

## ANALYSES AND DISTRIBUTION OF VARIOUS TYPES OF CANCERS RECORDED IN IFE-IJESHA CANCER REGISTRY IN THE FIVE YEAR PERIOD 2010 -2014

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### ABSTRACT

This work presents analyses of data on cancers diagnosed and recorded at the Ife-Ijesa Cancer Registry located at the Obafemi Awolowo University Teaching Hospital Complex (OAUTHC) Ile-Ife for the five-year period 2010-2014. Of the 2,042 total cases retrieved from the Registry, 830 were further linked with the records available at the Medical Records Department of the OAUTHC to obtain information on geographical residence, occupation, and marital status of the subjects. The records were thereafter exhaustively analyzed using Excel Spreadsheet and R-statistical package to describe the distribution of the various types of cancer among various demographic groupings. A geo-spatial distribution analysis was used to display the prevalence of cancer on a geographical map of Southwestern Nigeria. For the 2,042 cases, the relative distribution of these cancers, by site, were: Breast (25.5%), Reproductive sites (18%), Blood and Bone Marrow (13.3%), Gastro-intestinal Tract, G.I.T. (12.4%), Lymphoma (6.2%), Liver and Gall Bladder (4.4%), Skin (2.7%), Metastatic (2.3%), Cytology (2.1%), Ear, Nose and Throat E.N.T., (2.1%), Lungs (1.9%), Connective tissue (1.9%), Kidney (1.5%), Jaw (1.4%), Endocrine (1.1%), Eye (0.6%) and Others (2.9%). Fifty-seven percent (1169 cases) of these were in female subjects; however, if the 523 cases of breast cancer (all females) were excluded, more cancers (57.5%) would be recorded for males. Indeed, for cancers in Blood and Bones, Kidney, Jaw, and Eye, there were at least twice as many cases in Males than in Females, while for ENT, there were in male subjects, over thrice as many cases as were in females. The average age at diagnosis ranged from 25.0 years for cancers of the Eye to 63.4 years for cancers at reproductive sites. The youngest case was sacrococcygeal teratoma in an 8-day old female subject while the oldest subject was a 101 year female diagnosed with breast cancer. In female subjects below 20 years, there was no record of cancer of the lungs, E.N.T. or Jaw, and there were only very few cancer cases at the Skin and G.I.T. in those subjects. There were no records of cancer of the Liver and Gall Bladder and metastatic cancer in subjects below 20 years, either male or female. Other results presented are the relationship between reported cases of cancer and Marital Status, Occupation, and Geographical Region of Residence in 830 subjects. It was particularly interesting to see a wide disparity in reported cancer cases from two areas of Ondo West (53 cases) and Ondo East (4 cases) despite comprising of subjects with identical nutritional, lifestyle and cultural habits. This strongly suggests the influence of environmental factors related to the physical geography of the city. It is hoped that this preliminary data will stimulate more interest in the role of the physical environment and similar factors in cancer aetiology and prevention.

**Keywords:** Cancer Prevalence. Demographic and Geographical distribution.

### INTRODUCTION

Man's unsustainable modern-day lifestyle has exposed him to several environmental hazards. The environment that is supposed to protect man now predisposes him to various diseases such as cancer. Cancer is a group of diseases involving abnormal cell growth with the potential to invade or spread to other parts of the body. It has become a major source of morbidity and mortality globally [Parkin *et al.*, 2003, WHO 2003, USDHHS 2010, Sylla and Wild, 2011]. In 2008, there were 12.7

million new cases and 7.6 million cancer-related deaths [Ferlay *et al.*, 2010]. Fifty-six percent of these newly-reported cancer cases occurred in developing countries, and it is projected that by year 2030, 70% of all new cases of cancer will be found in developing countries [Boyle and Levin, 2008]. In Nigeria, about 100,000 new cases of cancer occur every year, with high case-fatality ratio [Ferlay *et al.*, 2010]. Nigeria contributed 15% to the estimated 681,000 new cases of cancer that occurred in Africa in 2008 [Ayanwu 2000, Sylla

and Wild, 2011]. 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 decreasing risk of death from infectious diseases, increasing prevalence of smoking, physical inactivity, as well as changing dietary and lifestyle patterns. [Sylla and Wild, 2011, Jedy-Agba *et al.*, 2012]

It is generally accepted that a large number of cancers can be prevented outright. The epigenetics theory has shown that quite often, even genes predisposed to becoming cancerous still need some favourable external environmental conditions to “pull the trigger” before going rogue [Akinyemi, 2016]. According to the US Department of Human Health Services, at least, as many as two-thirds of all cancer cases are linked to environmental causes and are therefore preventable, at least in principle (USDHHS, 2010). In the landmark Scandinavian Twins Study, Lichtenstein and co-workers (2000), evaluated the contribution of genetics to risk of breast cancer as 27%, while the rest 73% of risk was attributed to actionable environmental factors.

Despite the threats that cancer poses to public health in sub-saharan Africa, few countries in this region have data on cancer incidence [Curado *et al.*, 2008]. In recent times, information on cancer incidence, prevalence and mortality in Nigeria has been based on estimates from case series, medical records, mortality records, hospital-based cancer registries and the Ibadan Population-Based Cancer Registry (IBCR) [Parkin *et al.*, 2003]. The IBCR, located at the University College Hospital Ibadan and set up in 1962 was the first cancer Registry in Nigeria. However, due to logistics problems the Registry suffered some setbacks from the 1970s to 2000s [Parkin *et al.*, 2010; Jedy-Agba *et al.*, 2012]. The Ife-Ijesha Cancer Registry is located in one of the oldest cities in Nigeria, Ile-Ife, a small city in Osun State, Southwestern Nigeria. The major ethnic group in this region is Yoruba, one of the largest ethnic groups in Africa. The common religions in this area are Christianity, Islam, and Traditional religions, many of whom seek orthodox medical care, if at all, only as a last resort. The burden of cancer in Nigeria, and most parts of Africa, is unknown; mainly because of lack of adequate population statistics or under-

reporting. This paper attempts to report and analyze the cancer cases recorded at the Ife-Ijesha Cancer Registry with a view to providing currently-unavailable but direly-needed statistics on cancer burdens, types, and distribution in this region. This in turn could facilitate development of effective cancer prevention/management schemes to mitigate the burgeoning burden of cancer in Nigeria

## MATERIALS AND METHODS

Archived data of cancer cases recorded for the five-year period 2010-2014 were extracted from the Cancer Registry located at the Obafemi Awolowo University Teaching Hospital Complex (OAUTHC) Ile-Ife. The data retrieved were further linked with other records such as the residence, occupation, marital status, etc of the subjects which were extracted from their case notes archived at the Hospital Library by the Medical Records Department. As at the time of this report, 830 cases from the Registry have been linked with their records at the Hospital Library. The retrieval of records was preceded by both oral and written agreements for research collaboration with the two hospital groups involved, and apart from usual precautions to protect the privacy of the subjects, their personal identities (name and street addresses) were not extracted. Data extraction at both the Cancer Registry and the Medical Records Department was carried out under the supervision of the respective staff members in charge of the records with some medical students enlisted as research assistants. The records involving all 2,042 subjects, were exhaustively analyzed using Excel Spreadsheet to describe the distribution of the various types of cancers among various demographic groupings. The combined records of the 830 subjects were further analyzed using R-statistical Package to describe the distribution of the various types of cancers based on such parameters as subjects' geographical residence, occupation and marital status. Furthermore, a GIS-based package was used to graphically display prevalence of cancer (based on 8 class intervals) on a physical map of southwestern Nigeria.

