

## Biological Effects of Chemotherapy Experienced by Patients Diagnosed with Breast and Cervical Cancer Attending Treatment at Kenyatta National Hospital.

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### Abstract

**Background:** Chemotherapy is associated with many biological side effects which may affect adherence to treatment and the overall outcome of treatment. In Kenya studies on cancer are few and none has concentrated specifically on the effects of chemotherapy on patients diagnosed with breast and cervical cancer.

**Objective:** The aim of this study was to determine the biological side effects of chemotherapy experienced by patients diagnosed with breast or cervical cancer.

**Methodology:** This study involved both quantitative and qualitative data collection methods to explore on the effects of chemotherapy. Quantitative data was collected from 157 systematically sampled participants. In addition, two focus group discussions were held by purposively selected participants. Univariate analysis of quantitative data involved use of frequencies and proportions. Bivariate analysis was done using Pearson's correlation test to determine relationships between categorical variables and p-values of 0.05 or less were considered to have a significant relationship. Descriptive statistics was presented in text, frequency tables, pie-charts and bar graphs. Qualitative data analysis involved clustering together related narrative information then analyzed using content analysis. Permission to conduct the research was obtained from Kenyatta National Hospital/University of Nairobi Ethics and Research Committee (KNH/UON ERC).

**Results:** The highest percentage (31.2%) of participants fell within the age group of 41-50 years. Most (66.9%) were married and depended on their husbands (45.9%) for social support. Only (22.9%) were in formal employment and majority (73.2%) earned a monthly income of below 20000kshs. Biological effects experienced by participants were anorexia (90.4%), nausea (86.5%), alopecia (79%), and peripheral neuropathy (61.8%). Pearson's correlation test showed that older patients had higher chance of experiencing biological effects.

**Conclusion:** Patients diagnosed with breast and cervical cancer experienced various chemotherapy side effects.

**Key words:** cancer, chemotherapy, biological effects

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### I. Introduction

Cancer is a leading cause of death in the developed and developing countries. Breast and cervical cancers are the leading causes of cancer deaths among women(1). Chemotherapy is an important component of treatment for these two cancers. However the cytotoxic drugs used for the treatment of these two cancers also damage healthy cells as they destroy the cancer cells leading to multiple side effects sometimes at therapeutic doses (2). These side effects affect the patients physiological function, and the inability of these patients destabilizes their psychological status leading to a feeling of anxiety and deep suffering(3) Chemotherapy affects patients in different ways, some go through the treatment with minimal problems while others experience very many problems which bring a big change in their lives. Some express this experience as bearable while others feel it is great suffering(4). Understanding these side effects and their management is important because they affect the patients treatment tolerability and adherence(5)

Frequently experienced side effects among patients receiving chemotherapy for breast and cervical cancer include anorexia, nausea, vomiting and alopecia(6,7,8,9). Anorexia nausea and vomiting are frequently experienced by the patients at the beginning of treatment. These effects affect the patients ability to feed(6) which makes them anxious and weakens their will to live(8)

Patients receiving chemotherapy experience mucositis as a result of the action of cytotoxic drugs on the mucous membrane of the gastro intestinal tract (10). Patients stated this as moderately disturbing symptom(11). Patients may restrict their food intake due to the pain experienced from the disrupted mucous membrane(7)

Fatigue is usually described by patients as a feeling of tiredness which is not relieved by rest or sleep. This symptom experienced by patients on chemotherapy causes anxiety and may lead to depression and interfere with patients adherence to treatment and overall quality of life(12)

Alopecia was identified as a common symptom among breast cancer patient receiving chemotherapy in Malaysia(7,11) while in South Korea alopecia was found to be the most disturbing side effect among breast cancer patients receiving chemotherapy(14)

Many women treated for breast cancer experience sensory symptoms which they describe as numbness, tingling, cold sensation and others even describe this as pain and occasionally motor problems have been reported involving the lower limbs which can affect movement (15). Neuropathy is associated with taxanes (e.g. paclitaxel) which is one of the classes of drugs used for the treatment of cancer of the breast(16). This symptom develops within three months of receiving chemotherapy for breast cancer and patients have reported that it is very stressful since it interferes with the performance of daily activities(15,16) But a review of literature carried out in America in 2015 described it as an unclear experience and seemed to indicate that this is not a significant symptom though it has a negative effect on the patients quality of life (19).

