

## **Incidence of Malignant Neoplasm in Ozamiz City, Philippines**

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### **Abstract**

The term malignant neoplasm or cancer results from an abnormal and uncontrolled cell division. Despite the innovative development in the diagnosis and treatment options regarding cancer, it still remains one of the most undiagnosed and neglected diseases especially in areas with poor socioeconomic status. Cancer cases in Northern Mindanao rise but no definitive figure of percentage of cases is disclosed. It is the purpose of this study to determine the incidence of malignant neoplasms in Ozamiz City, Philippines. Documentary analysis was done to determine the cancer cases recorded from the year 2000-2014 in one tertiary hospital in the city. This hospital is the only healthcare center that performs biopsy. The data gathered showed that breast cancer in women had the highest incidence in Ozamiz City. In men, prostate cancer and Non-Hodgkin's lymphoma had the most cases recorded. Most malignant neoplasm cases were found in the ages between 48-67 years old in both males and females. The results of this study serve as a guide/baseline data for clinicians, researchers, and the health authorities in implementing or establishing cancer control related programs. This study can also pave way to more research about cancer in the future.

**Keywords:** abnormal, biopsy, cancer, diagnosis, hospital

## **Introduction**

Malignant neoplasm the uncontrolled growth of a cell that invades upon adjacent tissues, and metastasize to other locations of the body (Parenteau et al., 2018), is also known as cancer. Incidence and mortality of malignant neoplasm are rapidly growing worldwide (Bray et al., 2018). Ferlay et al. (2015) reported that cancer is the second leading cause of mortality in developed countries, accounting for more than 2.7 million deaths annually. The factors that cause cancer are complex but they reflect both aging and population growth as well as the changes in sociodemographic conditions (Chen et al., 2016; Jackaman et al., 2017).

In the report of Bray et al. (2018), there is an estimated 18.1 million new cancer cases in 2018 worldwide. In both sexes combined, lung cancer is the most commonly diagnosed cancer, closely followed by breast cancer in females, and prostate cancer in males. Based on the report, lung cancer is the most frequent and the leading cause of cancer death among males, followed by prostate and colorectal cancer (for incidence), and liver and stomach cancer (for mortality). Among females, breast cancer is the most commonly diagnosed cancer and the leading cause of cancer death, followed by colorectal and lung cancer (for incidence), and vice versa (for mortality); cervical cancer ranks fourth for both incidence and mortality. The type of cancer frequently diagnosed and the leading cause of death substantially vary across countries and within each county depending on the socioeconomic development and associated social and lifestyle factors.

In the Philippines, overall cancer incidence increased between 1993–1997 and 2003–2007 as Gomez et al. (2016) reported. Based on these findings, the highest increase occurred among males for prostate cancer and colorectal cancer. Among females, rates of cancers of the breast, colorectum, thyroid, and of leukemia increased during this time. The Philippines has the highest reported incidence of breast cancer in Southeast Asia (Que et al., 2018) and it has the lowest survival rate compared to other Asian countries (Tubeza, 2012; Carioli et al., 2018).

Increases in endometrial cancer incidence were more pronounced from 1978 to 2013 (Lortet-Tieulent et al., 2017). There is a drastic rise in prostate cancer in the Philippines with significantly increasing mortality rates (Wong et al., 2016). Increases in mortality rates of bladder cancer for both males and females have been observed also in the Philippines (Wong et al., 2018).

The Philippine Cancer Society (PCS) was established in order to control the incidence of cancer in the country (PCS, 2013). Its primary advocacy is for prevention and early detection of cancer, statistical research, and focused patient services. Despite the remarkable efforts made by the health authorities to control cancer, certain lifestyle-related cancers continue to rise (Medina et al., 2010). According to a report by Crismundo (2014), cancer cases in Northern Mindanao rise but no definitive figure of percentage is disclosed. The researchers were concerned of the incidence of malignant neoplasm in Northern Mindanao. Ozamiz City is one of the cities that composed the region. Several cases of cancer in the city have been heard. People would attribute this situation to cigarette smoking, some old water pipes, the presence of fast food centers, gasoline stations, street foods, barbecue stands, and use of pesticides and inorganic fertilizer in the area. However, there has been no scientific study that could prove the claim. Records of the incidence of cancer in the city were disjointed and not showing the whole situation. Hence, the purpose of this study was to determine the incidence of malignant neoplasm or cancer in Ozamiz City. This was the first study conducted that documented the status of cancer in the area. Determining the incidence of cancer in the area is important because it can contribute to effective quality healthcare services and can pave way to more research about cancer in the future.

## **Materials and Methods**

### ***Research design***

This study is descriptive in design. A documentary analysis was carried out to obtain data from one tertiary hospital in Ozamiz City.

This hospital is the only healthcare facility in the city that provides biopsy. Medical records from the hospital were retrieved to determine the cancer cases from the year 2000 to 2014. Only information of cancer patients residing in Ozamiz City were included. A data sheet was used for easy retrieval of information. Age, gender, residence, and final diagnosis of the patients were recorded using the data sheet.

### ***Ethical considerations***

Permission from the hospital was secured before the conduct of the study ensuring the anonymity of the identity of the patients and the confidentiality of the records. Names of the patients were not recorded for anonymity purposes. The policy of the hospital for cancer research with regard to asking permission for record retrieval and non-disclosure of patient's identity was followed. Only those records allowed by the hospital such as age, gender, residence, and final diagnosis of the patients were retrieved.

### ***Research site***

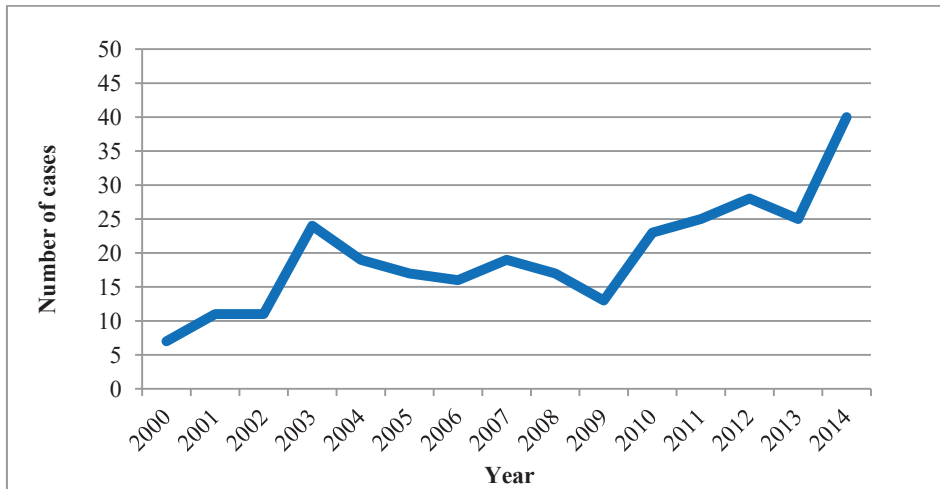
Ozamiz City has a population of 141,828 people (Census 2015). The city has 51 barangays, 28 of these are urban. The center of the city is characterized by the presence of shopping malls, fast food centers, gasoline stations, and business establishments. Street foods and barbecue stands are commonly seen in the city. One oil refinery is situated in one of the urban barangays.

