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# Effect of Mobile Based Educational Program through WhatsApp on Self-Efficacy and Psychological Distress among Female Geriatric Patients with breast cancer Undergoing Chemotherapy.

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## ABSTRACT

**Background:** Breast cancer diagnosis and its treatment act as a life-threatening negative stressor seriously affecting the physical and psychological wellbeing of the female geriatric patients. Although there are many evidences that support the value of patient education in the management of breast cancer and consecutive treatment side effects, few studies determine the effect of applying mobile based education on self-efficacy and psychological distress among female geriatric patients with breast cancer who undergo chemotherapy. **Aim of the study**: To determine the effect of mobile based educational program through WhatsApp on self-efficacy and psychological distress among female geriatric patients with breast cancer undergoing chemotherapy. **Setting:** The study was conducted in the chemotherapy outpatient clinics of Damanhour Oncology Institute in El-Behaira Governorate, Egypt**. Subjects:** A convenience sample of sixty female geriatric patients with breast cancer was randomly divided into two equal groups. **Design:** The study followed a quasi-experimental research design (study and control groups).**Tools**: Four tools were used for data collection:1) Socio-demographic and Clinical Data Structured Interview Schedule,2) Cancer Treatment Survey (CaTS), 3) The Side effects-Management Self-Efficacy Scale-Breast Cancer (SMSES-BC) Related to Chemotherapy Questionnaire, and 4) National Comprehensive Cancer Network Distress Thermometer (NCCN-DT) **Results**: After the interventions, the mean scores of side effect management self-efficacy were increased from (27.07 ± 34.89) to (172.47 ± 64.05) with a statistically significant difference between pre and post interventions in the study group (P= 0.000). As well, psychological distress mean scores were reduced from (6.600 ± 2.343) to (1.370 ± 1.752) with a statistically significant difference between pre and post interventions in the study group (P= 0.000).A statistically significant differences were found between the study and control groups post interventions regarding side effect management self-efficacy and psychological distress (P=0.000).**Conclusion**: Implementing the mobile based educational program through WhatsApp significantly improves self-efficacy and reduces psychological distress among female geriatric patients with breast cancer undergoing chemotherapy. **Recommendations**: The oncology nurses should implement mobile based educational sessions for female geriatric patients with breast cancer undergoing chemotherapy to improve their self-efficacy in managing chemotherapy side effects and enhance their psychological status.

**Key words:** Breast Cancer, Female Geriatric Patients, chemotherapy, Mobile based education, Self-Efficacy, Psychological Distress.

## Introduction:

Breast cancer is the most common type of cancer among women and the second leading cause of death worldwide (World Health Organization [WHO], 2018). Its incidence and mortality rates increase with advancing age and

about 50% of all new breast cancer diagnosis occur in women aged 65 years and more. In 2040, the number of breast cancer cases is estimated to rise to 26 million with 53% of them expected to need chemotherapy. In the USA, each year there is more than 200,000 patients are diagnosed with breast cancer and 73% of them are older women (American Cancer Society, 2022). In Egypt, the National Cancer Institute reported that the incidence of breast cancer is about 35.5 cases per 100,000 women each year and most of them are over the age of 50 years (El-Moselhy et al., 2017).

Breast cancer diagnosis and treatment acts as a life-threatening negative stressor seriously affecting the physical and psychological wellbeing of the female geriatric patients (Li et al., 2018). Chemotherapy is frequently prescribed for female geriatric patients with breast cancer to eradicate cancer cells. However, its benefits come with many side effects including physiological effects such as fatigue, insomnia, pain, infection, bruising, and gastrointestinal disturbances as well as psychological effects including fear, worry, anxiety, depression, and sadness. (De Martel et al., 2016). Female older adults are at greater risk for increased toxicity and poor tolerance to chemotherapy because of alterations in drug pharmacodynamics caused by increased susceptibility of organs with age. Chemotherapy side effects can be overwhelming and very distressing for geriatric patients especially when chemotherapy is given for the first time in life. These side effects can influence the patients' self-care abilities and treatment compliance resulting in poor physiological and psychological outcomes (Viveiros, 2020). Therefore, nursing interventions for female geriatric patients receiving chemotherapy should focus on improving their self-efficacy in managing chemotherapy side effects and reducing their psychological distress (Wagland et al., 2016).

Self-efficacy (SE) is defined as the person's belief in their ability to produce a desired outcome through their own actions using their own skills and abilities (Lopez-Garrido, 2023). Cancer-specific SE is often impaired up on detecting breast cancer and it has a significant impact on the patient's adaptation to cancer diagnosis and treatment (BorjAlilu et al., 2017). SE influences not only the patient's independence in performing daily living activities but also cooperation with the medical team, coping with cancer related stress and managing negative emotions. So, SE is a critical concept for female geriatric patients with breast cancer undergoing chemotherapy (Heitzmann et al., 2021). Female geriatric patients with high cancer specific self-efficacy may enjoy with low level of psychological distress (Cherry, 2023).

Psychological distress is defined by the American National Comprehensive Cancer Network (NCCN), as "multifactorial and unpleasant emotional experiences of a psychological, social, and/or spiritual nature that may interfere with the ability to cope effectively with cancer manifestations and its associated treatment side effects". (National Comprehensive Cancer Network [NCCN], 2020). It is considered

the sixth vital sign which should be integrated as a routine nursing care (Bultz et al. 2011). Psychological distress is a highly prevalent symptom among women with breast cancer who receive their first chemotherapy. About 50% of cancer patients complain of psychological distress. Moreover, it usually goes undetected and is not treated (Viveiros, 2020). Psychological distress results from inadequate preparation before receiving chemotherapy that may contribute to poor self-care management of side effects and decreased adherence to treatment (Mehnert et al., 2018).

Oncology nurses play an important role toward female geriatric patients with breast cancer through encouraging patients to promote their health by promoting effective self-care management practices in order to improve treatment compliance and reduce associated side effects. Moreover, patient education is effective for reducing psychological distress in patients receiving chemotherapy for the first time (Fridriksdottir et al., 2018; Cruz et al., 2019)

With the rapid development of information and communication technologies, mobile based education become an integral part of cancer care especially in managing side effects of chemotherapy among female geriatric patients with breast cancer. Mobile based education not only facilitates communication between geriatric patients and health care providers, but also improves home management of breast cancer manifestations as well as chemotherapy side effects, and promote regular follow-up (Uppu et al., 2021; Suchodolska & Senkus 2022). In light of the limited studies on effect of mobile-based education for female geriatric patients with breast cancer, this study is carried out to determine the effect of mobile based educational program through WhatsApp on self-efficacy and psychological distress among female geriatric patients with breast cancer undergoing chemotherapy.

