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# Lifestyle and Reproductive Factors Associated with Breast Cancer among Kenyan Females Screened for Breast Cancer at Thika Level 5 Hospital

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**Abstract:** ***Breast cancer is a leading female malignancy and a major health concern in the world today. In Kenya, breast cancer is a public health problem because it is on the rise with an increase in incidence and mortality rates. A cross-sectional study using structured questionnaire was conducted at Thika Level 5 Hospital in Thika on a sample of 167 women aged 18 years and above, attending the radiology department for breast cancer screening. From the findings, fat intake, fruits and vegetables, weight, physical activity, alcohol consumption, passive tobacco smoking, breastfeeding and hormonal contraceptive use were significant. Multiple binary logistic regressions indicated that women with BMI greater than 28 had a 53.43 fold risk of testing positive for breast cancer (13.2%, p-value 0.00) compared to those with BMI below 22. Those women in the study who had breastfed for 2 to 4 years had a 0.17 fold risk (5.4%, p-value 0.001) and women who had breastfed for more than 4 years had a 0.05 fold risk (3.6%, p-value 0.00) of testing positive for breast cancer, indicating a protection from breast cancer. Women who spent 3-5 hours daily engaging in any physical activity had 0.02 (95% CI:0.02 (0.004-0.153)) lower odds of testing positive for breast cancer compared to those who spent 1-3 hours daily. Women who passively smoked for more than 3 hours daily had a 15.66 fold risk (95% CI: (4.807-50.983) of testing positive for breast cancer compared to those who did not passively smoke. The results from this study support a role of lifestyle behavior as one of the main predisposing factors to developing aggressive forms of breast cancer in the African population. These findings will be useful to policy makers who guide the breast cancer prevention and control programs in the management of the rise in cancer incidence and increase awareness on the risks of breast cancer.***

**Keywords:** Breast Cancer, Lifestyle factors, Reproductive factors, Diet, Physical activity

## 1. Introduction

Breast cancer generally referring to a malignancy in women that arises from the terminal ductal-lobular units of epithelial tissue, which in the mature breast represents 10% of the total volume is the most common cancer in women worldwide, comprising 16% of all female cancers (Bernard 2003; WHO, 2004). The incidence of breast cancer is increasing in the low-income countries and middle- income countries due to increasing life expectancy, increased urbanization and adoption of western lifestyle. By 2030, the developing world is expected to bear 70% of the global cancer burden (Boyle and Levin, 2008; IARC 2014). More than 50% of new cancer cases and nearly two-thirds of deaths from breast cancer occur in low-income, lower middle income and upper middle income countries of the developing world (Boyle and Levin, 2008; WHO, 2010).

Globally 30% of cancer deaths are due to five leading behavioral and dietary risks; high body mass index, low fruit and vegetable intake lack of physical exercise, tobacco and alcohol use (WHO, 2004). Although the lowest incidence rates are found in most African countries, breast cancer incidence rates are also increasing. However, many etiological factors, including family history of breast cancer, benign breast diseases, age, sex, hormones and reproductive history factors (early menarche, late or no pregnancy), western lifestyle (high caloric diet, lack of physical activity and related factors), ionizing radiation, drugs, agro-chemicals, gene mutations, alcohol, and smoking contribute to World's burden of breast cancer (Bernard, 2003).

The mortality rate for breast cancer creates a heavy burden for women in their prime of life, their families and for the health care system. The international agency for Research on Cancer estimated the crude mortality rate for Kenya to be 7.7 for breast cancer, which is a very high rate (IARC, 2014; Gobocan, 2008).

In many African and Asian countries however, including Uganda, South Korea, and India, incidence and mortality rates have been rising (Parkin, 2010), with changes in reproductive patterns, physical inactivity, and obesity being the main contributory factors (Colditz, 2006).

In Nigeria breast cancer trends were declining and the frequency of hospital attendance raised, reduced late presentation and this was attributed to several factors; increased awareness about breast cancer, improved early detection methods and usefulness of breast self - examination (Parkin, 2003). Hence maintaining a healthy body weight, increasing physical activity, and minimizing alcohol intake are the best available strategies to reduce the risk of developing breast cancer (Kushi, 2006).

According to data by the US's National Cancer Institute (National Cancer Institute, 2006), more than 65% of women diagnosed with breast cancer were 55 years old and above. Comparative data from Kenya's Nairobi Cancer Registry shows only 26% of women diagnosed were 55 years and above. Majority (60%), of the women diagnosed with breast cancer was between the ages 35-54.

According to the Nairobi Cancer Registry, women affected by breast cancer in Kenya were relatively younger than those in developed countries (Nairobi Cancer Registry, Kemri 2008). For years, says the new study, poverty, ignorance, fewer and late testing, and lack of health care were believed to be responsible for high breast cancer deaths in Kenya.

In Kenya, cancer ranks as the number three killer disease, of Kenyans, in the country, with an estimated 18, 000 deaths reported annually and 82, 000 infections diagnosed every year (IARC, 2008). About 80, 000 cases of Cancer are diagnosed each year with about 50 Kenyans dying daily from various forms of cancers (Pact Kenya Cancer Assessment in Africa and Asia, 2010) and (Global Medicine, 2011). The top six types of cancer include breast cancer, cervical cancer, and cancer of the esophagus, stomach, prostate and liver. The severe lack of Medical Practitioners for a large number of new Cancer cases being diagnosed annually makes Cancer situation in Kenya dire in need (International Atomic Energy Agency, 2010).

The present study looks into the associated lifestyle factors and reproductive factors of female clients attending the radiology department at Thika Level 5 Hospital. The results of the study are useful in designing awareness and health education programs focused on women of Kenya.

## 2. Literature Survey

Breast cancer generally refers to a malignancy in women that arises from the terminal ductal-lobular units of epithelial tissue, which in the mature breast represent 10% of the total volume (Bernard, 2003). Cancer is a leading cause of death worldwide and accounted for 7.6 million deaths (around 13% of all deaths) in 2008. Breast cancer caused 458, 000 deaths which is more than cervical cancer that accounted for 275, 000 deaths. About 70% of all cancer deaths occurred in low- and middle-income countries. Deaths from cancer worldwide are projected to continue to rise to over 13.1 million in 2030 (Globocan 2008; IARC, 2010). Breast cancer is the most frequently diagnosed cancer and the leading cause of cancer deaths in females worldwide, accounting for 23% (1.38 million) of the total new cancer cases and 14% (458, 400) of the total cancer deaths in 2008. About half of the breast cancer cases and 60% of deaths are estimated to occur in economically developing countries (Globocan 2008; IARC, 2010).In many African and Asian countries however, including Uganda, South Korea, and India, incidence and mortality rates have been rising (Parkin et al; 2010), with changes in reproductive patterns, physical inactivity, and obesity being the main contributory factors (Colditz, 2006).