## **Results and Discussion**

A total of 295 malignant cases were reported from the year 2000-2014 from nine barangays in Ozamiz City. The barangay in Maningcol had the highest incidence. The barangay in Malaubang and Bañadero ranked second, followed by barangay in Calabayan, Carmen Annex, Catadman, Gango, Lam-an and Aguada, respectively. Calabayan is the only rural area among these places. In a study on breast cancer incidence in China, Fei et al. (2015) found that urban regions

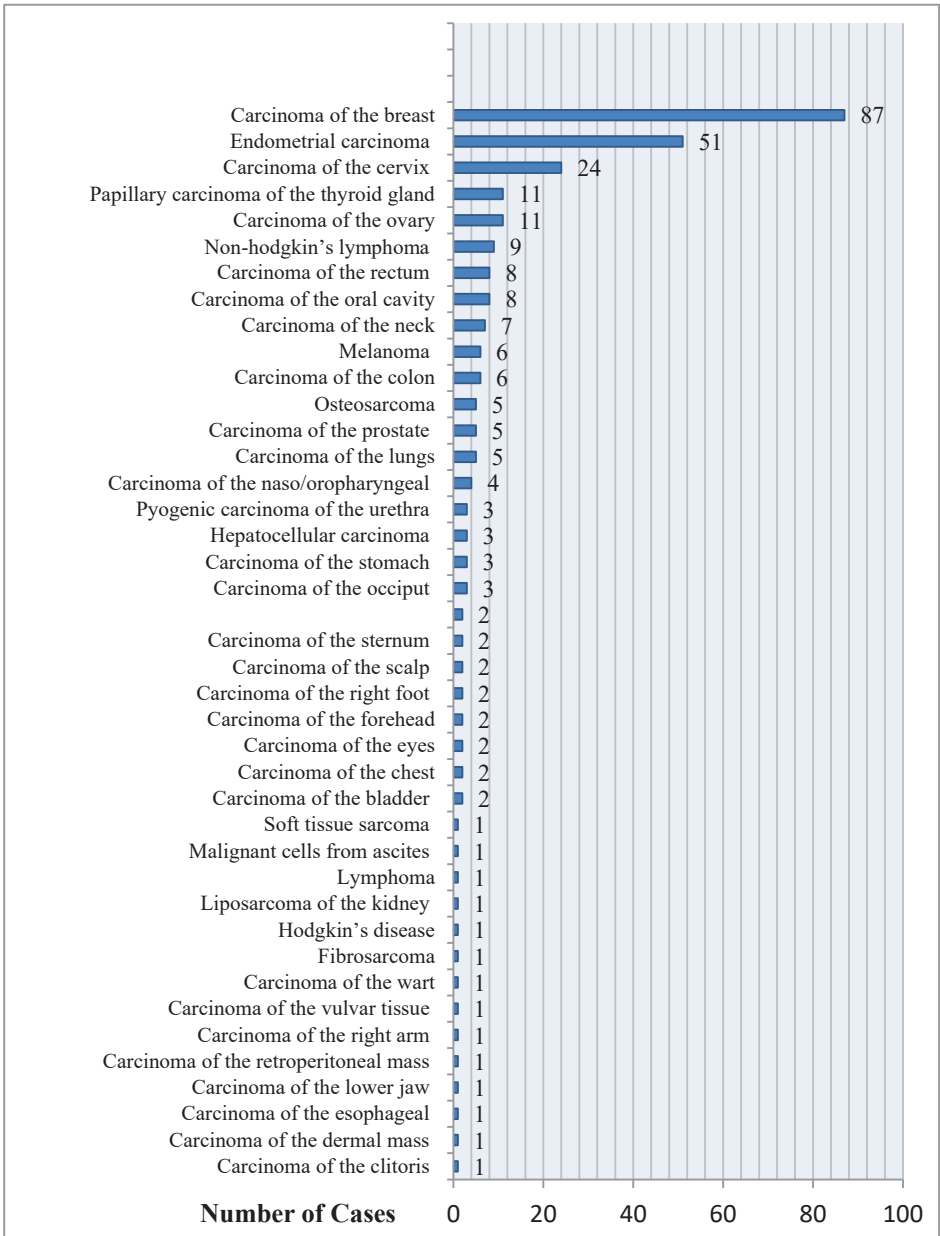
have more cancer cases than rural areas. The disparity could be attributed to the socioeconomic factors and environmental determinants of cancer risk that vary considerably in urban and rural areas including diet, alcohol consumption, occupational exposure, and physical exercise (Gentil et al., 2012).

The highest number of malignant neoplasm cases (40) was reported in the year 2014, whereas the lowest number was seen in 2000 with seven malignant cases (Figure 1). In the span of more than ten years, the data showed an increase in the incidence of malignant neoplasm. Several factors can be attributed to this rise. The causes may include environmental factors such as chemical and radiation exposure (Richardson et al., 2015). Also, industrialization increases the risk of exposure to harmful chemicals. Lifestyle is also known to increase the risk of cancer (Bray et al., 2018). Family history is also a factor to consider (Barnard et al., 2015). Moreover, hospital technology can also be a factor in accurate detection of neoplasm (Zanusso et al., 2016).



**Figure 1. Incidence of malignant neoplasm in Ozamiz City from 2000-2014.**

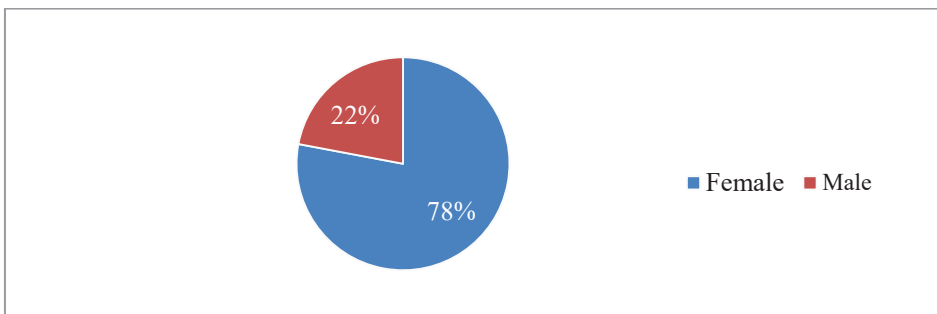
As shown in Figure 2, the two highest incidence of cancer are carcinoma of the breast (29%) and endometrial carcinoma (14%) respectively for female patients. Carcinoma of the breast has an overwhelming number of 87 cases followed by endometrial carcinoma with 40 cases recorded. Breast cancer is the most frequently diagnosed cancer and leading cause of cancer death in women (Bray et al., 2018). The finding is similar with the study of Redaniel et al. (2008) which illustrates that breast is among the top 10 leading sites of cancer. Que et al. (2018) also reported that the Philippines has the highest reported incidence of breast cancer in Southeast Asia. The risk for breast cancer is due to combination of genetic and environmental factors. The primary risk factors are being a female and older age at around after 50 (Dupont et al., 2018). Genetic mutation is a potential risk factor for breast cancer (Rebbeck et al., 2001; Melvin et al., 2016). The environmental risk factors include diet, smoking, alcohol consumption, lifestyle, and exposure to infectious agents and environmental pollution (Rahman et al., 2018).



**Figure 2. Major types of malignant neoplasm recorded in Ozamiz City.**

The second malignant neoplasm in rank in this study is endometrial carcinoma, which is the third most commonly diagnosed cancer in women worldwide (Lortet-Tieulent et al., 2017). Endometrial cancer is the most common gynecological tumor in developed countries, and its incidence is increasing (Morice et al., 2016; Saule et al., 2018). In the Philippines, increase in endometrial cancer incidence was more pronounced from 1978 to 2013 (Lortet-Tieulent et al., 2017). The main risk factor of endometrial carcinoma is high level of estrogen associated with obesity, diabetes, early age at menarche, nulliparity, late-onset menopause, increasing age, and use of tamoxifen (Saso et al., 2011; Galaal et al., 2014). There are some environmental components to endometrial cancer (Hoffman et al., 2012) but these environmental risk factors are not well characterized (Ma et al., 2013).

As shown in Figure 3, women with 230 cases (78%) have a higher incidence of malignant neoplasm compared to men with 65 cases (22%). The findings are similar with the studies conducted in Pakistan (Masood et al., 2015) where the incidences of cancers in men and women have increased to 67% and 98.6%, respectively. However, it is estimated that 45% of men and 38% of women will develop invasive cancer during their lifetime. Per observation, the incidence per gender differences may be attributed to number of reasons since men and women differ in lifestyle and in exposure to environmental factors.