**Significance of the study**

Given that breast cancer treatment today is often done at outpatient clinics and many patients have to handle the symptoms of illness and chemotherapy side effects at home. Furthermore, the limited time at outpatient clinic to access cancer care and continuous traveling of female geriatric patients with breast cancer between home and hospitals impose high costs and unfavorable emotional impact to patients and their families. Therefore, giving education using mobile phone technology provides effective alternative option to teach the female geriatric patients about home self-care skills to reduce incidence of side effects, increase patient's engagement in self-management, decrease health care costs, increase the patient's autonomy, and reduce the family caregiver stress (Suchodolska & Senkus, 2022). As well, making the educational content available upon request through mobile WhatsApp allows geriatric patients and their caregivers to view it comfortably at home and this ultimately can improve their self-care practices. Additionally, mobile based education may save the nurse's time at the outpatient clinics

and facilities the delivery of nursing care (Uppu et al., 2021).

**Aim of the study:**

The present study aims to determine the effect of mobile based educational program through WhatsApp on self-efficacy and psychological distress among female geriatric patients with breast cancer undergoing chemotherapy.

**Research hypothesis:**

Female geriatric patients with breast cancer undergoing chemotherapy who receive the proposed mobile based educational program exhibit higher self-efficacy and lower psychological distress than those who do not receive it.

**Materials and Method:**

**Materials:**

**Design**: The present study followed a quasi-experimental research design (study and control groups).

**Setting**: The present study was conducted at the chemotherapy outpatient clinics of Damanhour Oncology Institute in El-Behaira Governorate, Egypt. These clinics are located on the third and fourth floors of the outpatient clinics building and include four large chemotherapy halls. Each chemotherapy hall contains 9 beds where patient's examination is performed, and chemotherapy sessions are received. There is a waiting area for patients on each floor. The working hours of these clinics are from 8 am to 2 pm all days per week except Friday.

**Subjects**: A convenience sample of sixty (60) female geriatric patients with breast cancer was included in the present study based on the following Epi info parameters; population size 150, expected frequency 50%, acceptable error 10%, and confidence coefficient 95%. The study subjects were randomly assigned into two equal groups; study and control group with 30 female geriatric patients for each group. The study group received the proposed educational program, and the control group received the conventional hospital care provided by oncologists and nurses.

**The study inclusion criteria were as follow;**

- Aged 60 years and above.
- Diagnosed with breast cancer and scheduled to receive chemotherapy for the first time in life.
- Should have duration of not less than 2 weeks before starting the first scheduled chemotherapy session.
- Capable mentally to participate in a logical and clear conversation.
- Not receiving any concurrent cancer therapy (e.g., radiotherapy, hormonal therapy, ……etc.).
- Accepted to participate in the study and share in the digital educational sessions.
- Being able to use smart phones, read sent messages, and deal with related applications alone or with assistance of a family member.

**Tools of the study:**

In order to collect the study data, four tools were used.

**Tool I: Socio-demographic and Clinical Data Structured Interview Schedule:**

This tool was developed by the researchers based on review of the relevant literature to collect the following information:

**Part 1:** The socio-demographic data such as; age, marital status, educational level, and income.

**Part 2:** clinical data such as; medical history, current medications, as well as type, stage, and duration of breast cancer.

**Part 3:** Chemotherapy related data such as; type of chemotherapy, number of received sessions, and experienced side effects.

**Tool II: Cancer Treatment Survey (CaTS):**

This scale was developed by Schofield et al., (2012) to assess the patients' cancer treatment-related concerns. This questionnaire is validated worldwide and has been widely used. It provides a reliable and valid outcome measure for interventions to prepare cancer patients for chemotherapy. It consists of 25 items with two subscales: 14 items for sensory-psychological concerns and 11 items for procedural concerns relating to cancer treatment. Patients indicate the extent to which they agree or disagree with the items using a five-point Likert scale form 1(strongly disagree) to 5 (strongly agree). The higher scores indicate a greater need for assistance and preparation for receiving chemotherapy. The total score of the CaTS is 125 and classified as follows: -

- 25-31 indicates no cancer treatment-related concerns
- 32 to 62 indicates low cancer treatment-related concerns
- 63 0 to 93 indicates moderate cancer treatment-related concerns
- 94 to 125 indicates high cancer treatment-related concerns

**Tool III: The Side Effects-Management Self-Efficacy Scale-Breast Cancer (SMSES-BC) Related to Chemotherapy Questionnaire**

The SMSES-BC Related to Chemotherapy questionnaire was developed by Liang et al., (2015). It is a 27-item questionnaire on 11-point scale used to assess the multidimensional nature of self-efficacy in relation to chemotherapy side effects management for patients with breast cancer. It is divided into the three following subscales; acquiring problem-solving (7 items), managing chemotherapy-related symptoms (15 items), and managing emotional and interpersonal disturbances (5 items). Items are rated using a scale ranging from 0 to 10, with 0 indicating "not at all confident" and 10 indicating "completely confident". A higher score means higher perceived side effects management self-efficacy. The total score of the SMSES-BC is 270 and classified as follows:

- 0: no perceived side effects management self- efficacy.
- 1-89: low perceived side effects management self- efficacy.
- 90-179: moderate perceived side effects management self- efficacy.

- 180- 270: high perceived side effects management self- efficacy.

**Tool IV: National Comprehensive Cancer Network Distress Thermometer (NCCN-DT)**

The NCCN-DT is a single-item distress measurement developed by the National Comprehensive Cancer Network for evaluating not only the severity of psychological distress, but also the potential causes of such distress among patients with cancer (NCCN, 2013). It resembles a thermometer that has a 0-10 rating scale where 0 represents no distress, while 10 represents severe distress. The NCCN-DT was accompanied by a standardized problem checklist to identify distress related causes. It includes 39 problem items answered with "no" or "yes." and is divided into five categories including practical, family, emotional, spiritual, and physical problems. The average score for each category was the result of the division of its total score and the number of questions. The higher the score, the more problems the patients have. The NCCN-DT is a well-known quick and effective screening tool, and it is recommended by the last guidelines for cancer distress developed by the National Comprehensive Cancer Network, (2020). The total score of the NCCN-DT is 10 and classified as follows:

- 0 indicates no psychological distress.
- 1 to 3 indicates mild psychological distress.
- 4 to 6 indicates moderate psychological distress.
- 7 to 10 indicates severe psychological distress.