Maintaining a healthy body weight, increasing physical activity, and minimizing alcohol intake are the best available strategies to reduce the risk of developing breast cancer (Kushi, 2006). Early detection through mammography has been shown to increase treatment options and save lives, although this approach is cost prohibitive and not feasible in most economically developing countries (Anderson, 2006). Recommended early detection strategies in these `3countries include the promotion of awareness of early signs and symptoms and screening by clinical breast examination (Anderson, 2007). While communicable diseases still remain the leading killers in many developing countries, the incidence and mortality from non-communicable diseases is rising rapidly. According to the latest WHO data published in April 2011, Breast cancer deaths in Kenya reached 1, 491 or 0.47% of total deaths. The age adjusted death rate was 15.76 per 100, 000 people. Kenya ranks 102, in breast cancer mortality, in the world (WHO 2011). In Kenya, it was noted that breast cancer is the number one killer of women aged 35 to 55 years.

## 3. Methods

### 3.1 Study design

A descriptive cross-sectional study design was used for this study and was carried out in the radiology department at Thika Level 5 Hospital.

### 3.2 Study site

The research was conducted in Thika Level 5 Hospital located in Thika (Appendix I). It is a 300-bed government hospital in the town of Thika, about 50km north east of Nairobi, in Kiambu County. At Thika hospital, there are four operating theatres with about 300 major and minor operations done monthly. The department of radiology is a highly specialized, full service department which strives to meet all patient and clinician needs in diagnostic imaging as well as image-guided therapies. Services rendered include the ultrasound service (breast, abdomen, pelvic, prostate, among others), routine radiography, mammography and dental radiography. A rotating pool of 16-20 medical officers (junior doctors) and clinical officers (vocationally trained clinicians) handle a range of cancer cases together with their referrals to the national hospitals.

Thika Level 5 Hospital is not a university hospital but despite it being a mid-sized Kenyan Government Hospital, it receives patients from all over the region of Kiambu County and beyond, who are of different gender, tribe, economic background and race. Therefore, this hospital as my study site generated results that represent fully the study population of interest.

### 3.3 Study population

Thika Level 5 Hospital, being a Provincial General hospital, averagely attends to 248 patients per month, screened for breast cancer at the radiology department. This study targeted all female clients aged 18 years and above attending the radiology department for breast cancer screening at Thika Level 5 Hospital, Thika and those who agreed to participate after giving their consent.

### 3.4 Sample size determination

Fishers et al formulae (1998) for determining sample size at 5% precision and a 95% level of confidence was used as follows:

$$n = \frac{(p)(1-p)Z_{\alpha/2}{}^2}{d^2} \quad \text{(i)}$$

Where: n = sample size for the core group

$p$ = unknown prevalence of breast cancer occurrence (taken as 50%)

$Z_{\alpha/2}{}^2$ = the value corresponding to the 95% confidence interval

$d^2$ = the allowable error margin

$$\text{n} = \frac{(0.5)(1-0.5)\times 1.96^2}{(0.05)^2} = 385$$

Since the target population is <10, 000, the calculated sample size is adjusted using finite correction factor and the adjusted sample size becomes:

$$\text{n}_{\text{cf}} = \frac{\text{n}}{1+(\frac{\text{n}}{\text{N}-1})} \quad \text{(ii)}$$

Where: n = desired sample size (below 10, 000)

N= estimate of population attending the radiology department for breast cancer screening (700)

$$\text{nfcf} = \frac{385}{1+(385/_{248-1})} = 151$$

Adjusting for attrition of 10%

$\text{n} = \frac{151}{0.9} = 167$ Females

The study used the entire target population of 167 females.

### 3.5 Sampling procedure

Thika Level 5 Hospital, averagely attends to 744 patients in three months, screening for breast cancer in the radiology department. This study therefore employed the systematic random sampling to come up with the sampling frame.

$$1 \text{ month} = 248 \text{ females screened for breast cancer}$$

$$3\text{months} = 3 \times 248$$
$$= 744 \text{ females screened for breast cancer}$$

$$\text{K(sample interval)} = \frac{\text{Total population}}{\text{Sample size desired}} \quad \text{(iii)}$$

$$= \frac{744}{167} = 4.5 \cong 5$$

The flow of patients in the radiology department at level 5 Thika Hospital is 248 on average per month. This gave a total of 744 in three months. This study applied a systematic sampling procedure. The sampling interval K was 5. The starting patient, in the waiting line, was selected using a simple random sampling procedure by selecting a number between 1 and 5, say Lth number. Therefore, the second patient was to be L+5; the third was L+5+5 until the 167th was achieved.

### 3.6 Pretesting of questionnaires

The questionnaires were pretested on a purposively selected sample of about 10 respondents who waited for breast cancer screening at the radiology department. This was done two weeks before the actual study. The aim of the pretesting was to fine tune the questionnaire and have clarity in the interpretation and understanding of the questions to be put forth to the respondents. The pretest was also aimed at assessing the flow, order, timing and overall respondent well-being. The questionnaire was drawn into its final form. Participants in the pretesting of the questionnaire were not included in the final data analysis.

### 3.7 Data collection procedure

Quantitative technique of data collection was used. Data was collected at the radiology department between 8:00AM and 5:00PM daily over a period of three months. There was no interference with the health worker's decision with regards to patient's diagnosis or influence in the selection of pathological methods of diagnosis.

Primary data was collected using a structured questionnaire (Appendices III). The diet section in the structured questionnaire (Appendix III) that was used was developed using statements from existing instruments (Fred et al; 2000) whereas the rest of the questions were formulated by the principal investigator. The questionnaire contained closed ended and open ended questions. They were administered to the respondents who were waiting their breast cancer screening results via the help of research assistants, upon giving a written informed consent. The participants were required to fill the questionnaires in the waiting area as they wait to be served. The questionnaire contained lifestyle factors and reproductive factors. The questionnaire was administered in either English or Kiswahili which were the official languages in Kenya. Secondary data was obtained by review of participant's records so as to ascertain the breast cancer diagnosis of the screened participant. The results of the participants were revealed to them by the health worker in charge, after they had filled the questionnaires.