Chemotherapy induced neutropenia is a common complication during the treatment of cancer. It is associated with platinum compounds and taxane-containing treatments both of which are used for the treatment of breast and cervical cancer(20). Chemotherapy induced neutropenia can be a problem in the management of outpatient chemotherapy; it is one of the major adverse events that necessitate dose reduction or it can lead to patients having to postpone treatment and requires the use of granulocyte colony stimulating factor (G-CSF) which adds to the expenses of cancer treatment(21). The degree and duration of neutropenia determines the risk of life long infection. From a study among breast cancer patients, the researcher observed that the % of patients who developed neutropenia was high (22)

## **II. Materials and methods**

### **Setting**

This is a descriptive cross sectional study which used mixed methods of data collection including quantitative and qualitative data. The study was conducted at Kenyatta National Hospital which is Kenya's largest referral hospital. At the cancer treatment centre in this hospital, patients receive care as outpatients.

### **Sample**

Adult patients diagnosed with breast or cervical cancer who were receiving chemotherapy as outpatients at the cancer treatment centre, who had received at least one previous chemotherapy session were eligible to participate. Those who gave consent and were not too sick to comprehend and respond to questions were asked to participate by answering the questionnaire.

During the study period of six weeks in April and May 2019, 157 participants who were selected through simple random sampling answered the questionnaire. A total of 10 participants who were purposively selected by the nurse in-charge of the treatment centre took part in the focus group discussion.

### **Procedure and data collection**

#### **Questionnaire**

A questionnaire, developed by the first author from a modified memorial symptom assessment scale and discussed by a team of oncology experts was used to collect data on side effects of chemotherapy experienced by the patients. The questionnaire consisted of sociodemographic and clinical data of the participants as well as questions on the common side effects of chemotherapy guided by information from literature review. The questions were written in English and translated to Kiswahili by a Kiswahili expert. The questionnaires were self-administered and for the participants who could not read either Kiswahili or English the questionnaires were administered by two nurses who were trained as research assistants. Pretesting of the study questionnaire was done in an oncology outpatient clinic among 16 patients who had similar characteristics as the study population.

#### **Focus group discussion**

In addition to the inclusion criteria presented above the participants were selected by a nurse who was working in the treatment center based on their ability to communicate in English or Kiswahili. The potential participants were approached and requested to participate in the focused group discussion. This method was chosen because Focus group discussions are useful when collecting data from unexplored areas as was the case for Kenyatta hospital. The potential participants were asked told about the objectives of the study and the focus group discussion and told about consent. 20 participants were willing to participate and gave informed consent but only 10 turned up on the day of the discussion. The participants discussed their experiences on the side effects of chemotherapy. The discussion was guided by the first author using a guide prepared by the author and

discussed by a team of oncology experts who included oncology nurse specialist, a palliative care nurse, oncologist and a counsellor. Pre-test of the tool was done in a focus group discussion with 3 patients with breast cancer and 3 patients with cervical cancer from a cancer ward. Two research assistants conversant with qualitative data collection assisted during the focus group discussion. One of the assistants took notes during the discussion while the other assisted with recording of the discussion. The recorded discussions were transcribed verbatim and translated into English by the author.

**Data analysis**

Analysis of data from the questionnaires was done for the whole sample and depending on the sections of the questionnaire. Overall frequency of side effects was calculated as frequencies and proportions of the participants who stated they experienced them. Pearson’s correlation test was used to determine any relationship between the side effects and sociodemographic factors of the participants. Descriptive statistics are presented in text, tables, pie charts and bar graphs.

The data from the focus group discussion were analyzed by content analysis by the author and the two assistants in the following steps 1) The transcripts were read and sentences relevant to the study questions was identified.2) Similar sentences were then grouped into categories.3) central characteristics of each category were developed. During the analysis the author and assistants each analyzed independently and then they discussed the findings together in a data review meeting and came to a consensus on the findings.

**Ethical considerations**

Potential participants were informed verbally and through writing for those who could read. They were informed about the aim of the study, that participation was voluntary, confidentiality would be guaranteed, they could withdraw from the study at any time without any consequences, and that neither participation nor non-participation would affect their treatment and care. They were asked to give a consent to participate. Ethical approval was received from Kenyatta hospital/ university of Nairobi ethics and research committee and permission to carry out the research was obtained from Kenyatta national hospital management.

