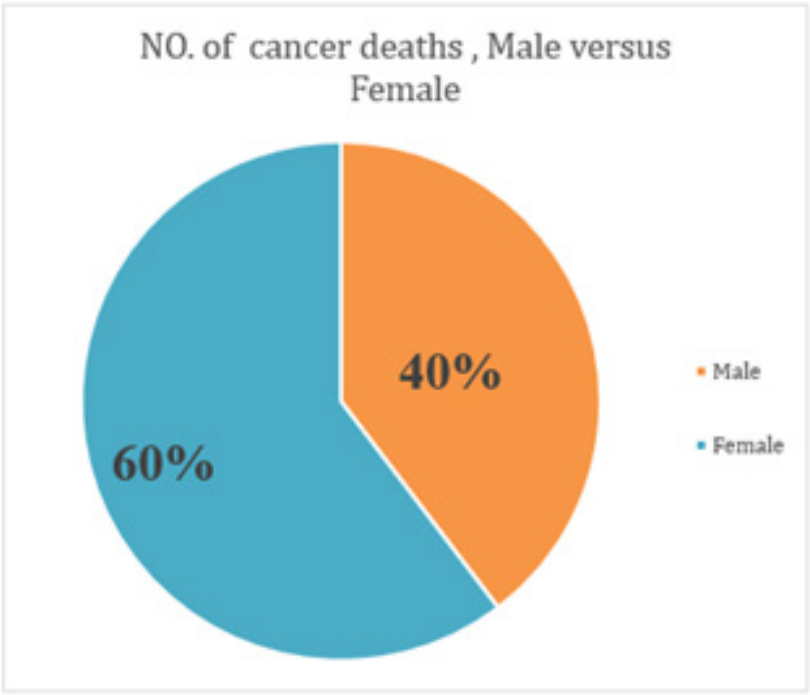


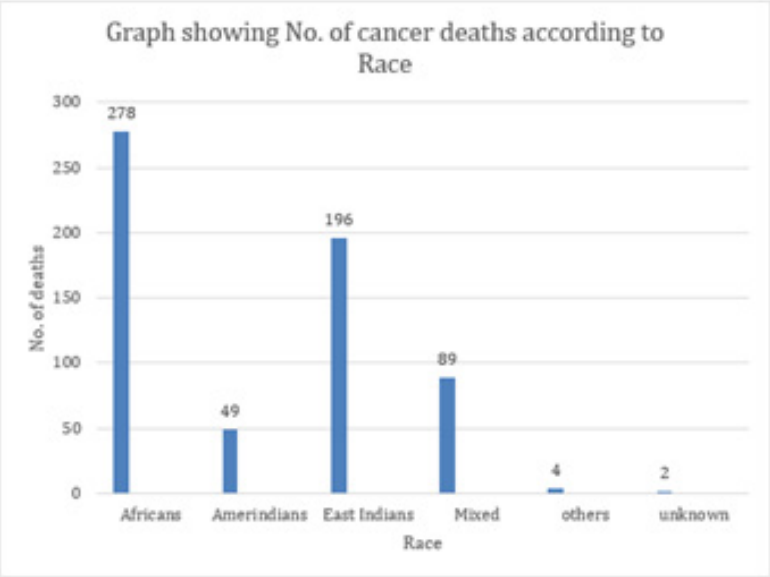
Figure 9: Pie chart, showing the number of deaths versus gender in 2017.

Table 12

Table 12: Number of cancer deaths according to Ethnicity in 2017.

Race	No. of Deaths
Africans	278
Amerindians	49
East Indians	196
Mixed	89
Others	4
Unknown	2
Total	618
Average, X	103±111.70

Graph 6



Graph 6: Showing the number of deaths versus ethnicity in 2017.