The hospital authorities were requested in advance to give three months in which the questionnaires were administered.

### 3.8 Data analysis

Data was entered into SPSS Statistics version 20 software and the outcome (occurrence of breast cancer) was coded as 1 or 0 where 1 indicated success and 0 indicated failure. This was necessary so as to use logistic regression which recognizes 1 or 0 coding system in SPSS software. Analysis was done for each objective and results presented

in tables, figures and statistical statements. In order to describe the study population, proportions (percentages) were determined. Distribution of the sample (univariate analysis) was done and variables found to be statistically significant were subjected to bivariate regression model and finally to multivariate logistic regression model for analysis of association breast cancer and independent variables. Both odds ratio (0R) and P values at 95% confidence interval were used to describe the significance of association in multivariate logistic regression.

### 3.9 Ethical considerations

The study was carried out after obtaining formal approval from the KEMRI scientific steering committee and the National Ethical Review Committee (Appendix II and III). Written consent was also to be obtained from the participants prior to administering the questionnaire (Appendix V). Approval was also obtained from Thika Level 5 Hospital, Thika to collect both the primary data and secondary data (Appendix IV).

## 4. Results

### 4.1 Magnitude of breast cancer

The prevalence of the study was determined as follows:

$$\text{Prevalence} = \frac{\text{Number of people tested positive for breast cancer}}{\text{Number of people sampled}} \times 100\%$$
$$= \frac{45}{167} \times 100\%$$
$$= \underline{26.95\%}$$

### 4.2 Lifestyle factors of females screened for breast cancer

#### 4.2.1 Fat intake

From the findings of the study, both white and red meat showed significant association to breast cancer occurrence ($p< 0.00$ and $p< 0.00$) in red meat frequency and white meat frequency. A higher proportion of women (47.17%) who consumed red meat weekly had breast cancer, compared to those who consumed red meat monthly (26.42%) and those who have never consumed red meat (9.84%). (Table 1)

**Table 1:** Red meat frequency of study participants

| | | Breast cancer occurrence | | Total | Proportion | Percent |
|---|---|---|---|---|---|---|
| | | Negative | Positive | | | |
| **Red meat frequency** | Never<br>Monthly<br>Weekly | 55 | 6 | 61 | 0.10 | 9.84% |
| | Weekly | 28 | 25 | 53 | 0.47 | 47.17% |
| | Monthly | 39 | 14 | 53 | 0.26 | 26.42% |
| Total | | 122 | 45 | 167 | | |
| **Pearson chi square = 20.09<br>P-value = 0.00** | | | | | | |

The respondents who ate red meat at a serving of 1cup had the highest proportion (0.68) in relation to breast cancer as compared to those who have never eaten (6 of 61, 10%). (Table 2)

**Table 2:** Red meat serving of study participants

| | | Breast cancer occurrence | | Total | Proportion | Percent |
|---|---|---|---|---|---|---|
| | | Negative | Positive | | | |
| | Never | 55 | 6 | 61 | 0.10 | 9.84% |
| **Red meat Serving** | ¼ cup<br>Monthly<br>Weekly | 25 | 7 | 32 | 0.22 | 21.88% |
| | ½ cup | 34 | 15 | 49 | 0.31 | 30.61% |
| | 1 cup | 8 | 17 | 25 | 0.68 | 68% |
| Total | | 122 | 45 | 167 | | |
| **Pearson chi square = 20.09<br>P-value = 0.00** | | | | | | |

A higher proportion (0.38) of women consumed white meat monthly compared to those who consumed weekly (0.36) and those who have never consumed white meat (0.08), (Table 3). However, as for the white meat serving, there is no statistical association ($p > 0.76$, $\chi^2 = 1.19$) to breast cancer occurrence.

**Table 3:** White meat consumption of study participants

| | | Breast cancer occurrence | | Total | Proportion | Percent |
|---|---|---|---|---|---|---|
| | | Negative | Positive | | | |
| **White meat frequency** | Never | 55 | 5 | 60 | 0.08 | 8.33% |
| | Weekly<br>Monthly<br>Weekly | 35 | 20 | 55 | 0.36 | 36.36% |
| | Monthly | 32 | 20 | 52 | 0.38 | 38.46% |
| Total | | 122 | 45 | 167 | | |
| **Pearson chi square = 19.03**<br>**P-value = 0.00** | | | | | | |

The other dairy products that showed significant relation to breast cancer occurrence are "yoghurt", "eggs" and "cheese" and "milk" ($p < 0.05$). The findings show that those respondents who drunk yoghurt weekly had a higher protection (0.32) of breast cancer than those who drunk monthly (7 of 49, 14.29%) Table 4.

**Table 4:** Yoghurt consumption of study participants

| | | Breast cancer occurrence | | Total | Proportion | Percent |
|---|---|---|---|---|---|---|
| | | Negative | Positive | | | |
| **Yoghurt frequency** | Monthly or less | 42 | 7 | 49 | 0.14 | 14.29% |
| | Weekly | 80 | 38 | 118 | 0.32 | 32.20% |
| Total | | 122 | 45 | 167 | | |
| **Pearson chi square = 5.65**<br>**P-value = 0.02** | | | | | | |

However, breast cancer occurrence increases with increase in yoghurt serving, with the highest proportion (0.54) being for those who consumed 1 cup and lowest (0.2) for those who never consume (Table 5). The study also shows that egg serving is statistically significant ($p < 0.05$) with breast cancer decreasing with decrease in egg serving (Table 5).