**III. Results**

***Socio Demographic characteristics of participants***

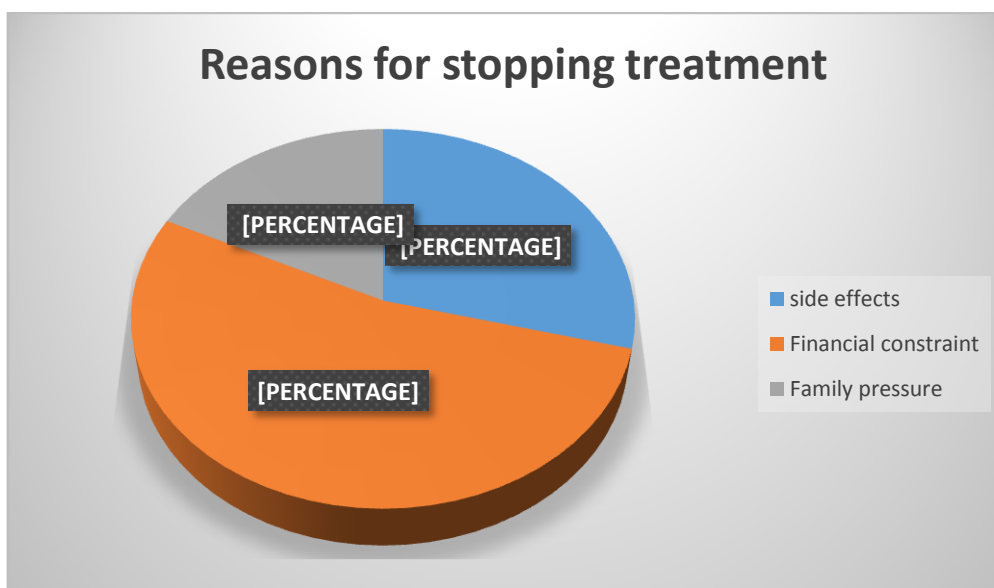
**Table 1** below shows the description of the sociodemographic characteristics of the participants. Many (31.2%) of the participants were aged between 41-50 years, majority (51.0%) of them were of the protestant faith, and most (66.9%) of them were married. Very few (22.9%) of the participants were in formal employment and the majority (73.2%) of the participants had a monthly income of below 20000kshs but majority (63.9) had stopped working. Many (35.8%) participants had 2-5 children and they got their social support mainly from their husbands (45.9%), with a small percentage supported by their family members (17.2%), community (1.9%) and the church supports 1.9%. Most (87.9%) of the participants had enrolled into the National Hospital Insurance Fund which pays part of their treatment expenses. Majority (75.8%) of the participants had attended at least two chemotherapy sessions and in the course of treatment 33.1% of the participants had contemplated stopping treatment.

**Table 1: Socio demographic characteristics of the participants.**

Variable	Category	Frequency (n)	Percentage (%)
Age in years n=157	<20	1	0.6
	21-30	13	8.3
	31-40	46	29.3
	41-50	49	31.2
	51-60	30	19.1
	>60	18	11.5
Religion n=157	Protestant	80	51.0
	Catholic	55	35.0
	Muslim	19	12.1
	Others	3	1.9
Marital status n=157	Single	19	12.1
	Married	105	66.9
	Divorced	16	10.2
	Widowed	17	10.8
Occupation n=157	Business	57	36.3
	Farmer	64	40.8
	Employed	36	22.9
Monthly income In kshs n=157	<20000	115	73.2
	20000-40000	32	20.4
	40000-60000	7	4.5

	>60000	3	1.9
Currently working N=157	Yes	58	36.1
	No	99	63.9
Number of children n=157	None	8	5.1
	One child	53	33.0
	2-5 children	55	35.8
	>5 children	41	26.1
Source of Social support n=157	Husband	72	45.9
	Children	52	33.1
	Family members	27	17.2
	Community	3	1.9
	Church	3	1.9
NHIF availability n= 157	Yes	138	87.9
	No	19	12.1
Previous chemotherapy sessions n=157	One	38	24.2
	Two	51	32.5
	Three	30	19.1
	>Three	38	24.2
Contemplated stoppage of treatment	Yes	52	33.1
	No	105	66.9

Among the participants who had contemplated stoppage of treatment, majority (53.2%) cited lack of finance as the reason that made them think of stopping treatment. These results are presented in **figure 1** below.