**Method**

**I- Preparation phase:**

1. Ethical Approval was obtained from the research ethics committee of the Faculty of Nursing, Damanhour University.
2. An official letter was issued from the Faculty of Nursing, Damanhour University and forwarded to the director of the Oncology Institute to obtain the approval to carry out the study after explanation of the study purpose.
3. Tool I was developed by the researchers to assess sociodemographic and clinical data of the study subjects.
4. Tools II, III, and IV were translated into Arabic language and presented to a panel of five experts in the fields of Gerontological Nursing, Medical Surgical Nursing, Psychiatric and Mental Health Nursing, and two experienced oncology nurses to test its content validity and necessary modifications were done accordingly.
5. Tools II, III, and IV were tested for reliability using Cronbach's coefficient Alpha. The results of the Cronbach's coefficient Alpha were (r= 0. 827) for tool II, (r =0.860) for tool III, and (r= 0. 926) for tool IV.
6. A pilot study was carried out on six female geriatric patients selected from the study setting and were excluded from the study subjects to assess the applicability, clarity, and feasibility of the study tools.

7. The researchers developed the proposed educational program and related educational brochure based on the data collected by Cancer Treatment Survey (Tool II) as this tool is identified to be useful for nurses to identify chemotherapy self- care needs and provide tailored strategies in preparing patients for their cancer treatment (Yahaya et al., 2022). Also, this educational program followed the guidelines of the American Cancer Society [ACS], (2021) which recommended that preventive interventions of chemotherapy side effects are best to be applied before, during, and after receiving chemotherapy.
8. The researchers developed an educational brochure in a simple Arabic language with colored images and large font to accommodate age-related visual changes.

**II-Implementation phase:**

1. Female geriatric patients with breast cancer were interviewed individually by the researchers in the waiting area of the chemotherapy outpatient clinics in order select the study subjects who fulfill the study inclusion criteria. Then, their baseline data were assessed including socio-demographic and clinical data, cancer treatment-related concerns, side effects management self-efficacy, and psychological distress using tools I, II, III, and IV. The researchers conducted the baseline assessment in the waiting area of chemotherapy outpatient clinics before receiving chemotherapy sessions within two weeks.
2. The study subjects were randomly assigned in to two equal groups (study and control groups); each of 30 female geriatric patients. Then, each of the study and control groups was randomly subdivided into three small groups with each group containing about 10 patients.
3. Because of the increased number of older women with breast cancer and the limited time and space available to educate them at the present study setting, mobile based education through WhatsApp meeting was the selected option and supported by two face to face educational sessions to ensure patient's understanding and adherence to educational content. So, the researchers developed WhatsApp groups for the study group where they were notified weekly with the meeting and educational content through WhatsApp chat groups. As well, WhatsApp groups are done thereafter for control group after evaluation of the effect of the educational program.
4. The researchers obtained the WhatsApp contact numbers of each geriatric patient under strict confidentiality agreements that they would not be shared outside the groups by any member, including the researchers, in order to ensure program content security and to prevent its exchange outside the structured concerned groups.

5. The researchers encouraged and explained to the study group how to participate in mobile based education through WhatsApp in which both geriatric patients and associated informal caregivers (family members) were included in the program sessions.
6. The proposed educational program was carried out in seven educational sessions given across the scheduled chemotherapy regimen; four pre-chemotherapy sessions which were implemented through WhatsApp meeting, two intra chemotherapy sessions which were conducted face to face to patients while they were receiving chemotherapy, and one post chemotherapy session which was implemented through WhatsApp meeting. The description and content of the educational program is shown in table (I):
7. The researchers represented the content of the mobile based sessions via audio presentation of the theoretical parts of each session using illustrative brochure through the WhatsApp groups. While the two videos of the third session were sent digitally in form of short videos of no more than 20 minutes duration to avoid patients becoming bored or tired.
8. Each female geriatric patient in the study group had the opportunity to revise sent audio presentation and videos after the session and had enough time later to ask questions for further clarification using WhatsApp meeting which is scheduled at time suitable for all group members. The researchers allowed group discussion and feedback via messages and audio for all members.
9. The face-to-face educational sessions were implemented individually for each study subject during receiving chemotherapy and its content was also forwarded to WhatsApp groups.
10. The researchers focused on using very simple statements and techniques to be understood and considering the limited attention span of older adults. In addition to encouraging them to ask questions and express their feelings related to receiving chemotherapy for the first time.
11. Before the start of each session, the researchers used to ask questions related to topics discussed in the previous sessions; any missed or unclear points were reemphasized. At the end of each session, a brief summary was given by the researchers emphasizing the most important points.
12. Follow up through telephone calls and WhatsApp chat was utilized for each study subject after each chemotherapy session to motivate her to get adhere to the education given in each session and to reinforce self-care strategies of chemotherapy side effects at home. Also, after completion of chemotherapy regimen daily mobile based follow up for two weeks was done.

**III-Evaluation phase:**

After two weeks from the end of the received chemotherapy regimen, the researchers met each patient in the study and control groups at the chemotherapy outpatient clinics during their scheduled follow up visit to evaluate the effect of the program by using the tools II, III, and IV.

- Following program evaluation, the educational sessions' content and brochure were given to the control subjects via WhatsApp groups meeting done thereafter to avoid interfering with the study results and ensuring that all study subjects were treated fairly.
- The data collection started from the beginning of November 2022 to the end of March 2023.
- The evaluation of the effectiveness of the educational program was determined through using the proper statistical analysis.