## RESULTS AND DISCUSSION

The cancer cases were grouped into 16 different types, based largely on their sites of occurrence.

Twenty-two cases that could not be easily classified were lumped together as “Others.” The frequency distribution of these different types of cancers for both male and female subjects, is shown in Figure 1. For the 2,042 cases, the relative distribution (both genders lumped together) were: Breast (25.5%), Reproductive sites (18%), Blood and Bone Marrow (13.3%), Gastro-intestinal Tract, G.I.T. (12.4%), Lymphoma (6.2%), Liver and Gall Bladder (4.4%), Skin (2.7%), Metastatic (2.3%), Cytology (2.1%), Ear, Nose and Throat E.N.T., (2.1%), Lungs (1.9%), Connective tissue (1.9%), Kidney (1.5%), Jaw (1.4%), Endocrine

(1.1%), Eye (0.6%) and Others (2.9%). Their distribution based on age and gender of the subjects is also summarized in Table 1. The age distribution of all the 2,042 subjects is shown in Figure 2a, while the distribution for the 830 subjects for whom further records on occupation, marital status and residence were obtained, is shown in Figure 2b. The distribution of each type of cancer among three age classifications (viz 0 – 10 years, 11 – 20 years, and above 20 years) for both male and female subjects is shown in Figures 3a to 3q. A summary of the demographic profile for each type of cancer is presented as follows:

Table 1: Age and gender profile of 2,042 patients presenting with various types of cancers at the Ife-Ijesa Cancer Registry between 2010 and 2014.

Nature of Cancer	Average Age at Diagnosis (years)	Female		Male	
		Number of Cases	Age Range (years)	Number of Cases	Age Range (years)
Breast	50.5	523	4 - 101	-	-
Reproductive	63.4	178	5 - 96	186	18 - 92
Blood and Bone Marrow	40.8	90	5 - 79	183	0.5 - 86
G.I.T.	52.3	111	18 - 90	141	18 - 80
Lymphoma	37.2	60	3 - 83	66	3 - 80
Liver and Gall Bladder	51.7	44	21 - 81	46	26 - 89
Skin	52.6	28	16 - 82	27	4 - 85
Metastatic	57.3	17	27 - 89	29	27 - 80
Cytology	46.7	19	3 - 78	23	6 - 85
ENT	48.1	9	25 - 66	33	4 - 92
Lungs	57.3	20	45 - 92	18	19 - 77
Connective tissue	44.1	15	6 - 80	23	0.5 - 85
Kidney	52.0	10	2 - 62	21	2.5 - 83
Jaw	44.0	8	27 - 70	21	8 - 75
Endocrine	44.3	11	3 - 64	11	5 - 70
Eye	25.0	4	2 - 72	8	2 - 75
Others	51.9	22	0.02 - 82	37	0.3 - 94

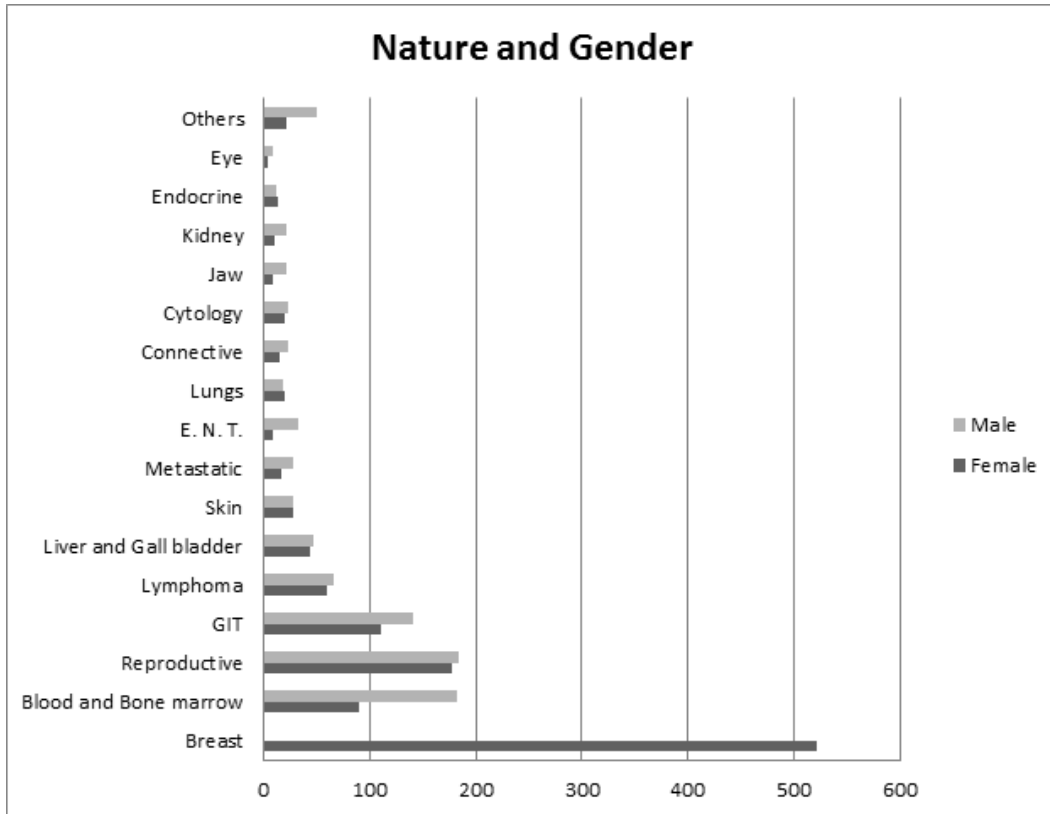


Figure 1: Distribution of various Cancers types recorded in Ife-Ijesha Cancer Registry 2010-2014