**Table 5:** Yoghurt and eggs servings of study participants

| | | Breast cancer occurrence | | Total | Proportion | Percent |
|---|---|---|---|---|---|---|
| | | Negative | Positive | | | |
| | Never | 28 | 7 | 35 | 0.2 | 20% |
| **Yoghurt Serving** | ¼ cup<br>Monthly<br>Weekly | 43 | 12 | 55 | 0.22 | 21.82% |
| | ½ cup | 38 | 11 | 49 | 0.22 | 22.45% |
| | 1 cup | 13 | 15 | 28 | 0.54 | 53.57% |
| Total | | 122 | 45 | 167 | | |
| **Pearson chi square = 12.18**<br>**P-value = 0.01** | | | | | | |
| | | Breast cancer occurrence | | Total | Proportion | Percent |
| | | Negative | Positive | | | |
| | Never | 21 | 10 | 31 | 0.32 | 32.26% |
| **Eggs serving** | ¼ cup<br>Monthly<br>Weekly | 29 | 6 | 35 | 0.17 | 17.14% |
| | ½ cup | 37 | 12 | 49 | 0.24 | 24.49 |
| | 1 cup | 28 | 8 | 36 | 0.22 | 22.22 |
| Total | | 122 | 45 | 167 | | |
| **Pearson chi square = 9.69**<br>**P-value = 0.05** | | | | | | |

The respondents who consumed cheese severally for a period of at most a month, had a higher proportion (17 of 41, 41.46%) of breast cancer occurrence than those who did not consume cheese at all (0.22) Table 6. Increasing the frequency of taking milk resulted in increased proportion of breast cancer occurrence (Table 6).

**Table 6:** Cheese and milk consumption of study participants

| | | Breast cancer occurrence | | Total | Proportion | Percent |
|---|---|---|---|---|---|---|
| | | Negative | Positive | | | |
| **Cheese frequency** | Never | 98 | 28 | 126 | 0.22 | 22.22% |
| | At most monthly | 24 | 17 | 41 | 0.41 | 41.46% |
| Total | | 122 | 45 | 167 | | |
| **Pearson chi square = 5.82**<br>**P-value = 0.02** | | | | | | |
| | | Breast cancer occurrence | | Total | Proportion | Percent |
| | | Negative | Positive | | | |
| **Milk frequency** | Monthly or less | 48 | 5 | 53 | 0, 09 | 9.43% |
| | Weekly | 38 | 17 | 55 | 0.31 | 30.91% |
| | Daily | 36 | 23 | 59 | 0.39 | 38.98% |
| Total | | 122 | 45 | 167 | | |
| **Pearson chi square = 0.00**<br>**P-value = 13.04** | | | | | | |

Sugary foods, in frequency, were statistically significant (p< 0.00). The proportions of breast cancer tend to reduce with decrease in sugary foods intake. The respondents, who consumed sugary foods at most weekly, had a higher proportion (0.7, 70%) of breast cancer compared with those who actually never consumed sugary foods (0.16, 16.47%). (Table 7)

**Table 7:** Sugary foods consumption of study participants

| | | Breast cancer occurrence | | Total | Proportion | Percent |
|---|---|---|---|---|---|---|
| | | Negative | Positive | | | |
| **Sugary foods frequency** | Never<br>Monthly<br>Weekly | 71 | 14 | 85 | 0.16 | 16.47% |
| | At most weekly | 6 | 14 | 20 | 0.7 | 70% |
| | Monthly | 45 | 17 | 62 | 0.27 | 27.42% |
| Total | | 122 | 45 | 167 | | |
| **Pearson chi square = 23, 58**<br>**P-value = 0.00** | | | | | | |

The same also happens with the sugary foods serving, breast cancer increases with increase in sugary foods serving, with the highest (17 of 32, 53.13%) were those who consumed 1 cup compared to those who consumed 1\4 cup (9 of 29, 31.030%) Table 8

**Table 8:** Sugary foods serving of study participants

| | | Breast cancer occurrence | | Total | Proportion | Percent |
|---|---|---|---|---|---|---|
| | | Negative | Positive | | | |
| **Sugary foods serving** | Never | 69 | 8 | 77 | 0.10 | 10.39% |
| | ¼ cup<br>Monthly<br>Weekly | 20 | 9 | 29 | 0.31 | 31.03% |
| | ½ cup | 18 | 11 | 29 | 0.38 | 37.93% |
| | 1 cup | 15 | 17 | 32 | 0.53 | 53.13% |
| Total | | 122 | 45 | 167 | | |
| **Pearson chi square = 23.89**<br>**P-value = 0.00** | | | | | | |

As for the oily foods serving, breast cancer increases as the serving increases, those respondents who consumed 1 and 1\2 cup of oily foods had a higher proportion (0.5) of breast cancer compared to those who consumed 1\4 cup (0.17) Table 9. The oily food frequency however, had no statistical association to breast cancer occurrence ($p < 0.06$, $\chi^2 = 3.57$)

**Table 9:** Oily foods serving of study participants

| | | Breast cancer occurrence | | Total | Proportion | Percent |
|---|---|---|---|---|---|---|
| | | Negative | Positive | | | |
| | Never | 6 | 8 | 14 | 0.7 | 57.14% |
| **Oily food serving** | ¼ cup<br>Monthly<br>Weekly | 34 | 7 | 41 | 0.17 | 17.07% |
| | ½ cup | 37 | 11 | 47 | 0.23 | 23.40% |
| | 1 cup | 38 | 11 | 49 | 0.22 | 22.45% |
| | 1 & ½ cup | 8 | 8 | 16 | 0.5 | 50% |
| Total | | 122 | 45 | 167 | | |
| **Pearson chi square = 13.64**<br>**P-value = 0.01** | | | | | | |

### 4.4.2 Fruits and vegetables

Among the items tested in the vegetable group, whole fruits, fruit salad and raw vegetable frequencies showed statistical significance in frequency of use ($p < 0.05$) as shown in Table 10. The findings show that a higher proportion (0.33) of those who consumed fruits weekly had breast cancer (37 of 112, 33.04%) compared to those who consumed daily (0.15).

**Table 10:** Whole fruits, fruit salads and raw vegetables consumption of study participants

| | | Breast cancer occurrence | | Total | Proportion | Percent |
|---|---|---|---|---|---|---|
| | | Negative | Positive | | | |
| **Whole fruits frequency** | Weekly<br>Monthly<br>Weekly | 75 | 37 | 112 | 0.33 | 33.04% |
| | Daily | 47 | 8 | 55 | 0.15 | 14.55% |
| Total | | 122 | 45 | 167 | | |
| **Pearson chi square = 6.41**<br>**P-value = 0.01** | | | | | | |
| | | Breast cancer occurrence | | Total | Proportion | Percent |
| | | Negative | Positive | | | |
| **Fruit salad frequency** | Never<br>Monthly<br>Weekly | 5 | 23 | 28 | 0.82 | 82.14% |
| | Weekly | 50 | 6 | 56 | 0.11 | 10.71% |
| | Monthly | 67 | 16 | 83 | 0.19 | 19.28% |
| Total | | 122 | 45 | 167 | | |
| **Pearson chi square = 53.31**<br>**P-value = 0.00** | | | | | | |
| | | Breast cancer occurrence | | Total | Proportion | Percent |
| | | Negative | Positive | | | |
| **Raw vegetables frequency** | Never<br>Monthly<br>Weekly | 51 | 34 | 85 | 0.4 | 40% |
| | Weekly | 30 | 5 | 35 | 0.14 | 14.29% |
| | Monthly | 41 | 6 | 47 | 0.13 | 12.77% |
| Total | | 122 | 45 | 167 | | |
| **Pearson chi square = 15.01**<br>**P-value = 0.00** | | | | | | |