**Table (I) Content of the educational mobile based program**

| Session number | Method of delivery | Timing of the session | Duration of the session | Content of the session |
|---|---|---|---|---|
| **Session (I)** | Group mobile based session | 1st week before chemotherapy | 20-30 minutes | **Significance and content of the program:**<br>-Explaining the importance of the proposed nursing interventions program sessions, planned goals to be achieved, and outlines of each session.<br>- Teaching about breast cancer including definition, age related changes, manifestations, and line of treatment. |
| **Session (II)** | Group mobile based session | 1st week before chemotherapy | 20-30 minutes | **Teaching about chemotherapy:**<br>-Teaching about meaning, purpose, types, and possible side effects of chemotherapy. |
| **Session (III)** | Group mobile based session | 2nd week Before chemotherapy | 15-20 minutes | **Psycho-educational videos:**<br>- A video demonstrating brief orientation about the chemotherapy outpatient clinics and the procedure of receiving chemotherapy.<br>-Educational video of relaxation techniques such as deep breathing exercise and progressive muscle relaxation. |
| **Session (IV)** | Group mobile based session | 2nd week before chemotherapy | 20-30 minutes | **Teaching about chemotherapy precautions:**<br>-Prechemotherapy precautions focused on lifestyle changes such as diet, fluid intake, adequate rest, and compliance with determined session's schedule.<br>-Intrachemotherapy precautions included proper positioning, side-effects' self-monitoring, fluid intake, and teaching about warning signs that should be reported.<br>-Postchemotherapy precautions included healthy nutrition, personal hygiene, regular exercises, safety, and follow up. |
| **Session (V)** | Individual face to face session at the chemotherapy hall | During the first session of chemotherapy | 30-45 minutes | **Self-care strategies for Physical chemotherapy side effects**:<br>This included educating patient about:<br>-Pain control education.<br>-Gastrointestinal side effects control education including nausea, vomiting, constipation, diarrhea, and dry mouth.<br>-Fatigue control education.<br>-Alopecia, skin, and nail changes control education. |

| Session number | Method of delivery | Timing of the session | Duration of the session | Content of the session |
|---|---|---|---|---|
| | | | | -Infection, bleeding, and anemia prevention. |
| **Session (VI)** | Individual face to face session at the chemotherapy hall | During the second session of chemotherapy | 30-45 minutes | **Self-care strategies for psychological chemotherapy side effects**:<br>This included educating patient about:<br>-Emotional distress prevention education.<br>-Sleep hygiene education.<br>-Difficulty concentrating and agitation prevention education. |
| **Session (VII**) | Group mobile based session | After completion of the last chemotherapy session | 20-30 minutes | **Home care strategies**:<br>-Teaching about oral and dental care, components of healthy nutrition following chemotherapy, and immediate follow up for any side effects. |

**Ethical considerations**:

All study subjects were informed about the purpose of the study and an informed consent was obtained. Study subjects' privacy and anonymity were assured, and confidentiality of the collected data was maintained. The researchers informed the study subjects that they have the right to withdraw from the study at any time without penalty.

**Statistical analysis:**

The collected data were coded and entered in a special format to be suitable for computer feeding. Following data entry, checking and verification process were done to avoid any errors. Data were analyzed using the statistical package for social science SPSS (version 26). The following statistical analysis measures were used; descriptive statistical measures which included numbers, percentages, and averages [Minimum, Maximum, Arithmetic mean ($\overline{X}$), and Standard deviation (SD)]. Statistical analysis tests included Chi square, student T test, ANOVA test, and Pearson correlation coefficient. Graphical presentation included Bar graphs for data visualization.

## Results:

**Table (II)** shows the sociodemographic characteristics of the studied female geriatric patients. Their age ranged from 60 to 93 years with a mean of 65. 77±3.9 year for those in the study group compared to 68.57±4.02 year for the control group. More than one half of the study and control groups (60% and 63.3% respectively) were married. As for education, 56.7% and 50% respectively of the study and control groups were illiterate. No statistically significant differences were noticed regarding age, marital status, and educational level between the study and control groups (P=0.977, P=0.756, and P=0.527 respectively).Being housewife was the prevailing occupation before retirement among 73.3% and 66.7% of the study and control subjects respectively with no statistically significant difference was found between the two groups (P=0.573).

**Table (III)** reveals the distribution of the study and control groups according to their health profile. Hypertension was the most common disease reported by 57.1% and 63 % of the study and control subjects respectively followed by diabetes mellitus which was encountered by 57.1% and 55.6 % of both groups respectively. Chronic diseases didn't differ significantly between the two groups (P=0.989). Ductal carcinoma was the most prevalent type of breast cancer among the study and control groups (46.7% and 40% respectively) followed by lobular carcinoma (36.7% and 33.3% respectively). As for stage of breast cancer, more than one half of the study and control groups were at the $4^{th}$ stage (53.3% and 60% respectively). It was also found that 80% and 70% of the study and control groups respectively were diagnosed with breast cancer for 9 to 12 months. No statistically significant differences were found between the two groups regarding type (P=0.640), stage (P=0.940), and duration of breast cancer (P= 0.601). Regarding type of chemotherapy, anthracycline was used for 66.7% of the study group compared to 60% of the control group. Number of the received chemotherapy sessions ranged from 11 to 15 sessions among 73.3% of the study group and 63.3% of the control group. The type of the received chemotherapy and number of its sessions did not differ significantly between the two groups (P= 0.592 and P=0.458 respectively).

**Table (IV)** compares between the study and control groups in relation to cancer treatment survey pre and post interventions. It has been found that 90% of the study group pre-interventions had high chemotherapy related concerns compared to 100% of them had low chemotherapy related concerns post-interventions. A highly statistically significant difference was found between pre and post interventions in the study group (P=0.000). Whereas in the control group, high chemotherapy related concerns constituted 86.7% pre interventions and 76.7% post interventions with no statistically significant difference was found between pre and post interventions in the control group (P=0.453). Furthermore, a statistically significant difference was found between the study and control groups post interventions regarding chemotherapy related concerns (P=0.000), and its dimensions including sensory-psychological concerns (P=0.000), as well as procedural concerns (P=0.000).

**Table (V)** displays chemotherapy side effects management self-efficacy among the study and control groups. No and low chemotherapy side effects management self-efficacy was reported by 46.7% and 46.7% respectively of the study group pre interventions while 63.3% of them had high chemotherapy side effects management self-efficacy post interventions with a statistically significant difference was found between pre and post interventions in the study group (P=0.000). On the other hand, 53.3% of the control group had no chemotherapy side effects management self-efficacy pre interventions and 50% of them had low chemotherapy side effects management self-efficacy post interventions with no statistically significant difference between pre and post interventions in the control group (P=0.552). A

highly statistically significant difference was noticed between the study and control groups post interventions regarding chemotherapy side effects management self-efficacy (P=0.000) and its subscales including; acquiring problem solving, managing chemotherapy related symptoms, and managing emotional, interpersonal disturbance (P=0.000, P=0.000, P=0.000 respectively).