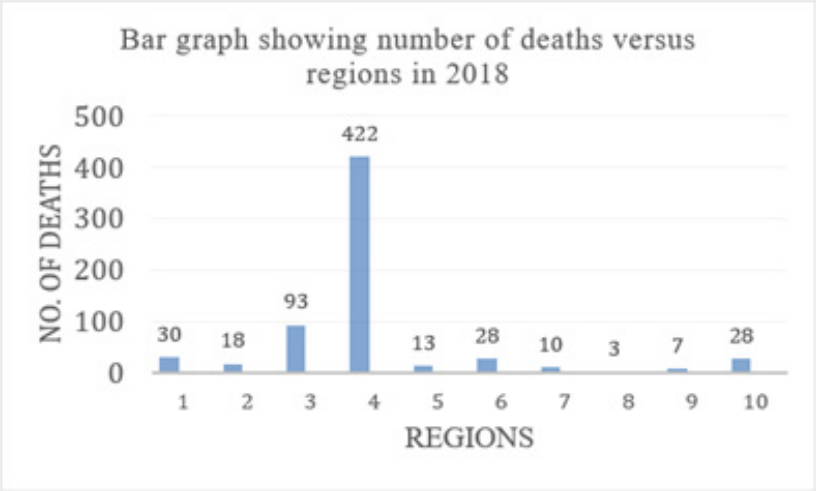
Cancer Research calculated data for 2018

Table 13

Table 13: Showing number of cancer deaths in each region.

Region	Number of Person
1	30
2	18
3	93
4	421
5	13
6	28
7	10
8	3
9	7
10	28
TOTAL	652
Average	65.1±127.64

Graph 7



Graph 7: Showing the number of deaths per region in 2018.

Table 14

Table 14: Showing number of deaths between male and female in 2018.

Gender	No. of Deaths
Male	239
Female	413
	652

Figure 10

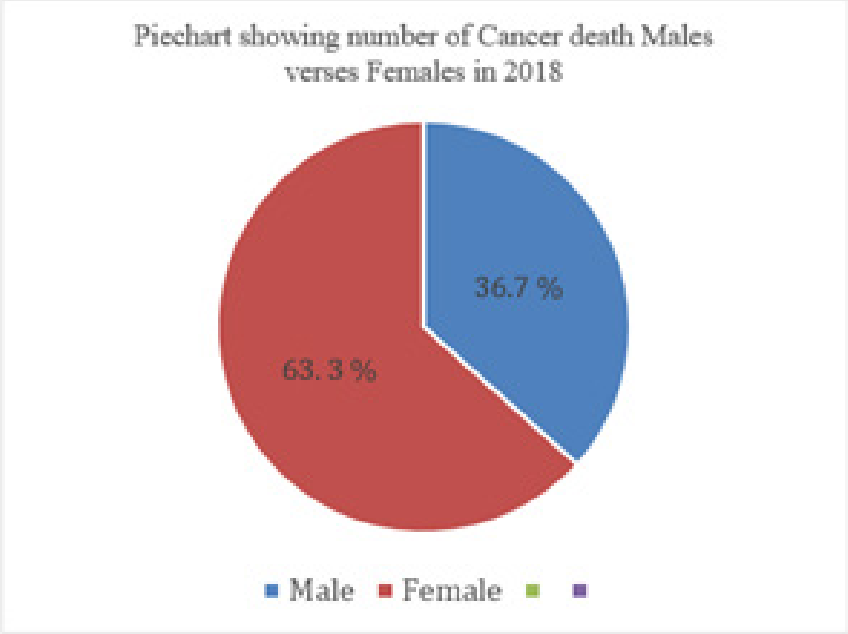


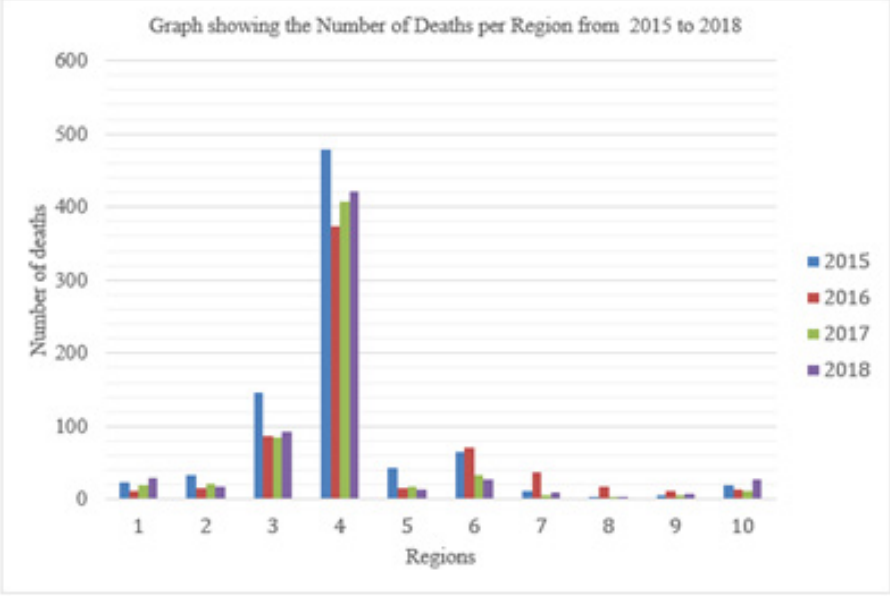
Figure 10: Pie-Chart showing number of deaths versus gender in 2018.