**Figure 1: Reasons for participants contemplating stoppage of treatment**

**Socio demographic characteristics of focus group discussion participants**

A total of 10 participants formed the two focus group discussions (FGD). Those participants were identified using numbers and their details are shown in **table 2** below

**Table 2: Sociodemographic characteristics of FGD participants.**

Participant	Age in years	Gender	Marital status	Occupation	Type of cancer	Previous chemo session
PPT1	41	Female	Married	Business	Breast	2
PPT2	70	Female	Widow	Farmer	Breast	5
PPT3	60	Female	Married	Retired teacher	Breast	3
PPT4	54	Female	Married	Clerk	Cervical	3
PPT5	45	Female	Married	Business	Breast	4
PPT6	29	Female	Single	Receptionist	Breast	6
PPT7	39	Female	Married	Business	Cervical	2
PPT8	35	Female	Married	Farmer	Breast	3
PPT9	27	Female	Separated	Hairdresser	Cervical	4
PPT10	54	Female	Married	Farmer	Breast	2

**Sources of information on diagnosis, treatment benefits and side effects**

Participants received information about their cancer diagnosis in the last 1-6 months (46.5%), 6-12 months (24%) and only 3.8% had received the information in the last one month. The majority (45.9%) of the participants received information on their treatment from the doctor and those who received information from the nurse were 35.7%. Information on treatment included benefits of chemotherapy where slightly more than half (52.2%) of the participants said they had received this information. Regarding information on the side effects of chemotherapy 59.9% said they were given this information. These results are shown in **table 3** below

**Table 3: Source of information on diagnosis, treatment and side effects**

Variable	Category	Frequency (n)	Percentage (%)
Time since diagnosis of cancer(months)	<1	6	3.8
	1-6	73	46.5
	6-12	38	24.2
	>12	40	25.5
Information on benefits of chemotherapy	Yes	75	47.8
	No	82	52.2
Information on side effects of chemotherapy	Yes	94	59.9
	No	63	40.1
Informant	Nurse	56	35.7
	Doctor	72	45.9
	Trained counsellor	18	11.5
	Relative	7	4.5
	Others	4	2.5

**Characteristics and patterns of cancer diagnosis among participants**

Half (50.3%) of the participants were diagnosed with cervical cancer and 49.7% had breast cancer. Of the cancers, 87.9% of those with breast cancer had invasive ductal carcinoma while for those with cervical cancer majority (82.2%) had squamous cell carcinoma. Approximately 50% of the participants presented for diagnosis at stage three as shown in **table 4** below.

**Table 4: Characteristics and patterns of cancer diagnosis among participants**

Variable	Category	Frequency(n)	Percentage (%)	
Site of cancer	Breast	78	49.7	
	Cervical	79	50.3	
Type of cancer	Breast N=78	Invasive ductal carcinoma	70	89.7
		Lobular carcinoma	8	10.3
	Cervical N=79	Squamous cell carcinoma	65	82.2
		Adeno carcinoma	14	17.8
Stage	One	2	1.3	
	Two	43	27.4	
	Three	78	49.7	
	Four	34	21.7	

**Chemotherapy drugs used for the treatment of breast and cervical cancer**

Cisplatin (44.6%) was the most commonly used chemotherapeutic agent for the treatment of both breast and cervical cancer followed by paclitaxel (41.8%). The aromatase inhibitor, anastrozole was the least commonly used chemotherapeutic agent and was used by 3.2% of the patients as indicated in **figure 2** below.