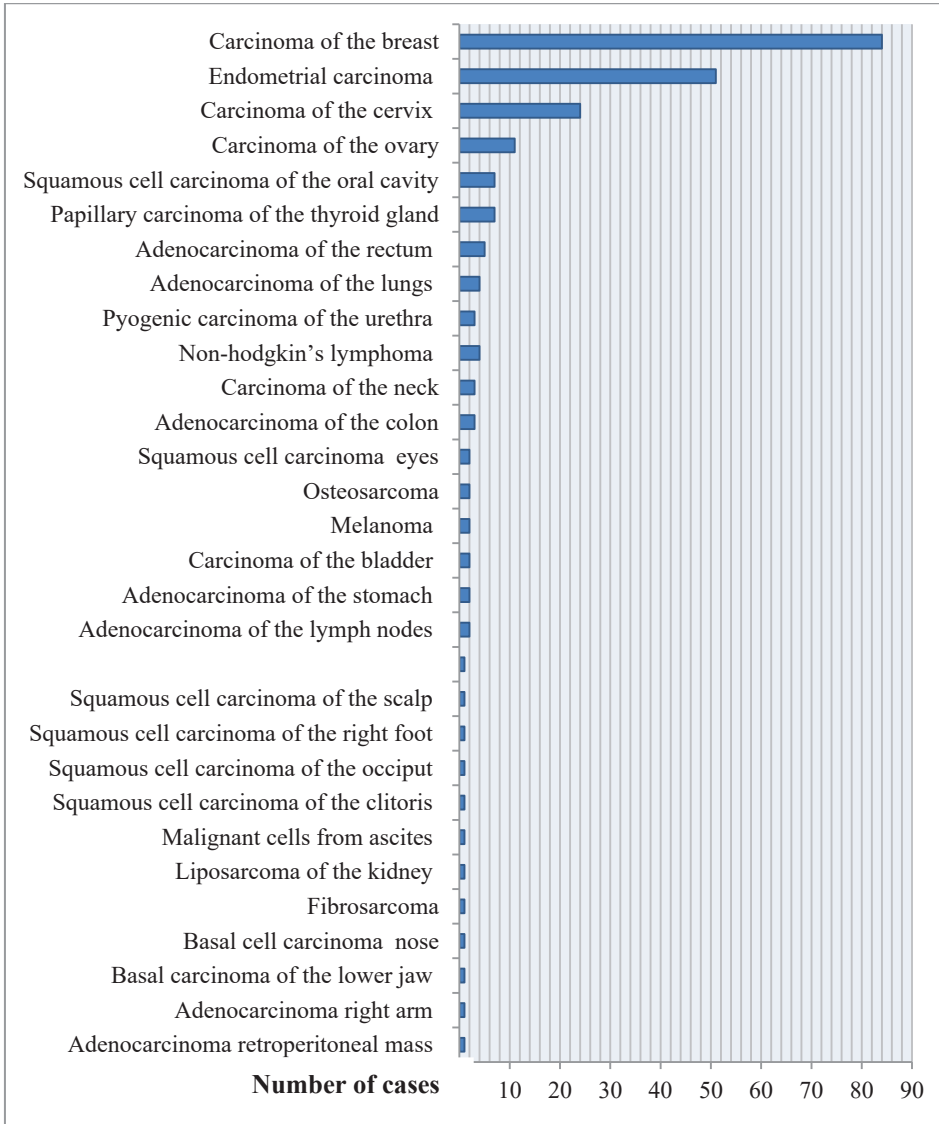
**Figure 3. Percentage of malignant neoplasm according to gender (2000-2014).**



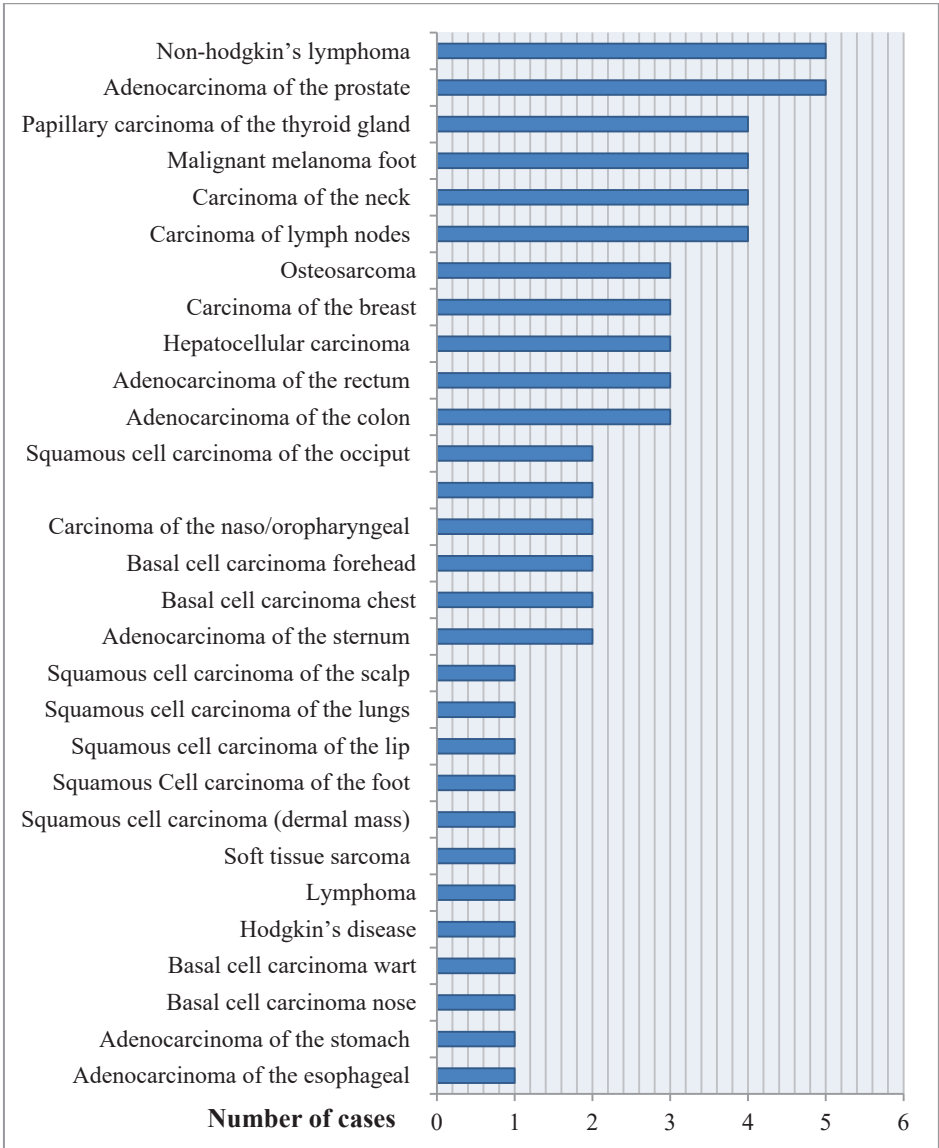
Among the least common type of malignant neoplasm of females are the squamous cell carcinomas, basal cell carcinomas, malignant ascites, fibrosarcoma, and the liposarcoma of the kidney (Figure 4). Breast cancer is the first biggest cause of cancer related deaths in women and one out of nine women has lifetime risk of developing breast cancer. It ranks the most common cancer among Pakistani women, and it was also the most frequently diagnosed cancer followed by ovarian cancer and cervix cancer which is consistent with the overall cancer incidence rate from 2000-2014 in the Philippines (Masood et al., 2015). The breast cancer incidence shows similar trends in the other parts of the country and is consistent with the South East Asian region trends (Afsharfard et al., 2013; Zhao et al., 2012; He et al., 2012; Takiar & Vijay, 2011).

Among the 65 cases in male, the highest incidences of cancer are adenocarcinoma of the prostate and Non-Hodgkin's lymphoma (NHL) as shown in Figure 5. There are no established risk factors for prostate cancer beyond age, family history, ethnicity, genetic factors, and insulin-like growth factor I despite considerable research conducted. However, existing studies suggest that many lifestyle and biochemical exposures, and genetic variants may be risk factors for prostate cancer (Wrightson & Key, 2017).