### 4.4.3 Weight

Table 11 shows that most of the respondents were in the overweight category (n=85) with a body mass index of between 22-27.9kg\m$^2$. However, a big proportion (0.81) of those who were obese (22 of 27, 82.48%) had breast cancer. From the table, proportions tend to increase with increase in body mass index ($p < 0.00$, $\chi^2 = 49.50$).

**Table 11:** Weight characteristic of study participants

| | | Breast cancer occurrence | | Total | Proportion | Percent |
|---|---|---|---|---|---|---|
| | | Negative | Positive | | | |
| **BMI (kg/m$^2$)** | BMI < 22 | 50 | 7 | 57 | 0.12 | 12.28% |
| | BMI 22-27.9 | 67 | 16 | 83 | 0.19 | 19.28% |
| | BMI > 28 | 5 | 22 | 27 | 0.81 | 81.48% |
| Total | | 122 | 45 | 167 | | |
| **Pearson chi square = 49.50**<br>**P-value = 0.00** | | | | | | |

Table 12 shows that most of the respondents were in the overweight category (n=85) with a body mass index of between 22-27.9kg\m$^2$. However, a big proportion (0.81) of those who were obese (22 of 27, 82.48%) had breast cancer. From the table, proportions tend to increase with increase in body mass index ($p < 0.00$, $\chi^2 = 49.50$).

**Table 12:** Weight characteristic of study participants

| | | Breast cancer occurrence | | Total | Proportion | Percent |
|---|---|---|---|---|---|---|
| | | Negative | Positive | | | |
| **BMI (kg/m$^2$)** | BMI < 22<br>Monthly<br>Weekly | 50 | 7 | 57 | 0.12 | 12.28% |
| | BMI 22-27.9 | 67 | 16 | 83 | 0.19 | 19.28% |
| | BMI > 28 | 5 | 22 | 27 | 0.81 | 81.48% |
| Total | | 122 | 45 | 167 | | |
| **Pearson chi square = 49.50**<br>**P-value = 0.00** | | | | | | |

### 4.4 Physical activity

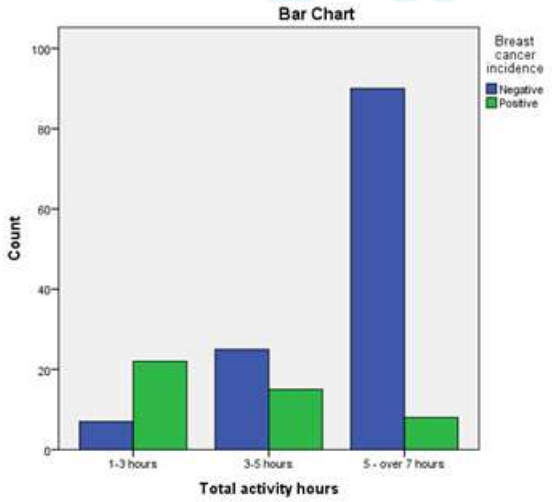


**Figure 1:** Duration of physical activity of study participants

The study shows a statistically significance ($p < 0.00$) between breast cancer and physical activity hours. (Figure 1) the women who had done physical activity for 1 to 3 hours had a higher proportion (75.86%) compared to those who did physical activity for over 5 hours per week (8 of 98, 8.16%).

### 4.4.5 Alcohol consumption

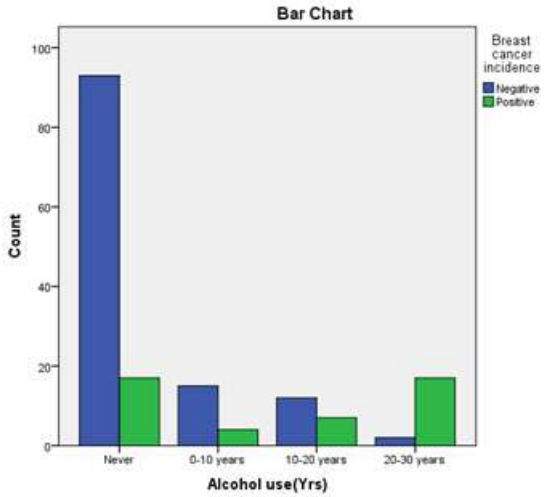


**Figure 2:** Duration of alcohol use of study participants

Figure 2 shows a decrease in women without breast cancer with increase in the number of years of alcohol use ($p < 0.00$, $\chi^2 = 47.77$).A big proportion (0.89) of those who drank alcohol for 20-30 years had breast cancer compared to those who have never drank alcohol (15 of 107, 14.02%).

The study also shows that the highest proportion of respondents who drunk more than 10 glasses of alcohol

per week had breast cancer (0.55) than those who drank less than 10 glasses (0.26) and those who have never drank (0.19). There is indeed a statistical significant relation of alcohol consumption and breast cancer ($p < 0.00$, $\chi^2$=16.34) Table 13

**Table 13:** Frequency of alcohol use of study participants

| | | Breast cancer occurrence | | Total | Proportion | Percent |
|---|---|---|---|---|---|---|
| | | Negative | Positive | | | |
| **Alcohol quantity per week** | None<br>Monthly<br>Weekly | 93 | 22 | 115 | 0.19 | 19.13% |
| | <10 glasses | 14 | 5 | 19 | 0.26 | 26.32% |
| | >10 glasses | 15 | 18 | 33 | 0.55 | 54.55% |
| Total | | 122 | 45 | 167 | | |
| **Pearson chi square = 16.34**<br>**P-value = 0.00** | | | | | | |

### 4.4.6 Tobacco

Tobacco smoking was not statistically significant to breast cancer ($p>0.05$) but passive smoking was statistically significant ($p < 0.00$, $\chi^2$ =31.91). Over 27% of respondents have zero exposure to secondary smoke per day. (Table 14) However, the proportion of breast cancer is highest (0.66) among those who have been exposed to secondary smoke for more than 3 hours per day (21 of 32, 65.63%)**.**The proportion of breast cancer incidence caused by tobacco use was also highest among women aged between 41-50 years who had a peak proportion of 38%, for those who were exposed for more than 3 hours a day.