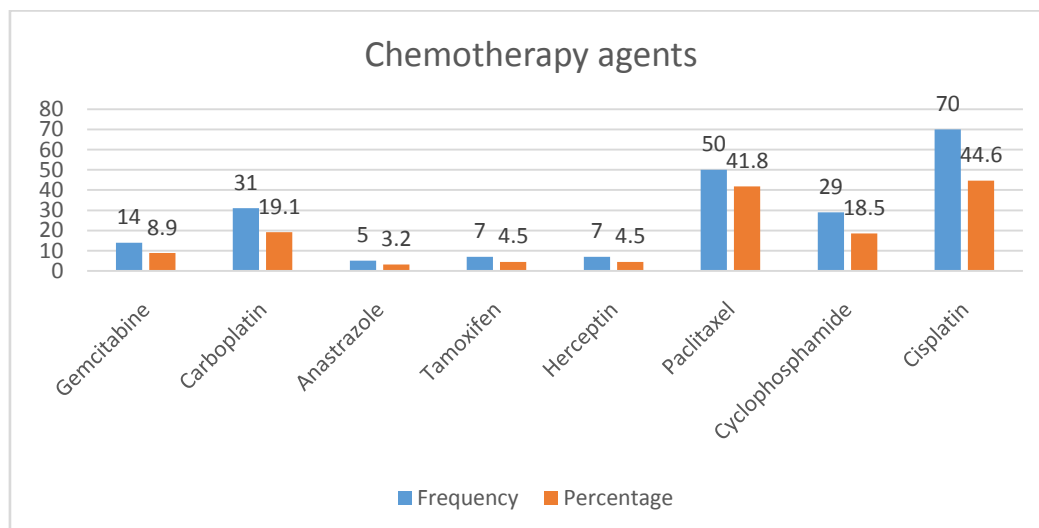


Figure 2: Chemotherapy agents used for treatment of breast and cervical cancer

**Biological effects of chemotherapy**

Most of the participants with breast or cervical cancer complained of having experienced anorexia (90.4%), nausea (88.5%), alopecia (79%), vomiting (76.4%) and skin color changes (67.5%) as shown in **table 5** below.

**Table 5: Biological effects of cancer chemotherapy**

Biological Effects	Frequency (n)	Percentage (%)
Nausea	139	88.5
Vomiting	120	76.4
Fatigue	105	66.9
Anorexia	142	90.4
Alopecia	124	79
Skin color change	106	67.5
Peripheral neuropathy	97	61.8
Diarrhea	61	38.9
Weight loss	90	57.3
Mucositis	69	43.9
Neutropenia	77	49

Further analysis with Pearson’s correlation test revealed that aged patients were more likely to experience biological effects of chemotherapy( $r=0.270$ ).Further analysis showed that the patients who had advanced into the treatment as indicated by the chemotherapy sessions they had attended were less likely to experience biological effects( $r= -0.253$ ) and the longer the time since diagnosis the less likely they were to experience biological effects( $r= -0.156$ )

These results on the biological effects of chemotherapy were supported by messages shared during FGD as quoted below,

*“When I was given chemo I felt very bad. I started vomiting a lot and even when the chemo is finished I continue vomiting. Chemo is very bad for me, I cannot eat anything because of nausea and vomiting. The vomiting stops after three days but not completely. When I think about chemo I just start vomiting so I do not talk about it. But when I reach almost going back for chemo I start having the nausea again. When I enter the chemo room I start vomiting even before I have the branula put...”* (PPT6)

*“I have lost a lot of weight and I do not like the way I look at all. I have changed a lot since I started being given the medicine. I have become black yet I used to be brown. These medicines have very bad side effects. I know if I had stayed with my illness without medicine I would not have reached where I am I would have been better. I don’t have hair now, I cannot eat well, I cannot enjoy my food even chicken which I liked to eat. Nausea all the time. No appetite. Food smells very bad. I don’t even want to talk about it. Without eating you even have no energy to do things. You are tired all the time. I keep sending my children to do for me things and I feel very bad about it...”* (PPT7)

#### **IV. Discussion**

Chemotherapy as one of the major treatment modalities for cancer is associated with many side effects which affect the patients' physiological function. This study was the first report of biological effects of chemotherapy among patients at Kenyatta national hospital. Majority of the participants in this study were middle aged, 41-50 years. This age distribution is attributed to the fact that the two cancers are commonest in the reproductive age group when the female hormones are most active. This finding is similar to a study in India where the highest incidence of the two cancers was found to be among middle aged patients (23). Similar findings were also observed in a study in Taiwan(6) where the average age at diagnosis for breast cancer was 48.89+/- 8.53 while that of cervical cancer was 49.0+/-10.30 years.

Most of the participants had been diagnosed with cancer late at stage three (49.7%) and stage four (21.7%) findings which are similar to those in a study in a university hospital in turkey where 50% and 33,3% participants had stage three and four cancer respectively(11). At these stages the cancer could have had an effect on the body systems hence interfering with the elimination of the chemotherapy from the body these leads to a more severe experience of side effects of the chemotherapy.

In this study, the most commonly used agent for the treatment of cancer of the breast and that of the cervix was cisplatin (44.6%). Cisplatin is a platinum compound used as a combination with paclitaxel for the treatment of cervical cancer. Carboplatin and paclitaxel were also very frequently used for the treatment of the two cancers. These platinum compounds and taxanes used for the treatment of cancer have known side effects which include peripheral neuropathy and chemotherapy induced neutropenia both of which were identified by the participants as symptoms which they suffered. Researchers(16,7,8) identified these symptoms associated with taxanes and platinum compounds among their study participants and they noted that these symptoms greatly affected the participants performance of activities of daily living.