Obesity and smoking increase the risk of aggressive prostate cancer and prostate cancer-specific mortality (Peisch et al., 2017). However, increased vegetable and fruit intakes, decreased saturated fat intakes, and increased exercise are potentially associated with decreased risk of incident disease and increased progression-free, prostate cancer-specific, and overall survival (Ballon-Landa & Parsons, 2018). Egg consumption may increase risk of aggressive prostate cancer due to their choline content (Richman et al., 2012). Men who habitually consume more fish have lower risk of death from prostate cancer (Szymanski et al., 2010).



**Figure 4. Incidence of malignant neoplasm among females (2000-2014).**



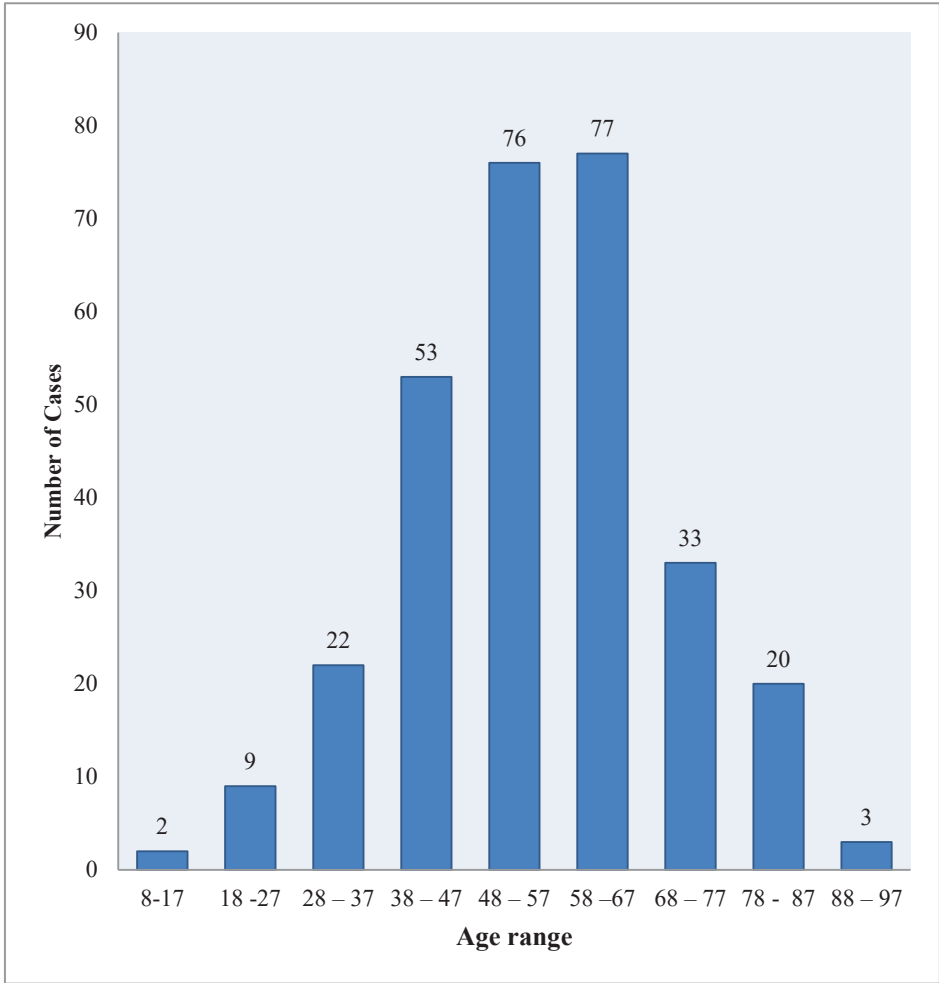
**Figure 5. Incidence of malignant neoplasm among males (2000-2014).**

Several studies have reported a positive association between processed red meat consumption and risk of advanced or fatal prostate cancer (Sinha et al., 2009), although others have reported no association (Richman et al., 2011; Alexander et al., 2010). Coffee has been reported to reduce the risk of developing lethal prostate cancer (Wilson, et al., 2011) but not all subsequent studies support the findings (Discacciati et al., 2013). Study in Asian populations suggests that soy intake is inversely associated with risk of developing prostate cancer (Yan & Spitznagel, 2009). However, available evidence does not strongly support that increasing soy intake will reduce prostate cancer progression (Peisch et al., 2017). Studies in Asian populations suggest that tea consumption may possibly be associated with a reduced risk of prostate cancer (Kurahashi et al., 2007; Jian et al., 2007), but findings were dominated by less reliable case-control studies (Zheng et al., 2011). A variety of dietary and lifestyle factors appear to affect prostate cancer progression, although data are sparse. These findings warrant further investigation (Peisch et al., 2017).

Non-Hodgkin's lymphoma is a type of cancer that arises in the lymphocytes of the immune tissue (Armitage et al., 2017). Men are at a higher risk of developing this cancer. Non-Hodgkin's lymphoma are more common in developed countries (Perry et al., 2016). Risk factors of NHL include immune disorders, medicines, infections, lifestyle, genetics, race, family history, and occupational factors (Boffetta, 2011; Morton et al., 2014; Cerhan & Slager, 2015). Immunosuppressed patients are known to be at an increased risk of developing NHL (Shiels et al., 2013). Viral and bacterial infections have been closely associated with the development of non-Hodgkin lymphomas. The Epstein-Barr virus has been associated with NHL (Saha & Robertson, 2011). The bacteria *Chlamydia psittacosis* and *Coxiella burnetii* have also been linked to NHL (Ferreri et al., 2012; Melenotte et al., 2016). History of periodontal disease is also positively associated with increased risk of NHL (Bertrand et al., 2017a).

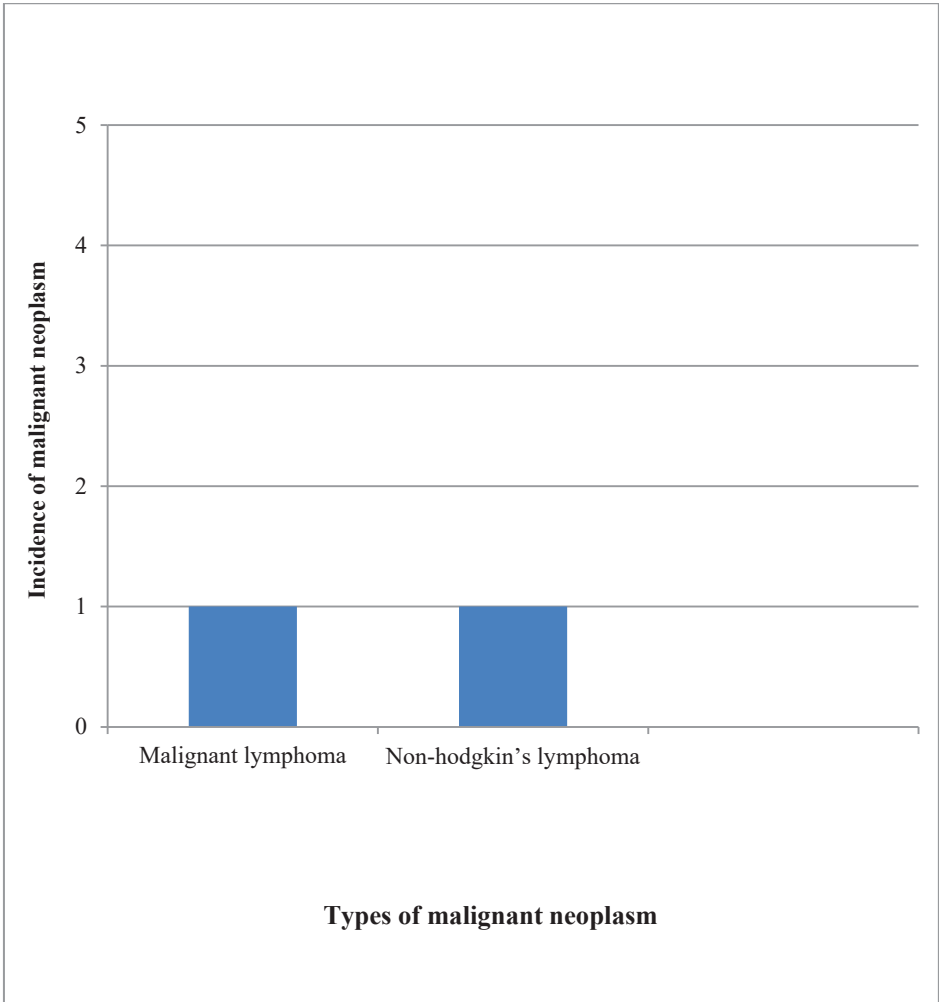
Obesity has been found to be a risk factor for diffuse large B-cell lymphoma (Castillo et al., 2014), but the biological factors driving this relationship have to be further investigated (Hosgood et al., 2018). However, dietary fat intake (Bertrand et al., 2017b) and cigarette smoking have been associated with NHL (Alexander et al., 2007). The substantial increase in the incidence of NHL over the last 50 years strongly suggests the role of environmental factors (Tramacere et al., 2012). Occupational exposure to radiation is associated to NHL risks (Alexander et al., 2007; Zhang et al., 2007). Although, recent finding of Lu et al. (2017) in their meta-analysis study showed no association between occupational ultraviolet exposure and NHL risk, precaution to radiation exposure has to be undertaken. On the other hand, the finding of Hu et al. (2017) showed that the organophosphate pesticide, diazinon was significantly associated with increase NHL risk. The use of permanent dark hair dye was associated with NHL (Alexander et al., 2007), but its effects seem to be decreasing owing to changes in the ingredients used in this product (Zhang et al., 2008).