**Table (VI)** illustrates severity of psychological distress among the study and control groups. Moderate and severe psychological distress was reported by 40% and 53.3% respectively of the study group pre-interventions. Post interventions, 50% of the study group reported no psychological distress and 36.7%reported mild psychological distress with a statistically significant difference between pre and post interventions in the study group (P= 0.000). On the other hand, severity of psychological distress ranged from moderate (50%) to severe (50%) among the control group pre-interventions. Post interventions, severity of psychological distress ranged from moderate (56.7%) to severe (36.7%) among the control group with no statistically significant difference (P= 0.254). The difference between study and control groups post interventions was highly statistically significant different (P= 0.000).

**Figure (1)** shows psychological distress related problems among the study and control groups before implementation of the educational program. Worry was the most common cause of psychological distress as reported by majority of the study and control group (90%, 83.3% respectively) followed by sadness (73.3%, 66.7% respectively), fatigue (50%, 63.3% respectively), eating disorders (51%, 50% respectively), self-care problems (36.7%, 30% respectively), and pain (20%, 16.7% respectively).

**Table (VII)** portrays chemotherapy side effects among the study and control groups post interventions. A significant reduction in side effects of chemotherapy was observed among the study group after implementation of the program as compared with the control group with a statistically significant differences were found between the two groups in relation to anxiety (P=0.000), fatigue (P=0.000), and insomnia (P=0.000). Gastrointestinal problems including anorexia, nausea/vomiting, dry mouth, and constipation or diarrhea (P= 0.001, 0.002, P= 0.000, and P= 0.001 respectively) were also statistically significant different among the two groups.

**Table (VIII)** shows correlation matrix between mean scores of chemotherapy related concerns, side effects management self-efficacy, and psychological distress among the study group post interventions. The mean score of chemotherapy related concerns and that of side effects management self-efficacy had a negative significant correlation (P=0.005) while a positive significant relationship was evident with the mean scores of psychological distress (P=0.000). As regards chemotherapy side effects management self-efficacy mean score, it was reversely correlated with that of psychological distress (P= 0.000).

**Table (II) Distribution of the study and control groups according to their socio-demographic characteristics**

| Socio-demographic characteristics | | Study group (n=30) | | Control Group (n=30) | | Test of Significance |
|---|---|---|---|---|---|---|
| | | No. | % | No. | % | |
| **Age (years)** | 60- | 16 | 53.3 | 14 | 46.7 | $X^2$= 0.202 P= 0.977 |
| | 75- | 8 | 26.7 | 9 | 30.0 | |
| | 85-93 | 6 | 20.0 | 7 | 23.3 | |
| **Mean ± SD** | | 65. 77±3.9 | | 68.57±4.02 | | t=0.473 p= 0.639 |
| **Marital status** | Married | 18 | 60.0 | 19 | 63.3 | $X^2$= 0.560 P= 0.756 |
| | Widowed | 11 | 36.7 | 9 | 30.0 | |
| | Divorced | 1 | 3.3 | 2 | 6.7 | |
| **Level of education** | Illiterate | 17 | 56.7 | 15 | 50.0 | X2=2.225 P= 0.527 |
| | Read & Write | 3 | 10.0 | 7 | 23.3 | |
| | Basic education | 5 | 16.7 | 5 | 16.7 | |
| | Secondary education | 5 | 16.7 | 3 | 10.0 | |
| **Occupation before retirement** | Housewives | 22 | 73.3 | 20 | 66.7 | $X^2$= 0.317 P= 0.573 |
| | Worker/Employee | 8 | 26.7 | 10 | 33.3 | |
| **Place of residence** | Rural | 24 | 80.0 | 21 | 70.0 | $X^2$= 0.800 P= 0.371 |
| | Urban | 6 | 20.0 | 9 | 30.0 | |
| **Living arrangement** | Live with family/ relatives | 21 | 70.0 | 23 | 76.7 | $X^2$= 0.341 P= 0.559 |
| | Live alone | 9 | 30.0 | 7 | 23.3 | |
| **Sufficiency of income** | Not enough | 19 | 63.3 | 21 | 70.0 | $X^2$= 0.300 P= 0.584 |
| | Enough | 11 | 36.7 | 9 | 30.0 | |