Table 15

Table 15: Showing total number of death from 2015-2018 for all 10 regions.

Regions	Number of Deaths
1	85
2	88
3	413
4	1681
5	88
6	197
7	63
8	26
9	29
10	72
Total	2742
Average	274.2±507.35

Graph 8



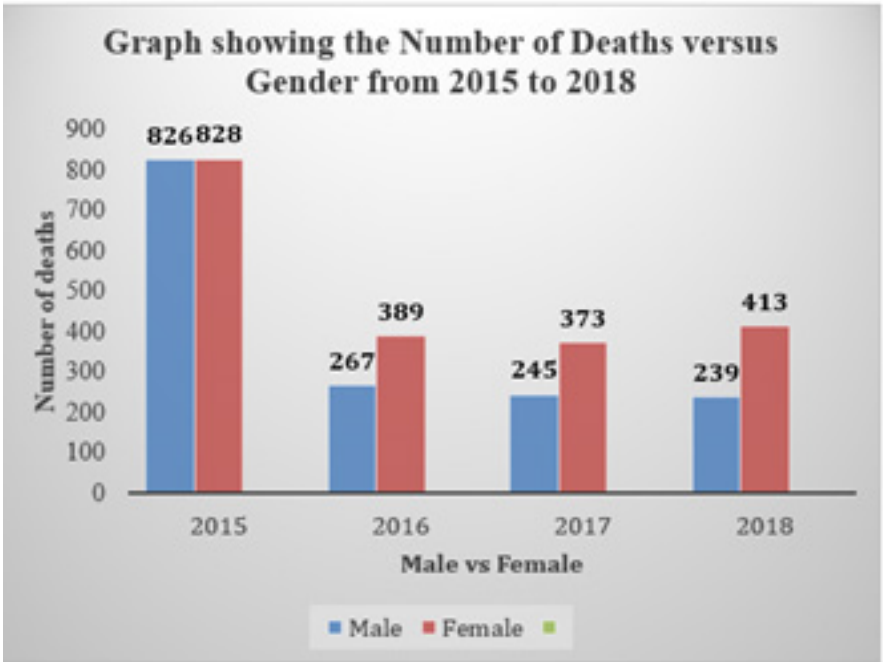
Graph 8: Showing the number of deaths per region from 2015 to 2018.

Table 16

Table 16: Showing the distribution of cancer related deaths versus gender from 2015-2018.

Gender	Number of Death
Male	1577
Female	2003
Total	3580

Graph 9



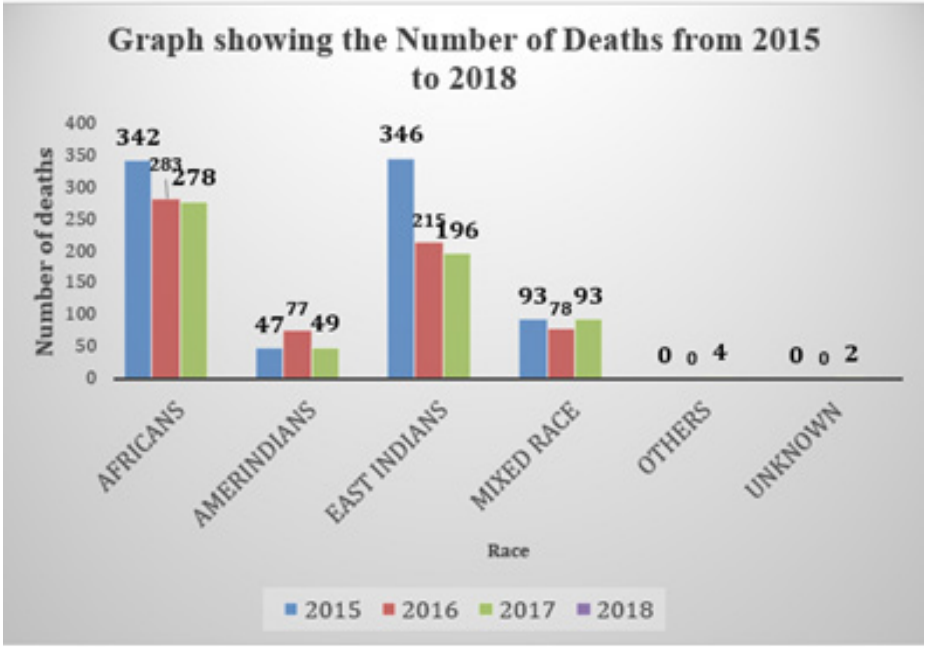
Graph 9: Depicting the number of deaths from 2015 to 2018 versus gender.