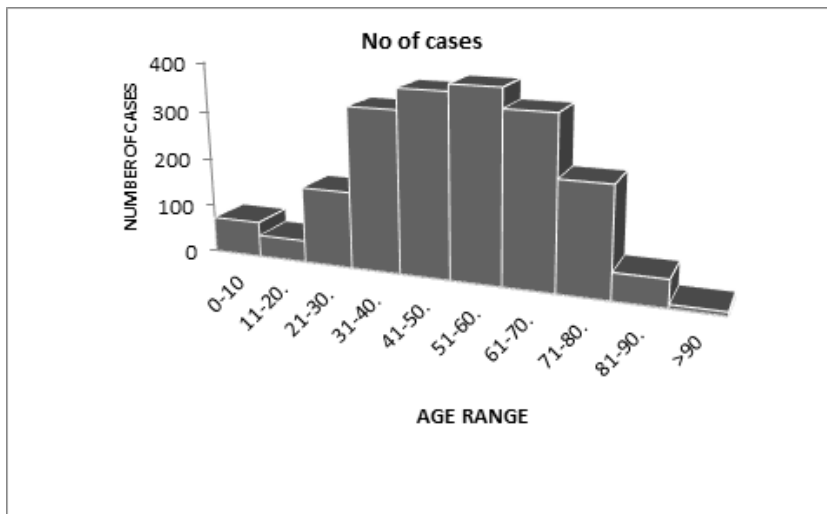


Figure 2a: Age Distribution of Cancer Patients (2,04 subjects) Average age is 50.7 years

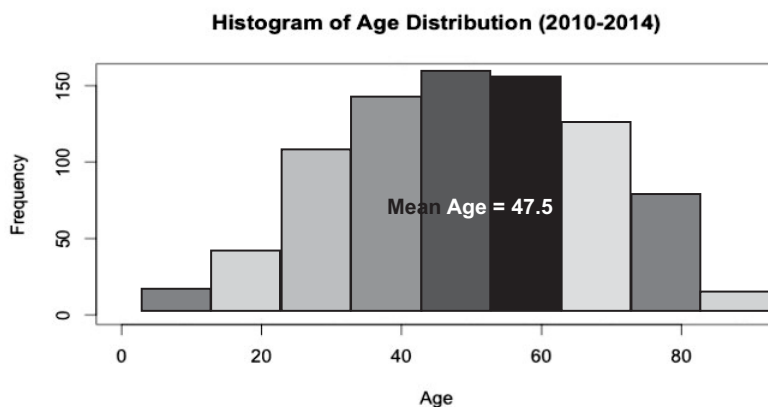


Figure 2b: Age Distribution of Cancer Patients (830 subjects) Average age is 47.5 years

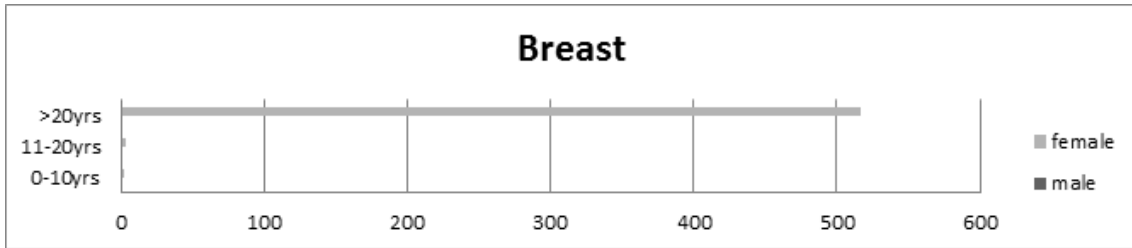


Figure 3a

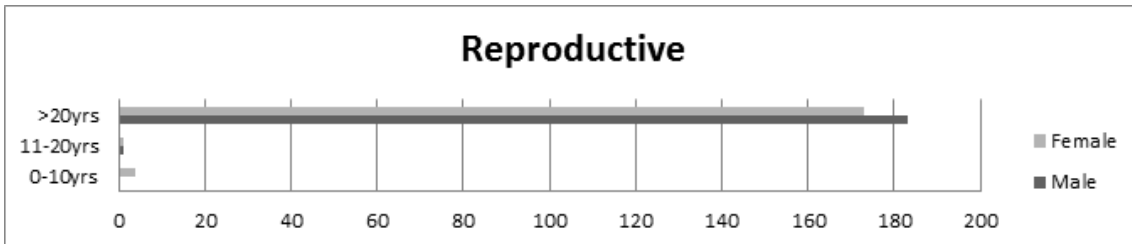


Figure 3b

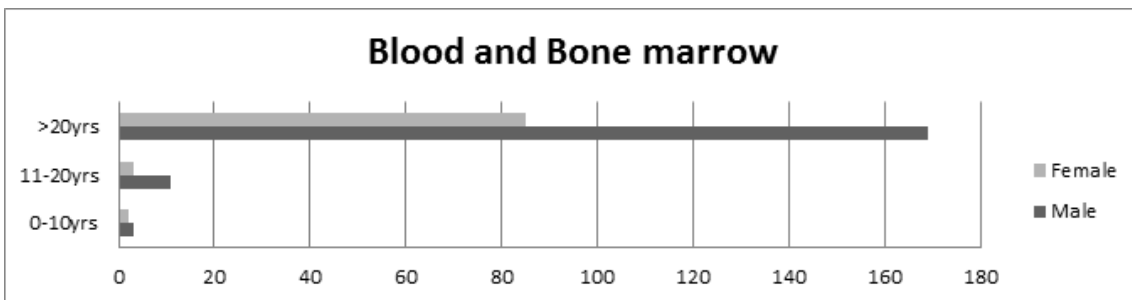


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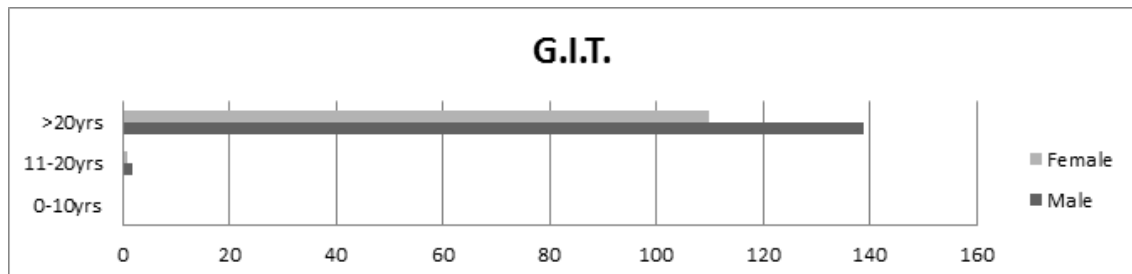