**$X^2$**= Chi Square test * Significant at p ≤0.05

**Table (III) Distribution of the study and control groups according to their health profile**

| health profile | | Study group (n=30) | | Control Group (n=30) | | Test of Significance |
|---|---|---|---|---|---|---|
| | | No. | % | No. | % | |
| **Presence of chronic diseases** | Yes | 28 | 93.3 | 27 | 90.0 | $X^2$= 0.218 P= 0.640 |
| | No | 2 | 6.7 | 3 | 10.0 | |
| **Chronic diseases#** | | N= 28 | | N= 27 | | $X^2$= 0.886 P= 0.989 |
| | Hypertension | 16 | 57.1 | 17 | 63.0 | |
| | Diabetes Mellitus | 16 | 57.1 | 15 | 55.6 | |
| | Cardiovascular diseases | 13 | 48.5 | 11 | 40.7 | |
| | Musculoskeletal disorders | 13 | 48.5 | 10 | 37.0 | |
| | Respiratory disorders | 9 | 32.1 | 7 | 25.9 | |
| | Renal disorders | 5 | 17.9 | 6 | 22.2 | |
| | Vision/Hearing disorders | 5 | 17.9 | 6 | 22.2 | |
| **Current drugs intake** | No | 1 | 3.3 | 0 | 0.0 | $X^2$= 1.017 P= 0.313 |
| | Yes | 29 | 96.7 | 30 | 100.0 | |
| **Current drug taken#** | | N= 29 | | N= 30 | | $X^2$= 1.736 P= 0.973 |
| | Anti-hypertensive | 16 | 55.2 | 17 | 56.7 | |
| | Hypoglycemic agents | 16 | 55.2 | 15 | 50.0 | |
| | Cardiovascular drugs | 13 | 44.8 | 11 | 36.7 | |
| | Musculoskeletal drugs | 13 | 44.8 | 10 | 33.3 | |
| | Respiratory drugs | 9 | 31.0 | 7 | 23.3 | |
| | Renal drugs | 5 | 17.2 | 6 | 20.0 | |
| | Eye/Ear drops | 3 | 10.9 | 1 | 3.3 | |
| | Vitamins | 5 | 17.2 | 3 | 10.0 | |
| **Type of breast cancer** | | N= 30 | | N= 30 | | $X^2$= 0.894 P= 0.640 |
| | Ductal | 14 | 46.7 | 12 | 40.0 | |
| | Lobular | 11 | 36.7 | 10 | 33.3 | |
| | Inflammatory | 5 | 16.7 | 8 | 26.7 | |
| **Stage of breast cancer** | First | 4 | 13.3 | 3 | 10.0 | $X^2$= 0.403 P= 0.940 |
| | Second | 4 | 13.3 | 3 | 10.0 | |
| | Third | 6 | 20.0 | 6 | 20.0 | |
| | Fourth | 16 | 53.3 | 18 | 60.0 | |
| **Duration of breast cancer diagnosis (months)** | 3- | 2 | 6.7 | 2 | 6.7 | $X^2$= 1.018 P= 0.601 |
| | 6- | 4 | 13.3 | 7 | 23.3 | |
| | 9-12 | 24 | 80.0 | 21 | 70.0 | |
| **Type of chemotherapy** | Anthracycline | 20 | 66.7 | 18 | 60.0 | $X^2$= 0.287 P= 0.592 |
| | Oxaliplatin | 10 | 33.3 | 12 | 40.0 | |
| **Number of chemotherapy sessions** | 2-6 | 3 | 10.0 | 2 | 6.7 | $X^2$= 1.562 P= 0.458 |
| | 7-10 | 5 | 16.7 | 9 | 30.0 | |
| | 11-15 | 22 | 73.3 | 19 | 63.3 | |

**$X^2$**= Chi Square test * Significant at p ≤0.05 # Multiple responses were allowed

**Table (IV) Comparison between the study and control groups in relation to cancer treatment survey pre and post interventions**

| Cancer treatment survey | Study group (n=30) | | | | Control Group (n=30) | | | | Test of significance |
|---|---|---|---|---|---|---|---|---|---|
| | Before | | After | | Before | | After | | |
| | No. | % | No. | % | No. | % | No. | % | |
| **Sensory- psychological concerns** | | | | | | | | | |
| **Low** | 3 | 10.0 | 30 | 100.0 | 4 | 13.3 | 7 | 23.3 | $X^{2a}$= 0.234 P= 0.890 |
| **Moderate** | 6 | 20.0 | 0 | 0.0 | 5 | 16.7 | 3 | 10.0 | $X^{2b}$= 37.29 P= 0.000* |
| **High** | 21 | 70.0 | 0 | 0.0 | 21 | 70.0 | 20 | 66.7 | |
| | $X^2$= 49.091 | | P= 0.000* | | $X^2$= 1.343 | | P= 0.511 | | |
| **Procedural concerns** | | | | | | | | | |
| **Low** | 0 | 0.0 | 30 | 100.0 | 0 | 0.0 | 1 | 3.3 | $X^{2a}$= NA |
| **Moderate** | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | $X^{2b}$= 56.13 P= 0.000* |
| **High** | 30 | 100.0 | 0 | 0.0 | 30 | 100.0 | 29 | 96.7 | |
| | $X^2$= 60.00 | | P= 0.000* | | $X^2$= 1.017 | | P= 0.313 | | |
| **Cancer Treatment(chemotherapy) related concerns** | | | | | | | | | |
| **Low** | 0 | 0.0 | 30 | 100.0 | 0 | 0.0 | 1 | 3.3 | $X^{2a}$= 0.162 P= 0.688 |
| **Moderate** | 3 | 10.0 | 0 | 0.0 | 4 | 13.3 | 6 | 20.0 | $X^{2b}$= 56.13 P= 0.000* |
| **High** | 27 | 90.0 | 0 | 0.0 | 26 | 86.7 | 23 | 76.7 | |
| | $X^2$= 60.00 | | P= 0.000* | | $X^2$= 1.584 | | P= 0.453 | | |
| **Mean ±SD** | 107.67 ± 16.44 | | 32.23 ± 11.46 | | 106.50 ± 17.82 | | 101.23 ± 24.64 | | $t^a$= 0.069 P= 0.793 |
| | t= 425.15 | | P= 0.000* | | t= 0.900 | | P= 0.347 | | $t^b$= 193.38 P= 0.000* |

**$X^2$**= Chi Square test $X^2$ comparison in the same before and after intervention $Xa^2$ comparison between the study and control group before intervention $X^{b2}$ comparison between the study and control group after intervention * Significant at p ≤0.05 NA= Not applicable

**t**= Paired t test $t^a$ ,$t^b$ = student t test $t^a$ comparison between the study and control group before intervention $t^b$ comparison between the study and control group after intervention

**Table (V) Comparison between the study and control groups in relation to chemotherapy side effects management self-efficacy pre and post interventions**