Table 17

Table 17: Showing the number of deaths from 2015 to 2017 versus race.

Race	Number of Death
Africans	912
Amerindians	173
East Indians	757
Mixed Race	260
Others	4
Unknown	2
Total	2108
Average, X	351.33±390.32

Graph 10



Graph 10: Showing the number of deaths from 2015 to 2017 versus race.

Discussion

Table 4 shows the number of deaths per region in 2015. The total number of deaths recorded was 824. The highest number of deaths of 479 was recorded for region 4. The lowest number of deaths via cancer, 3 was recorded for region 8. These data are displayed in Graph 1 on the corresponding Bar graph, which shows the number of persons with cancer versus regions for the year 2015. Table 5 shows the number of deaths versus gender for 2015. More females (828) died from cancer than males (826). This is shown in Figure 7, pie-chart. Table 6 displays the number of deaths from cancer versus ethnicity. As can be seen, the largest number of deaths were from East Indians (346), followed by African (342). The lowest number of deaths were recorded by Amerindians. The decreasing order of deaths, resulting from ethnicity is: East Indians>Africans>Mixed>Amerindians. These results are displayed accordingly on Bar graphs 2. Table 7 shows the cancer research data for 2016. As can be seen, the largest number of deaths resulting from cancer were from region 4 (373). The lowest was from region 9 (11). The total number of deaths recorded was 54. A bar graph reflecting the trend is shown in Graph 3. Table 8 shows the number of persons with cancer versus males/females in the year 2016. The number of persons who died from cancer was mostly females (389). This is displayed in the corresponding pie-chart in Figure 8. Table 9 shows the ethnical mortality that results from cancer in 2016. Africans showed the highest mortality (283), followed by East Indians (215). These results are displayed on Bar graph 4. Thus, based on ethnicity, the order follows the sequence: African>East Indian>mixed>Amerindians. Table 10 shows the number of cancer deaths for each region in 2017. The highest number of cancer death was recorded for region 4 (408). This was followed by that in region 3 (85). The lowest number of deaths of 3 was recorded in region 8 and that being 3. These results are shown in the corresponding Bar-graph 5. Table 11 shows the number of cancer deaths that is gender related in 2017. The highest number of cancer deaths was female in nature (373). Figure 9 is a corresponding representation in pie-chart, which shows that over 60% of the deaths was female in nature. The number of cancer deaths that were ethnically oriented in 2017 are shown in Table 12. Aficans constitute the highest (278) and unknow, with the lowest value of 2. The order of decreasing number of deaths follows the sequence:

Africans > East Indians > Mixed > Amerindians > others > unknown. These data are shown on Bar graph in Figure 10.

Cancer research data for 2018 indicates that a total number of 652 persons died, (Table 13). The predominant number came from region 4 (421). This was followed by 93 from region 3. The lowest number of deaths was recorded for region 8 and that being 3. The corresponding Bar graph 7, reflective of this trend. Table 14 shows the number of deaths based on gender for the year 2018. The highest number of deaths was recorded by males (413). Figure 10 shows the corresponding pie-chart. 63.3% were males and 36.7% females. An overall perspective of the number of deaths, resulting from cancer for the period 2015-2018 is shown in Table 15. During that period, a total number of 2,742 deaths were recorded. The highest was observed Region 4 (1681) and the lowest of 26 was recorded for region 8.0. This is shown on the corresponding bar Graph 8. The highest number of deaths in region 4 may be due to the lifestyle of the people. People are more engaged in the sedentary mode of life and prefer the "Fast Food" and eating out in restaurants. Obesity is high in this region. There is a direct correlation between obesity and cancer. The low number of cancers in Potaro-Siparuni may be due to the community been engaged in farming, an active form of life. The distribution of cancer related deaths versus gender is shown in Table 16. Female death (2003) was more than male (1577). Table 17 shows the number of deaths based on ethnicity. The highest cancer death was recorded by Africans (912), followed by East Indian (757).