Figure 6 reveals that the highest incidence of malignant neoplasm occurs in the age group of 58-67 years with a total of 77 cases recorded. The lowest incidence belongs to the age range of 8-17 with only two recorded cases. The rapid increase of incidence of malignancy was seen in the ages between 8-17 years old to 18-27 years old, and the gradual decline was in age between 68-77 years to 88-97 years old. The findings are similar with the studies conducted in Pakistan (Masood et al., 2015). As the age of the population grows older, the chances for developing cancer become greater. The age-specific incidence of female breast cancer had two peaks: age of 41-50 years and 51-60. These findings are similar with the reports of Zhang et al. (2012) and Wu et al. (2013).

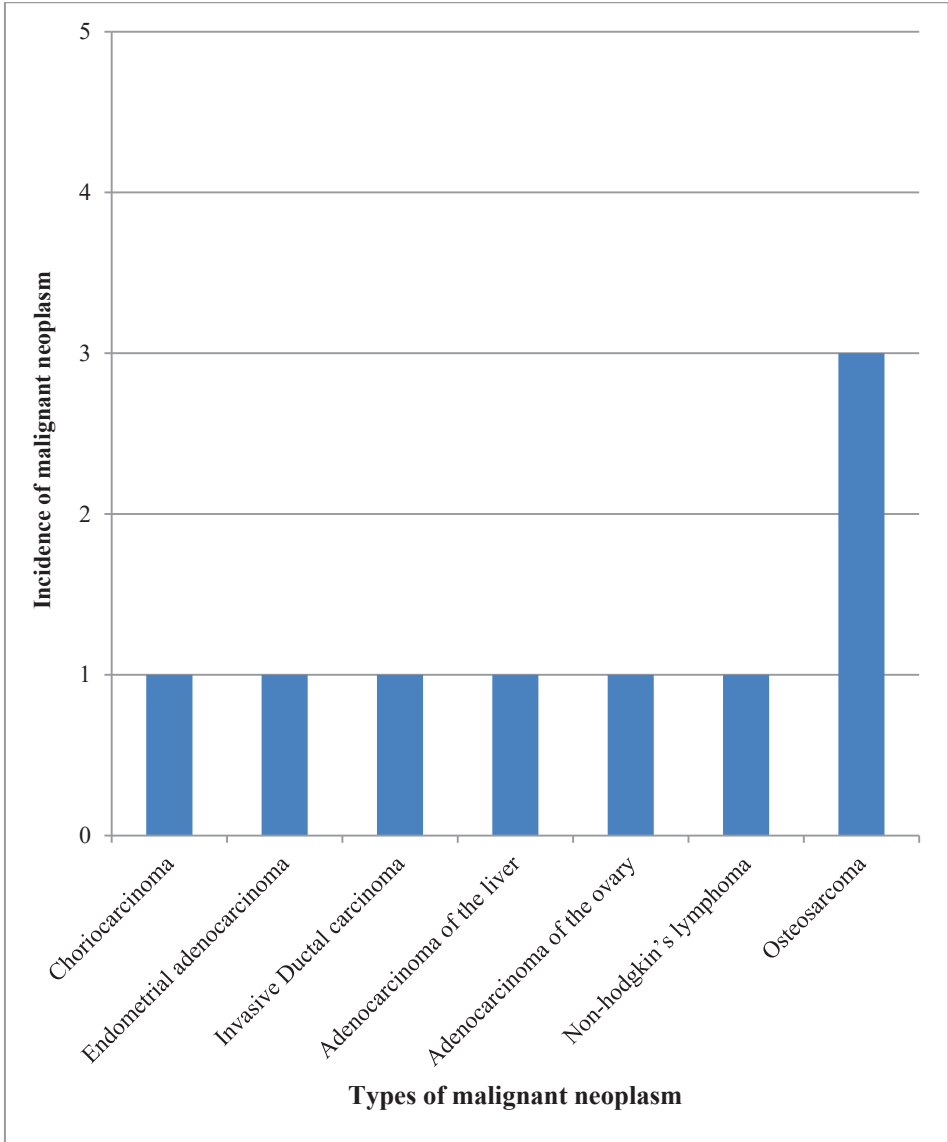


**Figure 6. Incidence of malignant neoplasm according to age.**

Breast cancer is the most common case of malignant neoplasm in almost all age groups except at 18-27 years old age range in which osteosarcoma or cancer of the bone is the most common. The incidence of malignant neoplasm per age group is further shown in Figures 7.1 to 7.9.