| Chemotherapy side effects management self-efficacy | Study group (n=30) | | | | Control Group (n=30) | | | | Test of significance |
|---|---|---|---|---|---|---|---|---|---|
| | Before | | After | | Before | | After | | |
| | No. | % | No. | % | No. | % | No. | % | |
| **Acquiring problem solving** | | | | | | | | | |
| **No** | 14 | 46.7 | 0 | 0.0 | 16 | 53.3 | 12 | 40.0 | $X^{2a}$= 0.287 |
| **Low** | 14 | 46.7 | 5 | 16.7 | 12 | 40.0 | 16 | 53.3 | P= 0.866 |
| **Moderate** | 2 | 6.7 | 6 | 20.0 | 2 | 6.7 | 2 | 6.7 | $X^{2b}$= 38.76 |
| **High** | 0 | 0.0 | 19 | 63.3 | 0 | 0.0 | 0 | 0.0 | P= 0.000* |
| | $X^2$= 39.263 | | P= 0.000* | | $X^2$= 1.143 | | P= 0.565 | | |
| **Managing chemotherapy related symptoms** | | | | | | | | | |
| **No** | 14 | 46.7 | 0 | 0.0 | 16 | 53.3 | 12 | 40.0 | $X^{2a}$= 0.693 |
| **Low** | 14 | 46.7 | 1 | 3.3 | 11 | 36.7 | 15 | 50.0 | P= 0.707 |
| **Moderate** | 2 | 6.7 | 10 | 33.3 | 3 | 10.0 | 3 | 10.0 | $X^{2b}$= 47.02 |
| **High** | 0 | 0.0 | 19 | 63.3 | 0 | 0.0 | 0 | 0.0 | P= 0.000* |
| | $X^2$= 49.600 | | P= 0.000* | | $X^2$= 1.187 | | P= 0.552 | | |
| **Managing emotional, interpersonal disturbance** | | | | | | | | | |
| **No** | 14 | 46.7 | 0 | 0.0 | 16 | 53.3 | 12 | 40.0 | $X^{2a}$= 0.693 |
| **Low** | 14 | 46.7 | 3 | 10.0 | 11 | 36.7 | 15 | 50.0 | P= 0.707 |
| **Moderate** | 2 | 6.7 | 8 | 26.7 | 3 | 10.0 | 3 | 10.0 | $X^{2b}$= 41.27 |
| **High** | 0 | 0.0 | 19 | 63.3 | 0 | 0.0 | 0 | 0.0 | P= 0.000* |
| | $X^2$= 43.718 | | P= 0.000* | | $X^2$= 1.187 | | P= 0.552 | | |
| **Chemotherapy side effects management self-efficacy** | | | | | | | | | |
| **No** | 14 | 46.7 | 0 | 0.0 | 16 | 53.3 | 12 | 40.0 | $X^{2a}$= 0.693 |
| **Low** | 14 | 46.7 | 1 | 3.3 | 11 | 36.7 | 15 | 50.0 | P= 0.707 |
| **Moderate** | 2 | 6.7 | 10 | 33.3 | 3 | 10.0 | 3 | 10.0 | $X^{2b}$= 47.02 |
| **High** | 0 | 0.0 | 19 | 63.3 | 0 | 0.0 | 0 | 0.0 | P= 0.000* |
| | $X^2$= 49.600 | | P= 0.000* | | $X^2$= 1.187 | | P= 0.552 | | |
| **Mean ±SD** | 27.07 ± 34.89 | | 172.47 ± 64.05 | | 28.23 ± 38.11 | | 34.03 ± 37.56 | | $t^a$= 0.015 P= 0.902 |
| | t= 119.23 | | P= 0.000* | | t= 0.353 | | P= 0.555 | | $t^b$= 104.29 P= 0.000* |

**$X^2$**= Chi Square test $X^2$ comparison in the same group before and after intervention $Xa^2$ comparison between the study and control group before intervention $X^{b2}$ comparison between the study and control group after intervention * Significant at p ≤0.05

**t**= Paired t test $t^a$ ,$t^b$ = student t test $t^a$ comparison between the study and control group before intervention $t^b$ comparison between the between the study and control group after intervention

**Table (VI) Comparison between the study and control groups in relation to severity of psychological distress pre and post interventions**

| Severity of psychological distress | Study group (n=30) | | | | Control Group (n=30) | | | | Test of significance |
|---|---|---|---|---|---|---|---|---|---|
| | Before | | After | | Before | | After | | |
| | No. | % | No. | % | No. | % | No. | % | |
| No | 0 | 0.0 | 15 | 50.0 | 0 | 0.0 | 0 | 0.0 | $X^{2a}$= 2.366 P= 0.306 |
| Mild | 2 | 6.7 | 11 | 36.7 | 0 | 0.0 | 2 | 6.7 | $X^{2b}$= 40.28 P= 0.000* |
| Moderate | 12 | 40.0 | 4 | 13.3 | 15 | 50.0 | 17 | 56.7 | |
| Severe | 16 | 53.3 | 0 | 0.0 | 15 | 50.0 | 11 | 36.7 | |
| | $X^2$= 41.23 | | P= 0.000* | | $X^2$= 2.740 | | P= 0.254 | | |
| Mean ±SD | 6.600 ± 2.343 | | 1.370 ± 1.752 | | 6.730 ± 2.016 | | 6.200 ± 2.156 | | $t^a$= 0.056 P= 0.814 $t^b$= 90.83 P= 0.000* |
| | t= 96.01 | | P= 0.000* | | t= 0.979 | | P= 0.326 | | |

**$X^2$**= Chi Square test $X^2$ comparison in the same group before and after intervention $Xa^2$ comparison between the study and control group before intervention $X^{b2}$ comparison between the study and control group after intervention

**t**= Paired t test $t^a$ ,$t^b$ = student t test $t^a$ comparison between the study and control group before intervention $t^b$ comparison between the between the study and control group after intervention * Significant at p ≤0.05

**Figure (1) Distribution of the study and control groups according to psychological distress related problems before implementation of the program**