**Table 14:** Duration of passive smoking of study participants

| | | Breast cancer occurrence | | Total | Proportion | Percent |
|---|---|---|---|---|---|---|
| | | Negative | Positive | | | |
| **Length of exposure to secondary smoke per day** | Zero | 41 | 5 | 46 | 0.11 | 10.87% |
| | 1-2 hours | 33 | 8 | 41 | 0.20 | 19.51% |
| | 2-3 hours | 37 | 11 | 48 | 0.23 | 22.92% |
| | >3 hours | 11 | 21 | 32 | 0.66 | 65.63% |
| Total | | 122 | 45 | 167 | | |
| **Pearson chi square = 31.91**<br>**P-value = 0.00** | | | | | | |

### 4.5 Reproductive factors of females screened for breast cancer

Chi-square test of significance was used to find out if there was an association between breast cancer and reproductive factors (Table 15). Among the reproductive factors, only breast feeding and hormonal contraceptives use were found to be significantly associated ($p< 0.05$). A big proportion (0.64) of those who breastfed for a total of 2 years or less had breast cancer (30 of 47, 63.83%).Breast feeding for 4 years and above is protective for breast cancer ($p < 0.00$, $\chi^2$= 48.89). (Table 5.6)

**Table 15:** Duration of breastfeeding and use of hormonal contraceptives

| | | Breast cancer occurrence | | Total | Proportion | Percent |
|---|---|---|---|---|---|---|
| | | Negative | Positive | | | |
| **Total years of breastfeeding** | < 2 years Monthly Weekly | 17 | 30 | 47 | 0.64 | 63.83% |
| | 2-4 years | 30 | 9 | 39 | 0.23 | 23.08% |
| | > 4 years | 75 | 6 | 81 | 0.07 | 7.41% |
| Total | | 122 | 45 | 167 | | |
| **Pearson chi square = 48.49**<br>**P-value = 0.00** | | | | | | |
| | | Breast cancer occurrence | | Total | Proportion | Percent |
| | | Negative | Positive | | | |
| **Years of hormonal contraceptive use** | < 1 year Monthly Weekly | 64 | 5 | 69 | 0.09 | 8.70% |
| | 1-15 years | 26 | 8 | 34 | 0.24 | 23.53% |
| | > 15 years | 32 | 32 | 64 | 0.5 | 50% |
| Total | | 122 | 45 | 167 | | |
| **Pearson chi square = 31.08**<br>**P-value = 0.00** | | | | | | |

Majority (n=64) of respondents used hormonal contraceptives for more than 15 years. That duration of use is significantly strongly associated with breast cancer ($\chi^2$= 31.08, p < 0.00) and had the highest proportion (0.5) of breast cancer (32 of 64, 50%). Table 15

### 4.6 Multivariate analysis

The multivariate logistic regression results are tabulated in table 16 where the individual predictor variables that retained their statistical significance on interaction are listed.

Women in BMI category 22-27.9 had 6.07 (95% CI: 6.07 (2.286-16.125)) higher odds of testing positive for breast cancer compared to women with BMI less than 22. Those with BMI greater than 28 had 53.43 (95% CI: 53.43 (15.466-184.575)) higher odds of testing positive for breast cancer compared to those with BMI less than 22.

Breastfeeding as a predictor variable retained its significance showing that women who had breastfed for between 2-4 years and for more than 4 years had 0.17 (95% CI: 0.17 (0.066-0.441)) and 0.05 (95% CI: 0.05 (0.016-0.126)) lower odds of testing positive for breast cancer, respectively, compared to those who had breastfed for less than 2 years.

Gardening retained its significance to reveal that women who gardened, compared to those who did not garden, reduced their odds of testing positive for breast cancer by values of 0.03 (95% CI: 0.03 (0.006-0.178)) and 0.01 (95% CI: 0.01 (0.001-0.070)) for those who gardened for 0.5 hours and 1 hour weekly respectively.

Total activity hours, which is the total number hours a respondent spent in various activities, was also significant in this regression model. Women who spent 3-5 hours engaging in any physical activity had 0.02 (95% CI:0.02 (0.004-0.153)) lower odds of testing positive for breast cancer compared to those who spent 1-3 hours daily engaged in any physical activity.

Another variable that retained its significance as a predictor of breast cancer incidence was duration of passive smoking. Women who passively smoked for more than 3 hours daily had 15.66 (95% CI: 4.807-50.983) higher odds of testing positive for breast cancer compared to those who were not exposed to any passive smoking.

**Table 16:** Multiple binary logistic regressions of participants with breast cancer

| Factor | Regression coefficient (β) | OR (95% CI) | P - value |
|---|---|---|---|
| BMI (kg/m$^2$) | | | |
| <22 | 1.00 (ref.) | 1.00 (ref.) | 0.00 |
| 22-27.9 | 1.80 | 6.07 (2.286-16.125) | 0.00 |
| >28 | 3.98 | 53.43 (15.466-184.575) | 0.00 |
| Total breastfeed years | | | |
| < 2 years | 1.00 (ref.) | 1.00 (ref.) | 0.00 |
| 2 – 4 years | -1.77 | 0.17 (0.066-0.441) | 0.00 |
| > 4 years | -3.09 | 0.05 (0.016-0.126) | 0.00 |
| Physical activity | | | |
| Gardening hours | | | |
| Zero | 1.00 (ref.) | 1.00 (ref.) | 0.00 |
| 0.5 hours | -3.42 | 0.03 (0.006-0.178) | 0.00 |
| 1 hour | -4.66 | 0.01 (0.001-0.070) | 0.00 |
| Total activity hours | | | |
| 1-3 hours | 1.00 (ref.) | 1.00 (ref.) | 0.00 |
| 3-5 hours | -3.14 | 0.02 (0.004-0.153) | 0.00 |
| Duration of passive smoking | | | |
| Zero | 1.00 (ref.) | 1.00 (ref.) | 0.00 |
| > 3 hours | 2.75 | 15.66 (4.807-50.983) | 0.000 |

## 5. Discussion

### 5.1 Lifestyle factors associated with breast cancer

#### 5.1.1 Fat intake

This study showed a strong significant association ($p < 0.01$) to breast cancer occurrence in serving. This implies that women who had larger servings of the oily foods had breast cancer compared to those who had smaller servings.