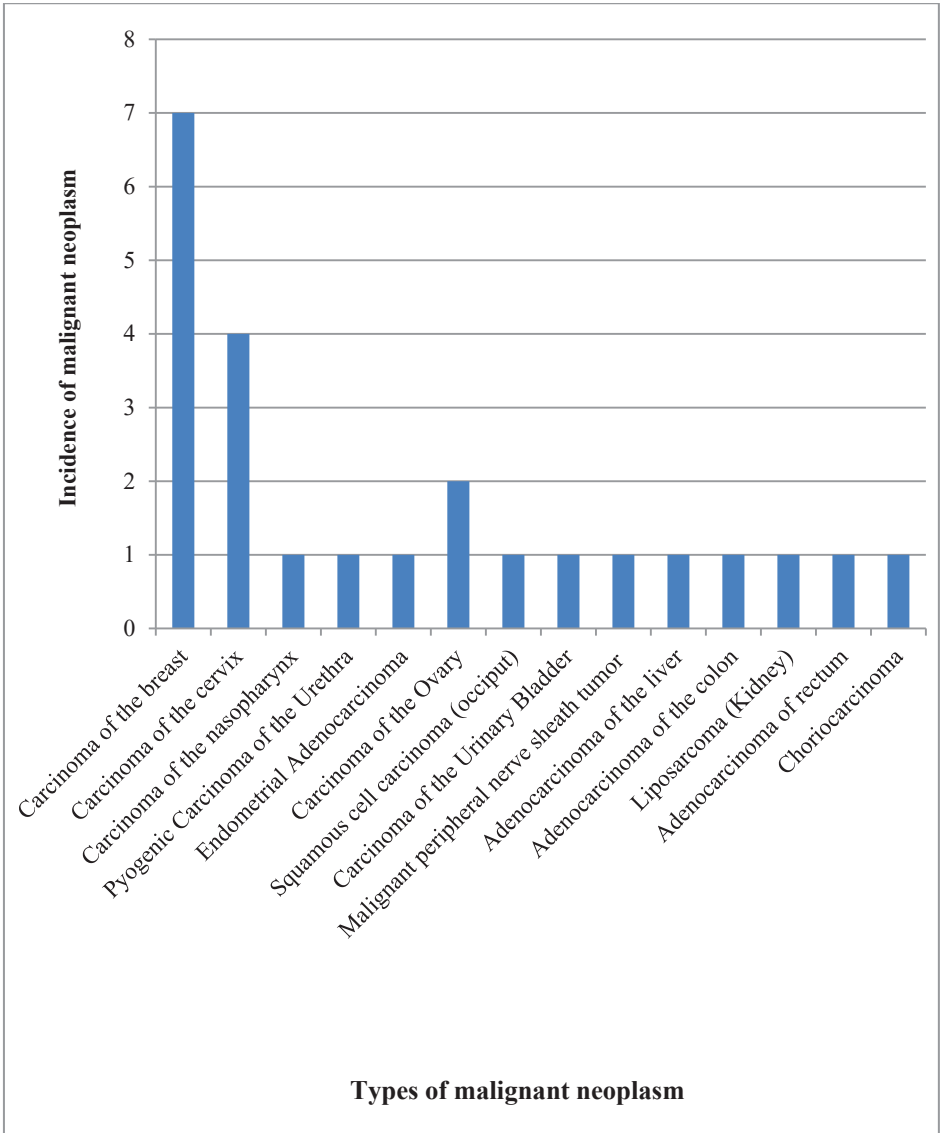


**Figure 7.1. Incidence of malignant neoplasm in age range 8-17 years old (2000-2014).**

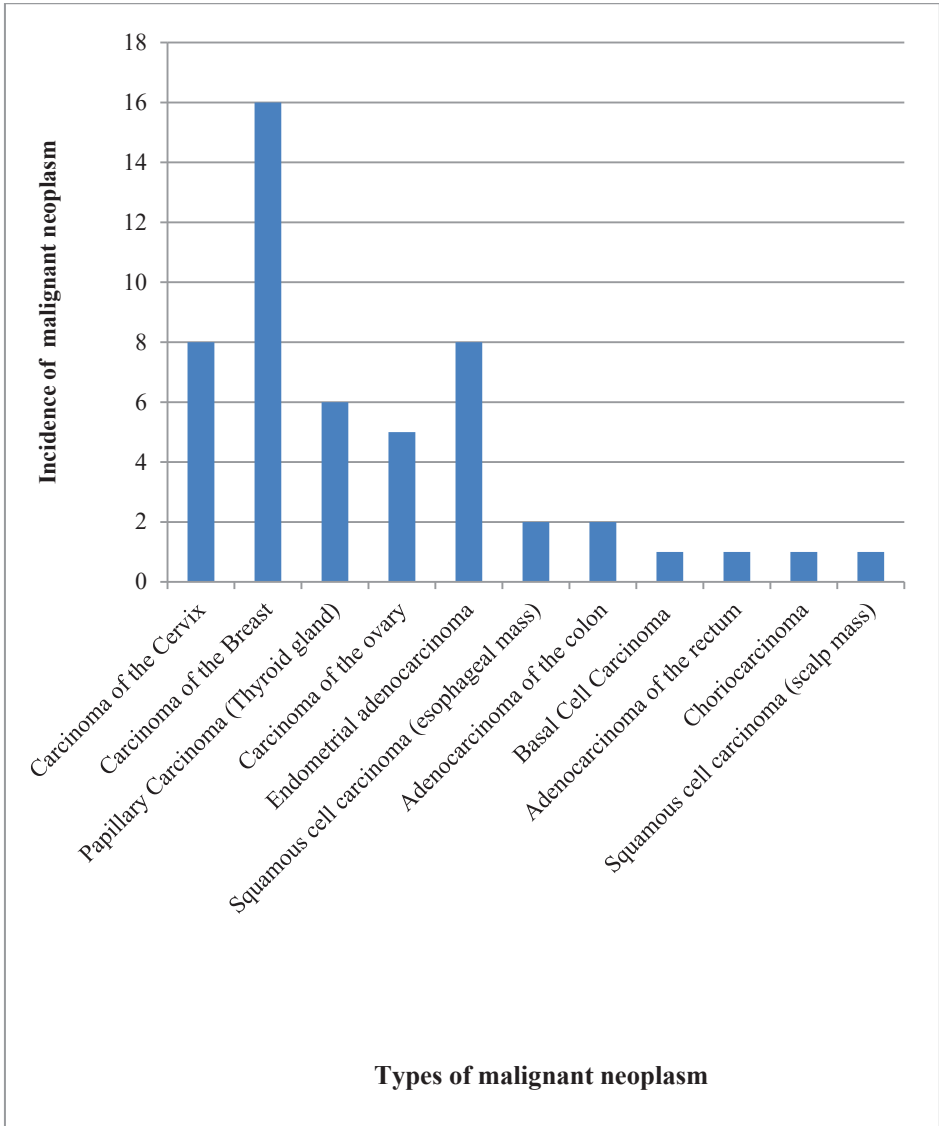


**Figure 7.2. Incidence of malignant neoplasm in age range 18-27 years old (2000-2014).**

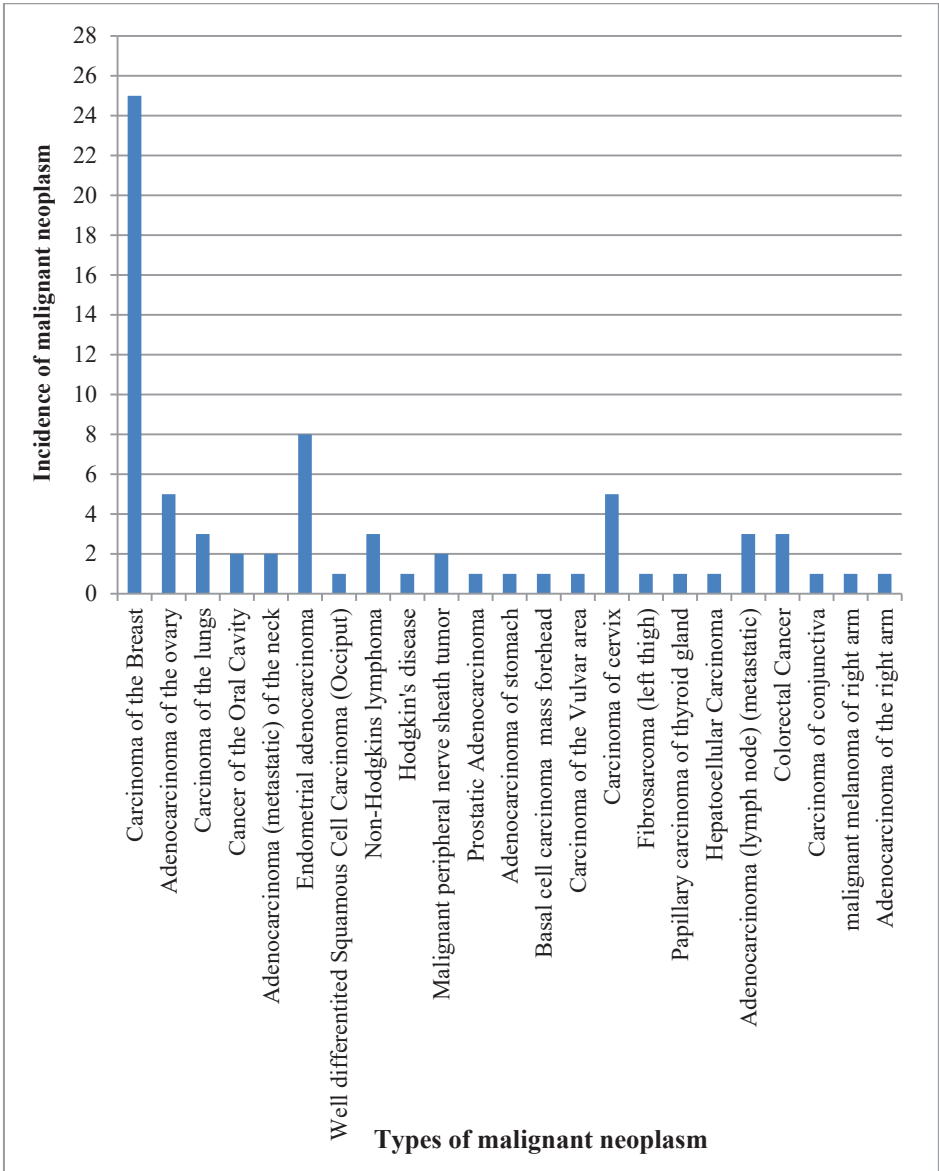