Conclusion

The cancer patterns and trends within Guyana reflects the socio-demographic differences within various parts of the country. The majority of the cancer cases were found to be affecting people of African and East Indian descent. Since these two-sub population make up the larger population in Guyana with region 4, the most populated and cancer affected region. The highest cancer profile in region 4 may be due to the socio-economic problem in that region. The consistent increase in cancer creates a burden to the health care system, particularly in the less developed regions. Major efforts to effectively address this issue should include surveillance across each region as for the evidence base for planning and evaluating cancer control interventions. Also, the populace should be engaged in a healthy lifestyle. Overall, the cancer epidemiology literature from Guyana is sparse. More Studies with robust designs representing all parts of the country is needed. Guyana has the capacity for research studies on many local herbs, fruits and some vegetables, such as guava, corilla, soursap with anti-cancer potentials. It is a country rich with diverse flora whose anticancer profile should be addressed. In addition, there should be a proliferation of anticancer herbs in the country, to prevent this life killing disease.

References

1. Danhier F, Feron O, Preat V (2010) To exploit the tumor microenvironment passive and active tumor targeting of nanocarriers for anti-cancer drug delivery. J Control Release 148: 135-146.
2. Reddy ARK, Grace JR (2016) Anticancer activity of methanolic extracts of selected mangrove plants. IJPSR 7(9): 3852-3856.
3. Priya K, Krishna KS, Vijayakumar M (2013) Cyathula prostate: A potent source of anti-cancer agent against Dalton's ascites in swis albino mice. Asian Pacific J Trop Med pp. 776-779.
4. Roukos DH (2009) Genome-wide association studies: How predictable is a person's cancer risk. Expert Rev Anticancer Ther 9(4): 389-392.
5. (2010) Cancers, NMH Facts sheet. World Health Organisation, WHO, Switzerland.
6. Cragg, GM, Newman DJ (2005) Plants as a source of anti-cancer agents. J Ethnopharmacol 100(1-2): 72-79.
7. Artun FT, Karagoz OG, Melikoglu AS, Kultur S, Sutlupinar N, et al. (2016) *In vitro* anticancer and cytotoxic activities of some plant extracts on HeLa and Vero cell lines. JBUON 21(3): 720-725.
8. Smith CM, Reynard AM (1992) Textbook of pharmacology. WB Saunders Company, Harcourt Brace Jovanovich, Inc, USA.
9. Bertram G, Katzung MD (2018) Basic & Clinical Pharmacology. 14th (edn), McGraw Hill Education, US.
10. www.worldatlas.com/webimage/countrys/samerica/gy.htm
11. Sung H, Ferlay J, Siegel RL, Laversanne M, Soerjomataram I, et al. (2021) Global cancer statistics 2020: GLOBOCAN estimates of incidence and mortality worldwide for 36 Cancers in 185 Countries. CA Cancer J Clin 71(3): 209-249.
12. https://www.who.int/news-room/fact-sheets/detail/breast-cancer
13. Ghoncheh M, Pournamdar Z, Salehiniya H (2016) Incidence and mortality and epidemiology of breast cancer in the world. Asian Pac J Cancer Prev 17(S3): 43-46.
14. Plummer BW, Premini P, Layne P (2009) Ethnicity and cancer in Guyana, South America. Infectious Agents and Cancer.
15. Guyana has highest incidence of cancer mortality in the region. Kaieteur News.
16. International Agency for Research on Guyana. WHO (2018) Guyana global cancer observatory.
17. Nguyen NH, Hoai Ta QT, Pham QT, Luong TNH, Phung VT, et al. (2020) Anticancer activity of novel plant extracts and compounds from *Adenosma bracteosum* (Bonati) in human lung and liver cancer cells. Molecules 25(12): 2912.

Crimson Publishers

Wings to the Research

Authored by

Jagessar RC