The findings of the present study agree with that of the late Ken Carroll, professor at the University of Western Ontario in Canada (Hagginson and Muir, 1973) which showed a very impressive relationship between dietary fat and breast cancer. It showed that people who migrated from one area to another and who started eating the typical diet of their new residency assumed the disease risk of the area to which they moved. This strongly implied that diet and lifestyle were the principle causes of these diseases (Hagginson and Muir, 1973).

Women who consumed red meat on weekly basis and also those who consume large serving (1 cup) had breast cancer and a strong association to breast cancer occurrence ($p = 0.00$). The same is true for the respondents who consumed white meat frequently ($p = 0.00$). The findings of this study agrees with the Harvard study which reported that the intake of animal fat, mainly from red meat and high-fat dairy foods, during premenopausal years, is associated with increased risk of breast cancer. (Eunyoung Cho, 2003).

The other animal products that showed significant association to breast cancer occurrence are “yoghurt”, “eggs”, “milk” and “cheese”. These all showed a strong association ($p < 0.05$) in their servings and frequencies (for only yoghurt and cheese). This implies that those who consumed a large serving of yoghurt, eggs and milk as well as those who frequently consumed yoghurt and cheese had breast cancer.

This suggests that increasing the frequency of consumption and servings, both lead to an increase in the chances of developing breast cancer.

The findings of this study agrees with a first expert panel report on Diet, Nutrition and Cancer that deliberated on the association of dietary fat with cancer. This report was the first to recommend a maximum fat intake of 30%of calories for cancer prevention (National Academy of Sciences., 1982).

Sugary foods showed a strong association to breast cancer occurrence both in frequency and serving ($p < 0.00$). This indicates that frequent consumption and large portions of sugary foods results to increase in breast cancer. In fact, the proportions of breast cancer tend to reduce with decrease in sugary foods intake by 54% and by 22% with decrease in sugary food serving from 1 cup to ¼ cup. Therefore, sugar is a major aggravate of breast cancer and this is in agreement with that of Peiying Yang study team which determined that it was specifically fructose, in table sugar and high-fructose corn syrup, ubiquitous within our food system, which was responsible for inducing12-LOX andb12-HETE production in breast tumor cells (Peiying, 2011).

#### 5.1.2 Vegetables and fruits

Only whole fruits ($p < 0.01$), fruit salads ($p < 0.00$) and raw vegetables ($p < 0.00$) tested in the vegetable group showed significant association in frequency of use to breast cancer. These statistics show that frequent consumption of the raw vegetables, whole fruits and fruit salad is protective against breast cancer.

This study coincides with a study published in the Journal of the American Medical Association, where biomedical investigators found that vegetable intake (broccoli, cauliflower, cabbage, kale and Brussels sprouts) was inversely related to breast cancer development that is women who had consumed around 1.5 servings of vegetables per day had 42% less risk of developing breast

cancer than those who consumed virtually none (Terry, 2001). This inverse association in frequency of consumption of raw vegetables, whole fruits and fruit salads with breast cancer could be due to antioxidants that they contain which, through the process of oxidation, cause gene damage in cancerous cells.

**5.1.3 Weight**

Findings from the present study determined that increase in BMI results to increase in breast cancer occurrence among women in menopause. The proportion of breast cancer among menopausal women who weighed between 41-50Kgs was highest at 37% while among post-menopausal women who weighed over 50 Kgs, the proportion was 11%. These are the highest proportion values in this study when age and weight are cross-examined. The results of this study are higher than the findings of (Nelson, 2011) who found out that putting on 9.9 kg after menopause increases the risk of developing breast cancer by 18%. Lack of exercise can be linked to breast cancer by the American Institute for Cancer Research. Before menopause, ovaries make most of the estrogen, and fat tissue makes a small amount. After menopause, most of a woman's estrogen comes from fat tissue and increase in fat tissue can increases the chances of getting breast cancer by raising estrogen levels.

**5.1.4 Physical activity**

The present findings also suggest that breast cancer occurrence decrease with increase in physical activity. Increasing the hours spent in physical activities including running, jogging, gardening, house work, dancing and in general total activity hours; all have an effect of decreasing the risk of developing breast cancer. This study went beyond to include everyday tasks and activities such as housework and gardening, which the study respondents were more likely to engage in more than gym-type exercises. This has shown that such everyday activities can stand in for typical exercises and have similar effects in mitigating breast cancer. This is supported by findings (Wu Y., 2013) which reported that intense exercise routine is not needed, activity equal to walking 30 minutes may lower risk by about 3%. Exercise can help in weight control (Huang Z., 1997), lower estrogen levels (Smith A. J., 2013) and boost body's immune system to kill or slow the growth of cancer cells (Winzer B. M., 2011).

**5.1.5 Alcohol consumption**

In respect to alcohol consumption, the study shows a strong association between alcohol consumption and breast cancer occurrence. This study concurs with that of (Allen, 2009). A study of more than one million middle-aged British women which concluded that each daily alcoholic beverage increases the incidence of breast cancer by 11 cases per 1000 women. This study determined that increase in alcohol consumption from less than 10 glasses per week to more than 10 glasses per week increases the proportion of breast cancer cases from 26.32% to 54.55%. Similarly, avoiding alcohol leads to a decrease in breast cancer occurrence from 26% to 19%. The more alcohol a woman drinks, the more likely she is to get breast cancer (IARC, 2008). The relationship is linear and dose-dependent. Even low levels of alcohol consumption carry some risk (IARC, 2008)

The association of alcohol and breast cancer may be explained by the primary mechanism through which alcohol causes breast cancer which in turn increases estrogen levels (Margoles, 2000). For this study, the direct proportion between amount of alcohol consumption and breast cancer occurrence may have been aggravated by the fact that most local alcohol brands contain a lot of sugar necessary for fermentation process which may lead to compounding of the risk factors.