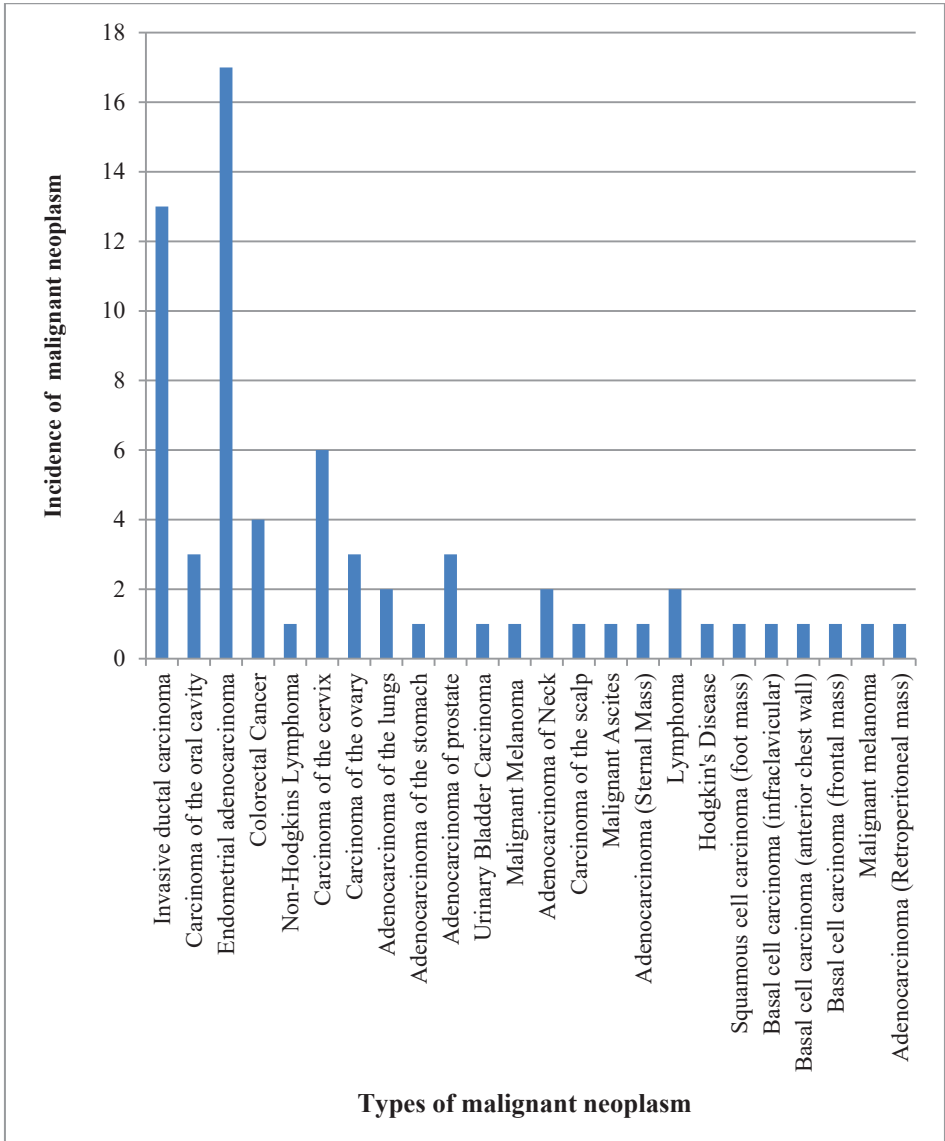
**Figure 7.3. Incidence of malignant neoplasm in age range 28-37 years old (2000-2014).**



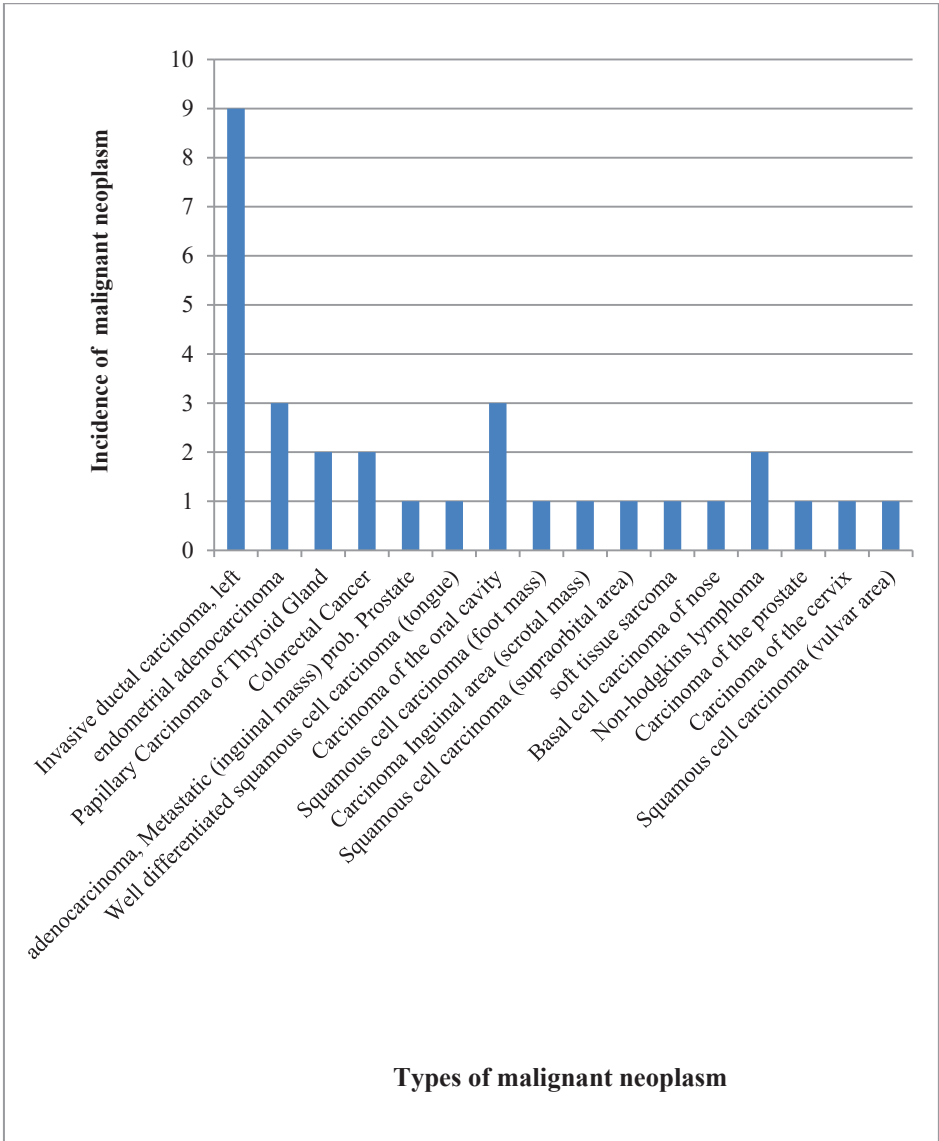
**Figure 7.4. Incidence of malignant neoplasm in age range 38-47 years old (2000-2014).**