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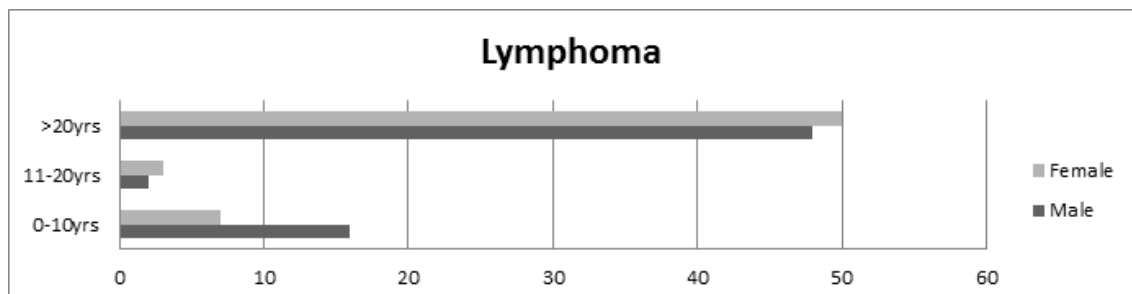


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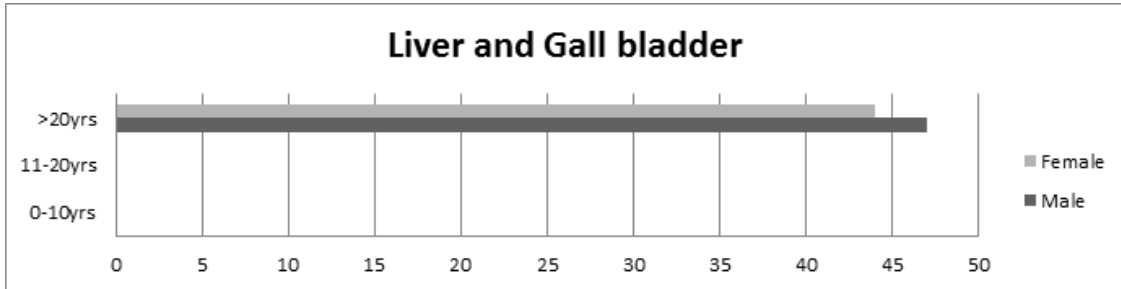


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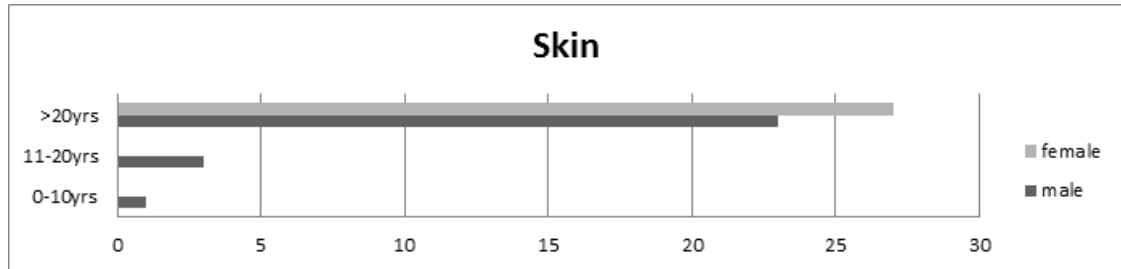


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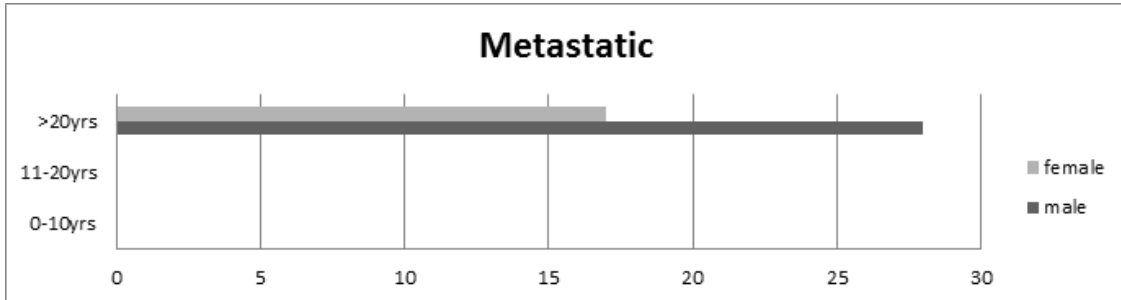


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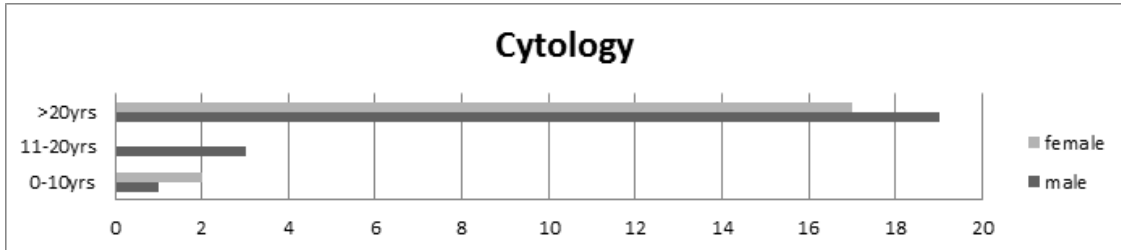