**5.1.6 Tobacco use**

The study determined a strong association between breast cancer occurrence and secondary smoking. This suggests that indeed not only mainstream but also secondhand smoke contain chemicals that, in high concentrations, cause breast cancer. On further interrogation of exposure to secondary smoke according to age the highest occurrence of breast cancer was among postmenopausal women who are exposed for more than 3 hours per day. The proportion of breast cancer incidence caused by tobacco use was highest among women aged between 41-50 years who had a peak proportion of 38%, for those who were exposed for more than 3 hours a day, compared to the average peak proportion of 22% among women exposed to secondary smoke for more than 3 hours a day. The effect of smoking in aggravating breast cancer is felt more among menopausal women.

The findings in the present study agrees with that of (Russo, 2003) findings that breathing second hand smoke increases breast cancer risk by 70% in younger, primarily pre-menopausal women. The California Environmental Protection Agency has concluded that passive smoking causes breast cancer.

**5.2 Reproductive factors associated with breast cancer**

**5.2.1 Pregnancy, Childbirth and Breastfeeding**

The findings of the study showed that there was no association between total breastfeed years, number of pregnancies, number of children and first pregnancy age. The findings are contrary to that of (McTiernan, 1986) that showed lower age of first childbirth, compared to the average age of 24, having more children (about 7% lowered risk per child) and breastfeeding (4.3% per breastfeeding year, with an average relative risk around 0.7) have been correlated to lowered breast cancer risk in large studies.

The results of age at first pregnancy contradict that of (Newcomb, 1994) that showed women who give birth and breastfeed by the age of 20 may have greater protection from breast cancer.

**5.2.2 Hormonal contraception**

The findings of the study revealed that out of 21 women who had used hormonal contraceptives before they attained age of 20 years and before first pregnancy had a greater chance of developing breast cancer by 33.3%. The findings also established that there was a 23.8% chance of breast cancer occurrence in women who had used hormonal contraceptives before they attained age of 20 years and had frequently continued to use them. This is a clear indication that contraceptives should be discouraged especially and more so before a woman is of 20 years of age and before first pregnancy. The East African Legislative Assembly (EALA) bill which seeks to introduce contraceptives for children and teenagers aged between 10 and 19 years (Emmanuel Ainebyoona, 2017) will pause great danger to our girls since more cases of breast cancer will be seen in the future. The findings agree with some studies which have suggested that women who began using hormonal contraceptives before the age of 20 or before their first full-term pregnancy are at increased risk for breast cancer, but it is not clear how much of the risk stems from early age at first use, and how much stems from use before the first full-term pregnancy (WHO, IARC, 1999).

**5.2.3 Hormonal Therapy**

Findings of the present study indicated that there was no association between breast cancer occurrence and hormonal therapy ($p > 0.05$). This may be due to most of the menopausal respondents opting for herbal medicine as opposed to conventional approach. For the few respondents using the conventional approach, they have not been consistent in using the HRT as observed in their responds, attributing it to some adverse effects of the therapy thus no relation to breast cancer. The results therefore indicate that use of HRT has no association to breast cancer. Further studies should be done to assess and ascertain this. The finding of this study contradict a study done by (Heiss, 2008) that indicated a relative risk of breast cancer of 1.35 for women, in a meta- analysis (1997) of data from 51 observational studies, who had used HRT for five or more years after menopause.

**5.3 Multivariate**

From the multivariate logistic regression, the study showed that increase in Body mass index is a risk factor for breast cancer. This is in agreement with previous study done by (Ligibel, 2011) which indicate that there is evidence to suggest that excess body fat at the time of breast cancer diagnosis is associated with higher rates of cancer recurrence and death (Ligibel, 2011). The results also correspond with research findings that indicate that obese women are more likely to have large tumors, greater lymph node involvement, and poorer breast cancer prognosis with 30% higher risk of mortality (Protani, 2010)

On breastfeeding, the findings showed the risk to be statistically significant and it decreased with increase in years of breast feeding their children (> 2 years, <0.05). These results are consistent with those (Fregene and Newman, 2005) that indicated that prolonged lactation among Africans has a protective role for it lowers endogenous estrogen levels over a life time therefore it reduces the risk of breast cancer (Fregene and Newman 2005). We suggest that young women, despite of challenges of work and other stressful events of life, should allow their children to breastfeed the longest for this is not only beneficial to the immunity of the baby and bonding between the baby and the mother, but also protects from developing breast cancer.

The study also showed a strong relationship (82.0%) between prediction and total activity grouping. Gardening hours and total activity hours were significant and protective for breast cancer for those who exercised for a total of 3-5 hours a week compared to those who exercised for 1-3 hours per week. These results are consistent with the Nurses' Health Study which reported that women who had one or more hours per day of moderate exercise had a 30 percent lower risk of colon cancer than women who exercised less. Exercise protects against breast cancer, as well by helping women maintain a healthy body weight, lowering hormone levels, or causing changes in a women's metabolism or immune factors.

Most epidemiological studies associated heavy smoking, smoking of long duration, smoking before a first full term pregnancy (FFTP) and passive smoking with increased risk of breast cancer in women with high levels of estrogen (Catsburg, 2015). In this study, the highest odds of testing for breast cancer were noted in the passive smokers group where women who had passively smoked for more than 3 hours daily had 15.66 (95% CI: 4.807-50.983). This indicates that, there could be a link between passive smoking and breast cancer occurrence. This as a critical area that needs urgent attention preferably from the politicians, simple and efficient measures such as increasing taxes and enforcing strict pricing policies as well as restricting cigarette smoking in public and providing educational information could combat this upcoming pandemic.

## 6. Conclusion

This study shows that there is a positive association between some risk factors and the occurrence of breast cancer among women in Kenya. These factors are fat intake, fruits and vegetables, weight, physical activity, alcohol consumption, passive tobacco smoking, breastfeeding and hormonal contraceptive use. These results support a role of lifestyle behavior as one of the main predisposing factors to developing aggressive forms of breast cancer in the African population.

Overall, the findings of this study corroborate the results of previous investigations on analytical epidemiology of risk factors for breast cancer. This study provides important background information for designing detailed studies and interventions that aim to improve our understanding of the epidemiology and management of breast cancer in Kenya.

## 7. Future Scope

Further studies should be done to ascertain the findings of hormonal therapy and age at menarche of Kenyan women. Further follow up studies that are more of community based rather than hospital based should be carried out so that the sample size can represent Kenya at large. The Kenyan Ministry of Health should also allocate more resources both financial and manpower to programs in the county to deal with non-communicable diseases in an effort to scale up early cancer detection and management to reduce morbidity and mortality from the disease. This should also include subsidizing the cost of treatment.

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