The most common side effects experienced by the study participants included anorexia (90.4%), nausea (88.5%) and vomiting (76.4%) in that order. This is despite the patients having been given antiemetic medicines before the administration of the chemotherapeutic agents. Participants from the focused group discussion expressed that these symptoms were very distressing because they interfered with their feeding and they did not enjoy foods which were their favorite before treatment. A study in Gifu hospital(8) found that inability to feed due to anorexia made patients conscious of their own illness. The study in Taiwan(6) found that patients receiving chemotherapy experienced anorexia, nausea and vomiting despite prior administration of anti-emetic medication.

Most (79%) participants reported that they had experienced Alopecia which is a common side effect of cytotoxic agents as these agents target destruction of fast growing body cells of which hair is among them. All the participants in the focused group discussion experienced loss hair before the second chemotherapy session and they expressed how disturbing this effect is because it reports a person who is taking chemotherapy to the community and they have to hide this using wigs or a scarf. Similar to Chan and Ismail (13) findings from a Malaysian general hospital which showed that 50% of the participants reported alopecia as one of the symptoms they had experienced. Another study among breast cancer patients in South Korea also reported that hair loss was the most disturbing chemotherapy side effect and that it was associated with psychological effects like anxiety and depression as well as sociological effects including stigma and isolation (14).

Weight loss was experienced by 57.3% of the study participants. Members of the focused group discussion also stated that they had experienced this symptom and went further to discuss its cause as being a result of other side effects like nausea, vomiting and anorexia which contribute to the patients inability to feed adequately. Weight loss during cancer treatment could be due to the cancer itself or due to the treatment(24). The doctors and nurses should be aware of this and monitor patients weight as this affects the prescription of chemotherapy and the resultant experience of side effects. It is also important to educate the patients that weight loss could also be as a result of the cancer not just the treatment.

Participants experienced fatigue (66.9%) which they described as an experience of tiredness which is not relieved by rest or sleep and is troublesome. This finding concur with other studies (25),(26) who found that patients experience on treatment fatigue which could extend even after treatment. It is important for the health care providers to be aware of this long term symptoms and educate the patients to develop ways of coping.

Mucositis (43.9%) and diarrhea (38.9%) were among the least experienced symptoms by the patients. However among the 3 focused group discussion participants who stated that they had experienced mucositis they said the experience was very distressful because they experienced a lot of pain and they were unable to feed but once the symptom cleared they were comfortable again.

Older patients were more likely to experience biological effects as indicated by ( $r=0.270$ ) from the Pearson's correlation test carried out to determine if there was a relationship between age and the biological symptoms experienced by the participants. This finding could be attributed to the reduction in the physiological function associated with aging which reduces the clearance of the drugs from the body allowing the body cells to be exposed to drug toxicity for a longer time. Older patients may also be having other comorbidities and

resultant polypharmacy which affects the pharmacological function of the chemotherapy. Similar findings were observed from a study in USA which found that older patients experienced chemotherapy side effects due to reduced physiological function and they were noted to have comorbidities like cardiovascular diseases. (27)

#### **Limitations**

This study was carried out in one center in Kenya. It is thought that this study will contribute to future research and a multi-center study is recommended for a better generalizability of the findings.

### **V. Conclusion**

1. Patients diagnosed with breast and cervical cancer who receive chemotherapy at KNH experience biological effects which include anorexia, nausea and vomiting which are distressing at the beginning of treatment. Alopecia, fatigue and peripheral neuropathy appear latter in the treatment period and may last long after treatment is completed.
2. Findings from the focused group discussion show that the patients experience biological effects which are very distressing. This has exposed a knowledge gap among the patients on what to expect during chemotherapy so that they can develop a way of coping and reduce the distress caused by the treatment side effects.

#### **Implications of the study**

By identifying the effects of chemotherapy experienced by the patients, an oncology nurse will be able to educate the patients on what to expect during chemotherapy and this makes the patients better prepared to cope with the effects. The nurse will also be able to plan effective nursing interventions according to the patient's individual needs providing symptom control and management which will contribute to better adherence to treatment.

#### **Acknowledgement**

We thank all the study participants, the nurses who assisted in the data collection and the administration of Kenyatta National Hospital for allowing us to carry out the study.

#### **DISCLOSURE.**

The authors declare that there was no conflict of interest in this study.

#### **DATA AVAILABILITY.**

Data used to support this study findings has been included in the appropriate sections in this article.

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