Figure 3i

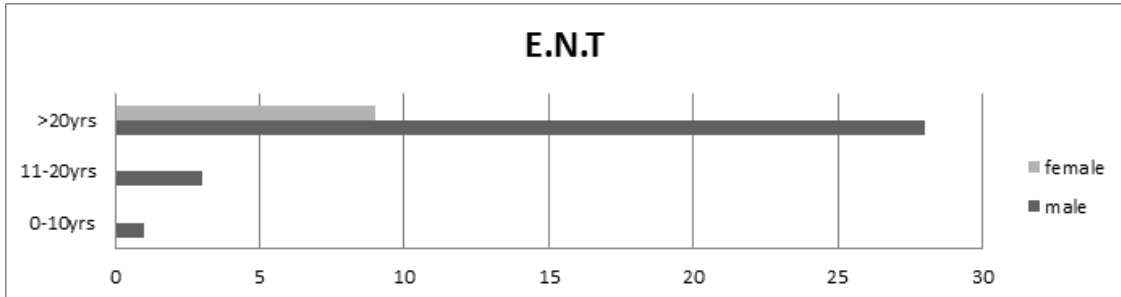


Figure 3j

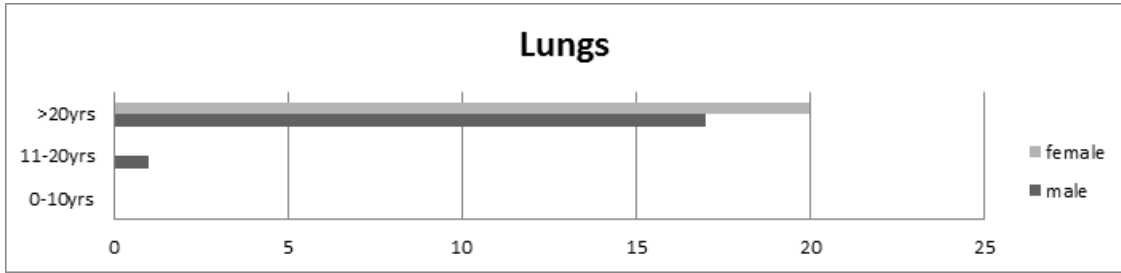


Figure 3k

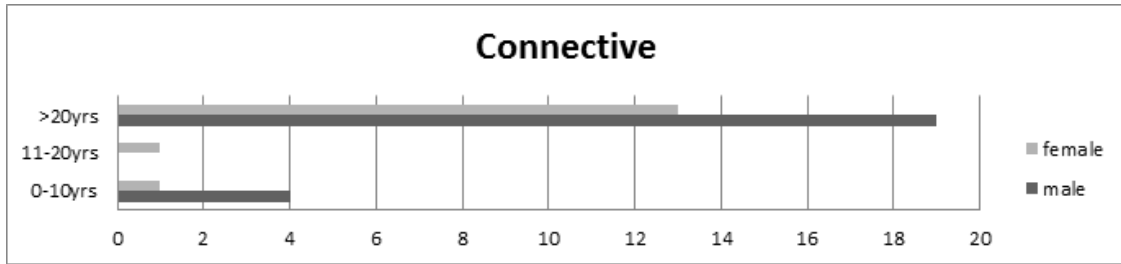


Figure 3l

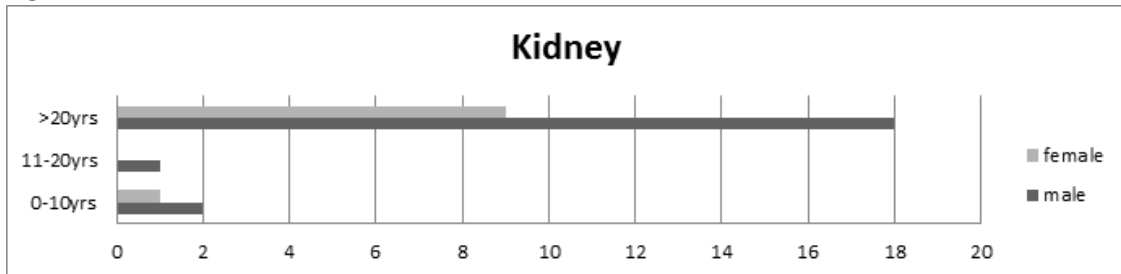


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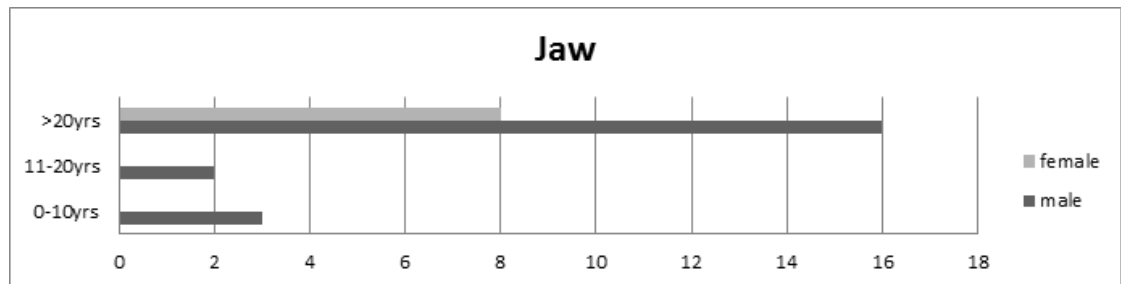


Figure 3n

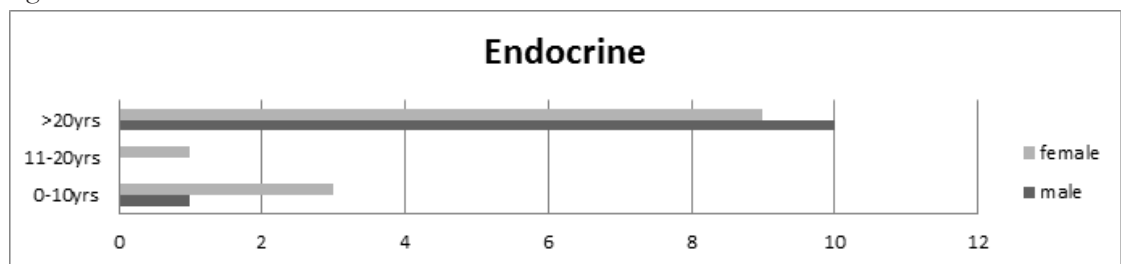


Figure 3o

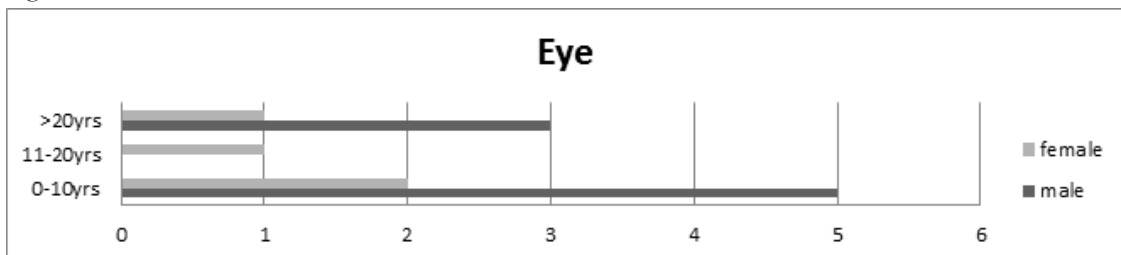


Figure 3p

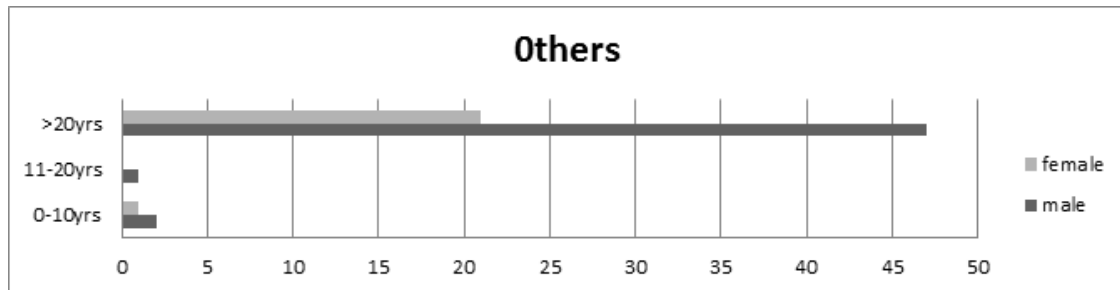


Figure 3q

Figure 3a-q. Distribution of various cancers among 3 age categories (0-10 years, 11 – 20 years, and >20 years) in male and female subjects

*Breast Cancers:* There were 523 cases of various types of breast cancers, and all were recorded in female subjects. The ages of the subjects ranged from 4 to 101 years, with the average age at 50.5 years. The diagnosis for the youngest subject was invasive ductal carcinoma while that for the oldest subject was infiltrating ductal carcinoma.