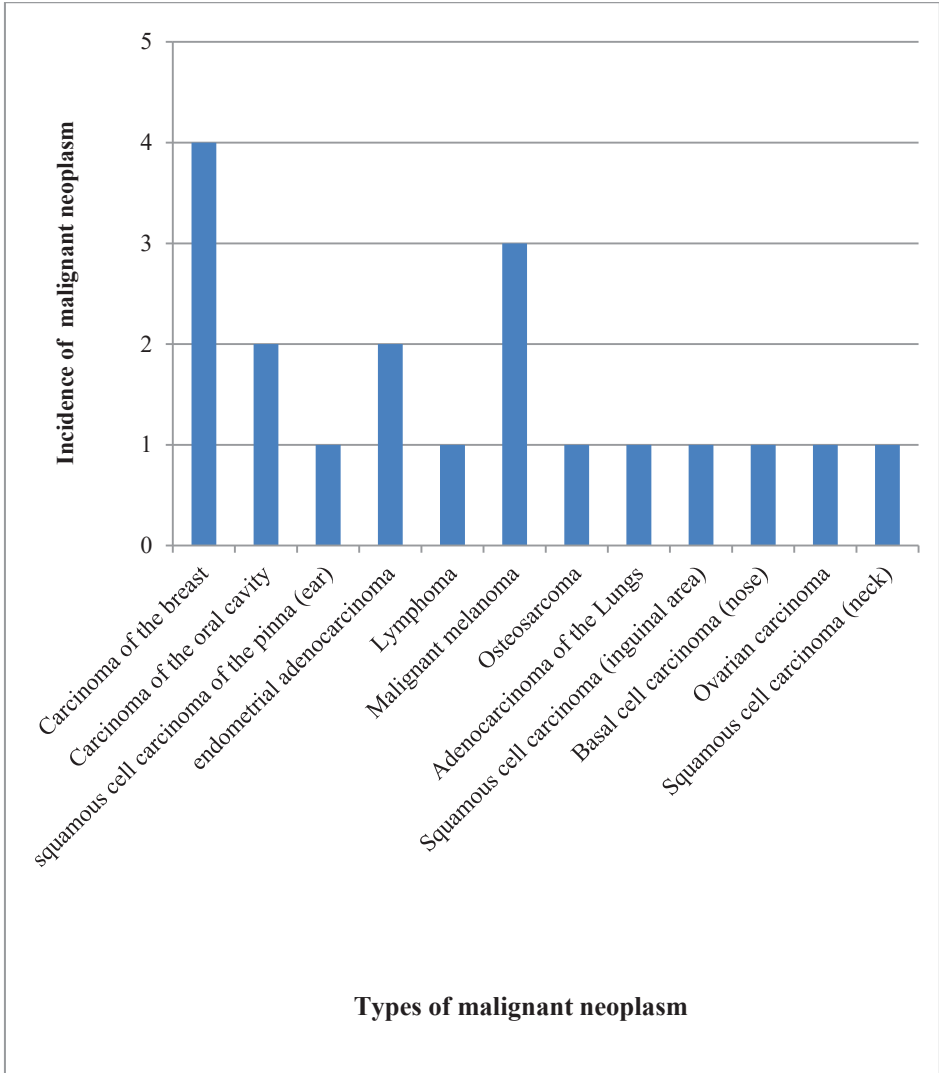
**Figure 7.5. Incidence of malignant neoplasm in age range 48-57 years old (2000-2014).**



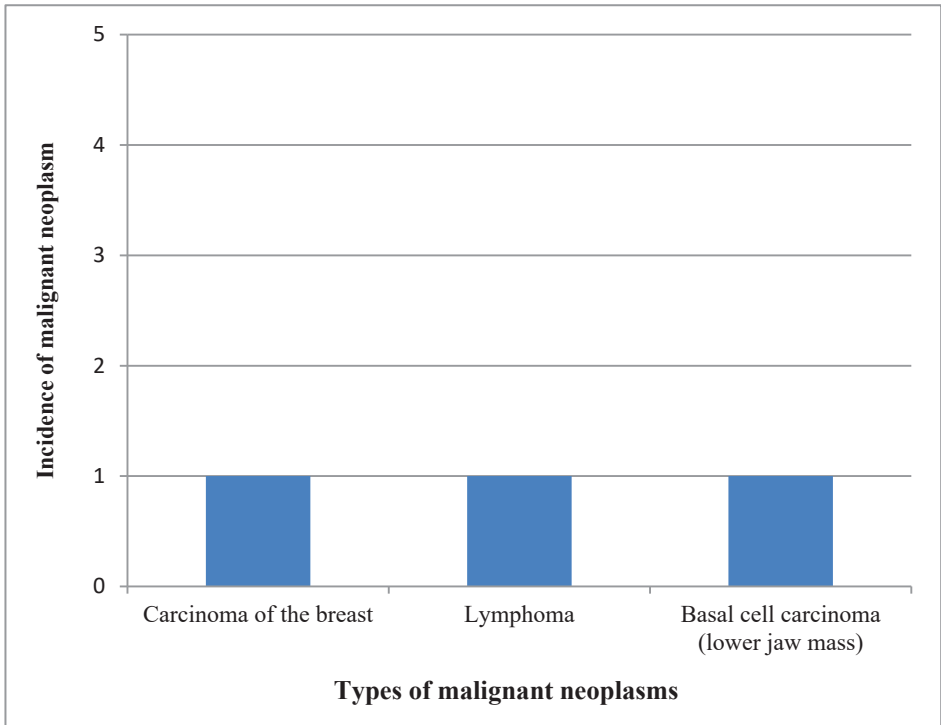
**Figure 7.6. Incidence of malignant neoplasm in age range 58-67 years old (2000-2014).**



**Figure 7.7. Incidence of malignant neoplasm in age range 68-77 years old (2000-2014).**



**Figure 7.8. Incidence of malignant neoplasm in age range 78-87 years old (2000-2014).**



**Figure 7.9. Incidence of malignant neoplasm in age range 88-97 years old (2000-2014).**

Cancer cases in Ozamiz City have increased for the last decade and the situation should be given full attention. As the findings show that breast cancer has the highest incidence in women and prostate and Non-Hodgkin lymphoma in men, clinicians, health authorities, researchers, and residents in the study areas need to convene and collaborate to come up with a comprehensive plan that targets the reduction of cancer incidence.

Substantial support for cancer awareness and research funding may help create advances in the diagnosis and treatment of cancer to improve the prognosis for people with cancer. Since cancer is caused by a complex interaction of genetic makeup and environment, awareness

campaign of the risk factors of each type of cancer and identifying the possible risks in the environment could help in cancer prevention.

Records of family history and other chart entries to determine the environmental risk factors were not allowed for retrieval during the conduct of research because of hospital policy. Nevertheless, the possible environmental risk factors in Ozamiz City may include unhealthy lifestyle and chemical exposure. The area has many fast food centers, barbecue stands, and street food carts where people often eat. People also attribute cancer to the presence of old water pipes that supply water to households. Exposure to cigarette smoking may also be considered a risk factor. Several tricycle drivers smoke cigarettes even while driving that might make the passengers secondary smokers. Exposure to pesticides and inorganic fertilizer or paints and construction materials can also be risk factors in the area.

Residents should have a routine medical care, mammogram in women in age 40 and older, colonoscopy in both men and women at age 50 and beyond, and Pap smear every three years in women 30 to 65 years. Notifying the community of the importance of being vaccinated to cervical cancer is very essential. Health offices should organize an educational campaign about the preventive measures and strategies on developing cancer. Further research has to be conducted in identifying the risk factors of cancer in the area.

## **Conclusion and Recommendations**

The incidence of malignant neoplasm in Ozamiz City increased from 2000-2014 with breast cancer and endometrial carcinoma in women, prostate cancer, and Non-Hodgkin lymphoma in men as the most common. There were 87 cases of breast cancer and 51 cases of endometrial carcinoma in women. There were 5 cases of prostate cancer and Non-Hodgkin lymphoma in men. Carcinoma of the cervix has also gone up to 24 cases. Papillary carcinoma of the thyroid gland and carcinoma of the ovary have 11 cases each. The cases are still below the Philippine cases but increasing with time. The health centers in



Ozamiz City should come up with health programs that increase cancer awareness, reduce risk exposure, and encourage early detection of cancer.

### **Acknowledgment**

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