*Reproductive Cancers:* Reproductive cancers ranked second with a total of 364 cases. These comprised of 189 cases of Prostate cancers, 144 Cervical, 18 Ovarian, 10 Endometrial, 3 cases each of Vagina and Vulva, and also 1 case each of Testicular and Inguinal cancer. One hundred and seventy-eight of reproductive cancers were in female subjects, with the ages ranging from 5 to 96 years. Similarly there were 186 cases in male subjects, with the ages ranging from 18 to 92 years. The average age of the subjects was 63.4 years. The diagnoses for the youngest subjects were Burkitt's Lymphoma (female) and pleomorphic sarcoma (male), while those for the oldest subjects were Small cell carcinoma (female) and Invasive adenocarcinoma (male).

*Blood and Bone Marrow Cancers:* The 273 cases of Cancers of Blood and Bone marrow comprised of 266 cases in Blood, 6 cases in Bone marrow, and 1 Trephine. 33.8% of the cases were recorded in female subjects. The ages of the female subjects ranged from 5 – 79 years, while those in male subjects ranged from 6 months to 86 years. The average age for the diagnosis of cancers of Blood and Bone marrow was 40.8 years. The diagnosis for the youngest subjects, both male and female, was Acute Lymphocytic Leukaemia, while that for the oldest subjects was Chronic Myeloid Leukaemia (also for both female and male).

*Gastrointestinal Tract Cancers:* Cancers of the gastrointestinal tract (G.I.T.) ranked fourth at the Ife-Ijesa Cancer Registry. The total 252 cases were distributed as follows: Gastric 69, Rectal 59, Omentum 14, Caecum 10, Anorectum 9 Oesophageal 12, Antrum 5, Anal 5, Intestine 3, Stomach 3, Ileum 2, Hepatic flexure 2, and 1 each for Appendix, Bowel and Duodenal. 44% of the cases were recorded in female subjects. The ages of the female subjects ranged from 18 - 90 years, while those in male subjects ranged from 18-80 years. There was thus no case of cancer of the G.I.T. in subjects below 18 years of age. The average age for the diagnosis of this cancer was 52.3 years. The diagnoses for the youngest subjects were Rectal (female) and Gastric (male), while those for the oldest subjects were Oesophagogastric (female) and Rectal (male).

*Lymphoma:* The 126 cases classified as Lymphomas were comprised of: Lymphone 43, Lymph node 29, Axillary 17, Neck 16, and Supraclavicular 9. There were also 2 cases each for Inguinal, Abdominal mass, and Nodular sclerosis; and 1 case each for immunocytochemistry, intra maxilla, ratropentoned, chest, gluteal, and right anterior. There were roughly equal cases recorded in both male and female subjects (66 and 60 respectively), and the age distributions were also similar, ranging from 3 – 80 years in males, and 3 – 83 years in female subjects. The average age of the subjects was 37.2 years. The diagnoses for the youngest subjects were Malignant (female) and Non-Hodgkin's Lymphoma (male), while that for the oldest subjects, for both female and male subjects, was also Malignant.



*Liver and Gall Bladder:* The 91 cases listed under this group comprised of 82 cancers in the liver, and 9 in the Gall Bladder. 48.4% of the cases were recorded in female subjects. The ages of the female subjects ranged from 21 - 81 years, while those in male subjects ranged from 26 - 89 years. There was thus no case of cancer of the Liver and Gall Bladder in subjects below 21 years of age. The average age for the diagnosis of this cancer was 46 years. The diagnosis for the youngest subjects was Malignant (liver) for both female and male subjects, while those for the oldest subjects were Malignant (female) and Hepatocellular carcinoma (male).

*Skin Cancers:* There were 55 Cases listed as Skin Cancer. The number at the various locations as recorded in the Cancer Registry were as follows: Skin – 21, Anterior abdominal - 7, Foot - 7, Chest and Scalp - 6, Lip - 5, Wound - 3. Additionally, there was one case each recorded for Conjunctival, Elbow, Forearm, Groin, High and low Neck. 50.9% of the cases were recorded in female subjects. The ages of the female subjects ranged from 16 - 82 years, while those in male subjects ranged from 4 - 85 years. The average age for the diagnosis of skin cancer was 52.6 years. The diagnoses for the youngest subjects were Upper Lips (female) and Elbow (male), while those for the oldest subjects were Scalp (female) and Foot (male).

*Metastatic:* The 46 cases listed as metastatic comprised of the following: Abdomen 6, 4 each for Groin, Peritoneal, Neck, and Pleural; 3 cases each for Chest and Vertebra Lamina; 2 cases each for Supraclavicular and Thigh; and 1 case each for Endocranium, Extradural Intraspinal, Gluteal, Axillary, Forearm, Pelvic, Inguinal, Mesenteric, Laryngeal, Submandibular, Subcutaneous Node, Umbilical, Spleen, and Falciiform Ligament. 37.0% of the cases were recorded in female subjects. The age ranges in both female and male subjects were similar (27 - 89 years, and 27 - 80 years respectively). The average age for the subjects was 57.3 years. The diagnoses for the youngest subjects were Neck (female) and Vertebra lamina (male), while those for the oldest subjects were Pleural (female) and Chest (male).

*Cytology:* The 42 cases classified as Cytology

comprised of 20 cases of Ascetic Fluid, 11 of Pleural, 4 of Peritoneal, and 1 each for CSF, Hepatic Aspirate, Pericardial, Pleural, Thoracic spinal, urine, and ventricular. 45.2% of the cases were recorded in female subjects. The ages of the female subjects ranged from 3 - 78 years, while those in male subjects ranged from 6 - 85 years. The average age for the subjects was 46.7 years. The diagnoses for the youngest subjects were Pleural fluid (female) and Thoracic spinal (male), while those for the oldest subjects were Ascetic fluid (female) and Ventricular (male).

*Ear, Nose and Throat (E.N.T.):* There were also 42 cases of cancers of the ENT. These were 22 Nasopharyngeal cases, 17 Laryngeal, 2 Ear, and 1 post auricular. Most of these cases (78.6 %) were in male subjects with the ages ranging from 4 to 82 years. In female subjects, the ages ranged from 25 to 66 years. The average age for all the subjects was 48.1 years. The diagnoses for the youngest subjects were Nasopharyngeal (female) and Nasal (male), while that for the oldest subjects was Laryngeal (both male and female).

*Lungs:* The 38 cases listed as cancers of the Lungs in this study were recorded at the Cancer Registry as Bronchial (27 cases), Lungs (9 cases) and one case each for endoscopy and upper lobe. The cases were evenly distributed between male and female subjects. All the subjects were adults, with the age ranging from 19 - 77 years in male subjects and 45 - 92 years in female subjects. The average age for all the subjects was 57.3 years. The diagnoses for the youngest subjects were Bronchial (female) and Bronchogenic (male), while those for the oldest subjects were Lung (female) and Bronchogenic (male).

*Connective Tissue:* There were also 38 cases listed under this category. These were comprised of 9 cases each for Bone and Leg; 5 for Thigh, and 3 each for Soft tissue and for Facial. There was 1 case each for Femoral neck, Fibular, Forearm, Groin, Intraabdominal, Limb and trunk, Shoulder, Skull, and Thumb. 39.5% of the cases were recorded in female subjects. The ages of the female subjects ranged from 6 - 80 years, while those in male subjects ranged from 6 months to 85 years. The average age for the subjects was 44.1 years. The diagnoses for the youngest subjects

were Fibular (female) and Soft tissue (male), while that for the oldest subjects was Thigh in both male and female subjects. Four of the 23 male subjects (17%) were under the age of 4 years.

*Kidney.* The 31 cases listed under cancer of the Kidney were recorded at the Cancer Registry as 18 cases of Bladder, 8 cases of Kidney, 4 cases of Renal, and 1 of Abdomen. The cases in male subjects were more than double the cases recorded in female subjects. The ages of the male subjects ranged from 2.5 – 83 years, while those in female subjects ranged from 2 - 62 years. The diagnoses for the youngest cases (male and female) were nephroblastoma, while those in the oldest cases (male and female) was renal cell carcinoma. The average age for the subjects was 52.0 years.

*Jaw:* The 29 cases listed as Cancers of the Jaw comprised of the following: Jaw 7, Mandibular 6, Maxillary 4, Parotoid 4, Palatal 2, Tongue 2, Panatoid 1, Tooth 1, Hard Palatine 1, and Lip 1. The cases in male subjects were almost three times the cases in female subjects. The ages of the male subjects ranged from 8 - 75 years, while those in female subjects ranged from 27 - 70 years. The average age for the subjects was 44.0 years. The diagnoses for youngest cases were mandibular (female) and malignant (male), while those for the oldest cases were palatal (female) and mandibular (male).

*Endocrine:* There were 22 cases listed as Endocrine, and these comprised of 15 cases in the Thyroid, 5 in the Pancreas, and 2 in the Abdomen. There were as many cases involving female subjects as male (11 each). The ages of the female subjects ranged from 4 to 64 years, while those of the male

subjects ranged from 5 – 70 years. The average age was 44.3 years. The diagnoses for the youngest subjects were Abodonimal (adrenal), in both male and female subjects, while those for the oldest subjects were Thyroid (female) and Pancreas (male).

*Eye:* There were 12 cases listed as Cancers of the Eye, and these were recorded at the Registry as: Eye 5, Orbital 5, Occular 2. There were twice as many cases in male subjects as were in females. The age ranges were similar, 2 – 72 years in female subjects, and 2 – 75 years in male subjects. At 25 years, the average age of diagnosis of cancer of the eyes was the earliest of all the categories. The diagnoses for the youngest subjects were Retinoblastoma (female) and Left Occular (male), while those for the oldest subjects were Supra orbital (female) and Orbital mass (male).

*Others:* There were 59 cases classified as “Others.” Twenty-two of these were in female subjects while 37 were in male subjects. Ages for the female ranged from 8 days (a case of sacrococcygeal teratoma) to 82 years, while those for male subjects ranged from 4 months (a case of pelvic malignancy) to 94 years. The average age for the cases listed in this category was 51.9 years.

The marital status of the 830 subjects whose records were accessed at the Hospital Library, revealed that over 80% percent were married, while 11% and 8.6% were, respectively, widows and singles. For the group of subjects under consideration, the distribution of some various types of cancers with marital status is shown in Figure 4a while that between gender and marital status is shown in Figure 4b

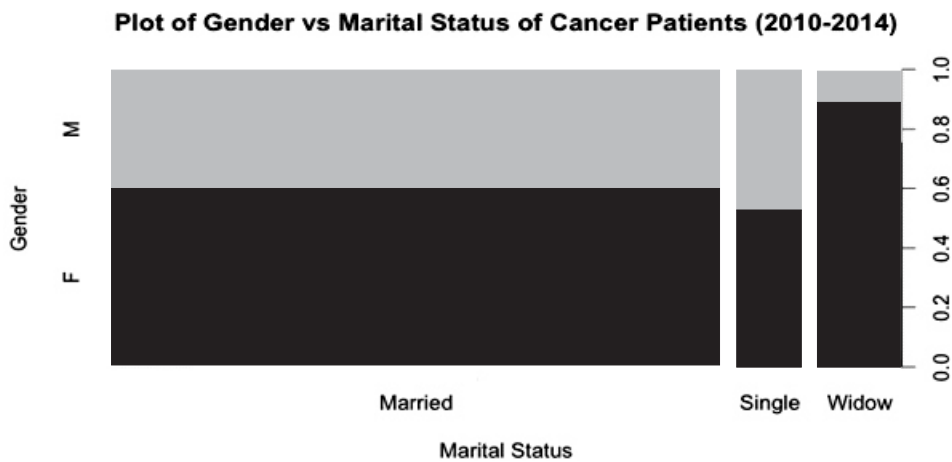


Figure 4a: Profile of Marital Status and Gender for 830 subjects

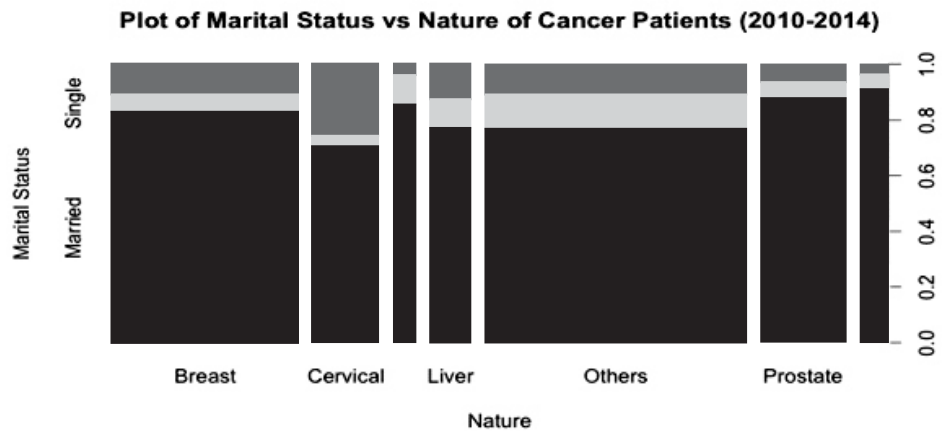


Figure 4b: Profile of Nature of Cancer and Marital Status for 830 subjects

By occupation, these 830 subjects were listed under six categories as Artisans, Civil Servants, Farmers, Traders, Students, and Retirees. Most of the subjects (36.5%) were Traders, while the Artisans formed the smallest group (5.3%). The geographical locations of abode for the 830 subjects, giving an idea of the prevalence, are indicated on a map of Southwestern Nigeria in Figure 5. The geographical map was presented in 8 class intervals, ranging from the sparse (Class Interval 1-2) to the dense (Class Interval 51 – 160). The vast majority of the subjects, not surprisingly, were from Local Government Areas in close proximity to Ile-Ife, reflecting ease of access to the OAUTHC. Such subjects, together with those from locations very far from the Ife-Ijesha Cancer

Registry, constitute 87.2% of all the patients. These are classified as “Others” in the Boxplot of Figure 6 which depicts the residence of the patients together with their ages. Of the remaining cancer patients, residing in places adjudged to be of having comparable level of access to the Ife-Ijesha Registry, the vast majority were from the city of Ondo. What is even more surprising is that 93% of cancer patients from Ondo were from the western part of the City and only 7% were from Ondo East Area. In Figure 6, it is seen that the few subjects from Ondo East presented much later in life (late fifties) while those from Ondo West presented earliest of all the categories.

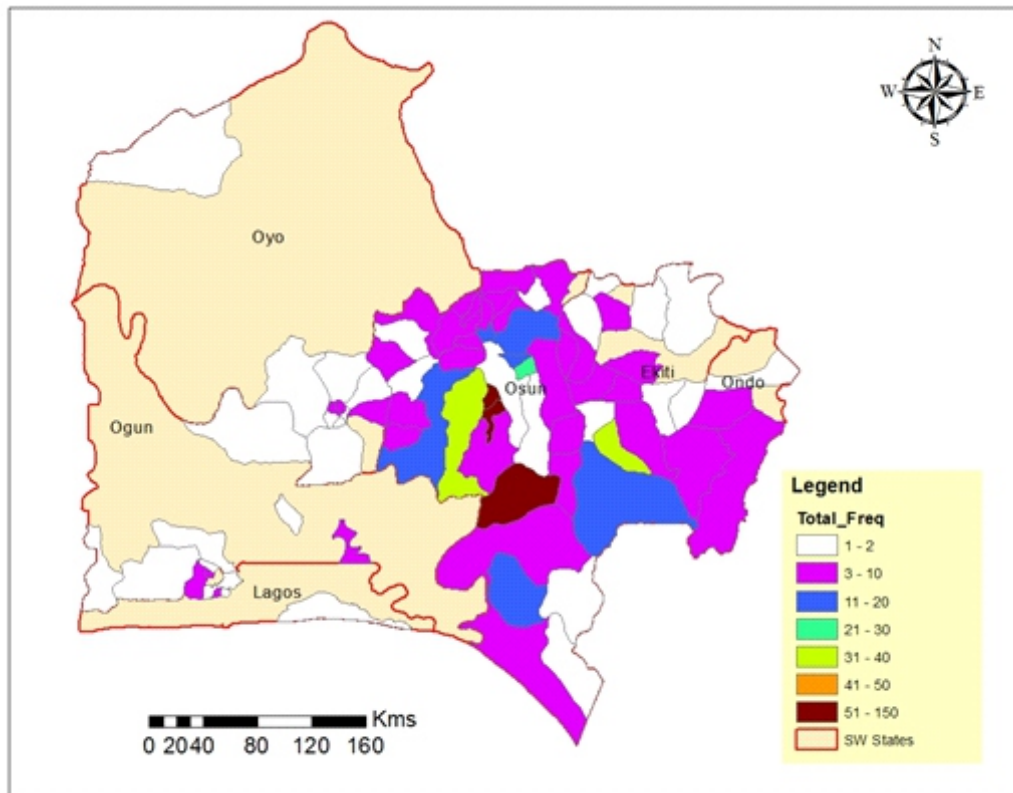


Figure 5: Geo-spatial Map showing the prevalence of cancer in southwestern Nigeria (830 subjects)

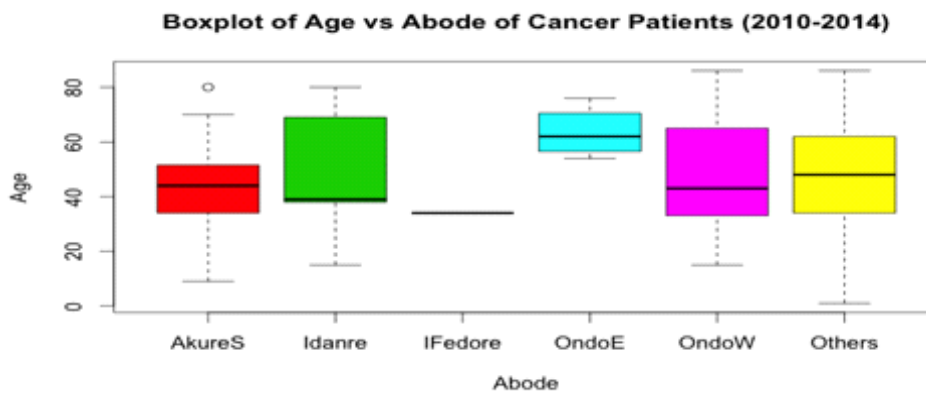


Figure 6: Plot of Age versus Residence of Cancer Patients

**CONCLUSION**

An exhaustive analysis of the various types of cancer in subjects presenting at the Ife-Ijesa Cancer Registry between 2010 and 2014 has been presented in terms of gender, age, residence, and occupation. The data can help in better understanding the various factors responsible for the development of cancers in the region. In particular, the various relationships with age examined here could help throw more light on the very important environmental-health issue of induction periods of cancers, including childhood

cancers. It is particularly interesting to see Ondo West and Ondo East, in the same city have so wide disparity in cancer prevalence despite comprising of people with identical nutritional, lifestyle and cultural habits. It is hoped that these preliminary analyses will stimulate more interests in the possible influences of geographical locations and the physical environment on the etiology of cancer in Nigeria as is the situation in the developed countries. As affirmed by the WHO's World Cancer Report of 2003 (WHO, 2003), regional differences in cancer burdens could help

identify causative factors and eventually help in taking preventive actions. According to the Report “Progress in cancer control requires not only sound knowledge of the disease process, but also an understanding of the psychological, social, economic and organizational factors which govern how that knowledge can be put to effective use.”

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