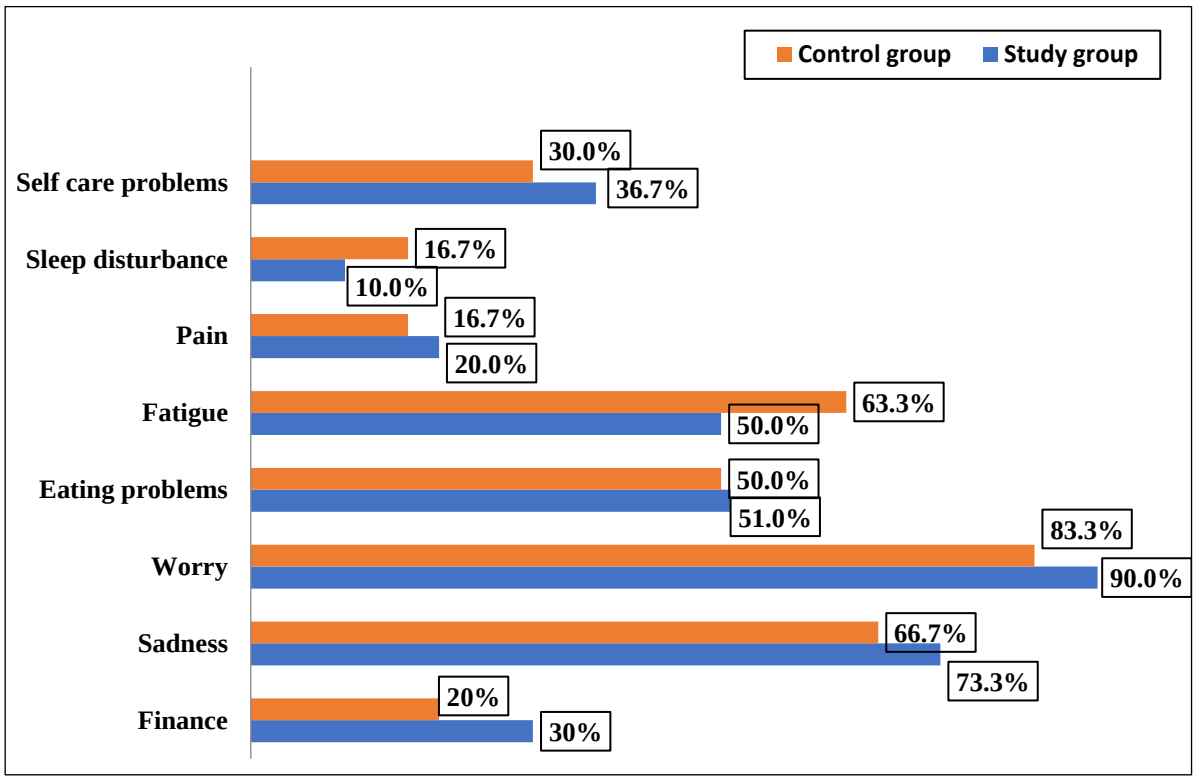

**Table (VII) Chemotherapy side effects among the study and control groups post interventions**

| Side effects of chemotherapy# | Study group (n=30) | | Control Group (n=30) | | Test of Significance |
|---|---|---|---|---|---|
| | No. | % | No. | % | |
| **Anxiety** | 7 | 23.3 | 26 | 86.7 | $X^2$= 24.310 P= 0.000* |
| **Fatigue** | 9 | 30.0 | 24 | 80.0 | $X^2$= 15.152 P= 0.000* |
| **Insomnia** | 5 | 16.7 | 21 | 70.0 | $X^2$= 17.3376 P= 0.000* |
| **Anorexia** | 7 | 23.3 | 20 | 66.7 | $X^2$= 11.380 P= 0.001* |
| **Nausea/vomiting** | 8 | 26.7 | 20 | 66.7 | $X^2$= 9.643 P= 0.002* |
| **Alopecia** | 16 | 53.3 | 19 | 63.3 | $X^2$= 0.617 P= 0.432 |
| **Dry mouth** | 3 | 10.0 | 19 | 63.3 | $X^2$= 18.373 P= 0.000* |
| **Constipation/diarrhea** | 5 | 16.7 | 17 | 56.7 | $X^2$= 10.335 P= 0.001* |
| **Stomatitis** | 9 | 30.0 | 9 | 30.0 | $X^2$= 0.000 P= 1.000 |
| **Weight changes** | 1 | 3.3 | 7 | 23.3 | $X^2$= 5.192 P= 0.023 |
| **Skin irritation** | 2 | 6.7 | 6 | 20.0 | $X^2$= 2.308 P= 0.129 |

**$X^2$**= Chi Square test * Significant at p ≤0.05 # Multiple responses were allowed

**Table (VIII) Correlation Matrix between mean scores of chemotherapy related concerns, side effects management self-efficacy, and psychological distress among the study group post interventions**

| Correlation Matrix | | Chemotherapy related concerns | Side effects management self-efficacy | Psychological distress |
|---|---|---|---|---|
| **Chemotherapy related concerns** | R | | | |
| | P | | | |
| **Side effects management self-efficacy** | R | - 0.503 | | |
| | P | 0.005* | | |
| **Psychological distress** | R | 0.480 | -0.745 | |
| | P | 0.000* | 0.000* | |

R correlation coefficient * Significant p at ≤0.05

## Discussion:

Breast cancer is the second most prevalent malignancy in the world. It is a traumatic disorder that is associated with feeling of stress and anxiety especially if the patients are receiving chemotherapy and having inadequate knowledge about its side effects and self-care management at home. Moreover, the diagnosis of breast cancer places a burden among patients and their family members in terms of physical sufferings, psychological distress, and economic burden (Rani et al., 2021). In coping with these events, the studies shed light on self-efficacy and patient's education as a psychological source for enabling geriatric patients to adapt with breast cancer and chemotherapy side effects (BorjAlilu et al., 2017; Heitzmann et al., 2021).

Educating cancer geriatric patients undergoing chemotherapy is of great importance. However, increasing the number of patients who are receiving chemotherapy on an outpatient basis limits the ability of nurses to provide effective face to face education (Suchodolska & Senkus, 2022). So, this study aims to determine the effect of mobile based educational program through WhatsApp on self-efficacy and psychological distress among female geriatric patients with breast cancer undergoing chemotherapy.

The present study results revealed that mobile based educational program significantly increased female geriatric patients' chemotherapy side effects management self-efficacy and reduced their psychological distress. The success of this program may be attributed to several causes. Firstly, using cancer treatment survey (CaTS) before the implementation of the program to assess patients' sensory or psychological and procedural concerns related to chemotherapy could be useful for the researchers to provide tailored strategies and education in preparing patients for their chemotherapy. Ultimately, this could likely result in improved psychological outcomes. Secondly, the educational interventions may increase the geriatric patients' awareness about their disease and its treatment and also make them psychologically strong enough to accept themselves, fight the disease, and cope with the burden of chemotherapy side effects. Finally, the researchers maintained continuous motivation, contact, and follow up through mobile calls and WhatsApp meetings before, during, and even after completion of the chemotherapy in addition to maintaining social support by involving family members with geriatric patients into the educational sessions which could have helped in obtaining such results.

In relation to the effect of mobile based educational program on chemotherapy side effects management self-efficacy, the current study findings showed a significant improvement of chemotherapy side effects management self-efficacy among the study group post interventions with a statistically significant difference between the study and control groups (Table V). This finding may be interpreted as the educational sessions improved the female geriatric patients

understanding of the diagnosis, treatment goals, and management strategies which increase their ability to deal with the chemotherapy side effects. Additionally, the significant reduction of chemotherapy related concerns among the study group post interventions (table IV) indicated that the educational program meets their needs and become well prepared to receive and manage chemotherapy which could in turn improve their self-efficacy in managing chemotherapy side effects.

Furthermore, decreased chemotherapy related concerns among the study group was associated with lower levels of psychological distress (table VIII) which could enable geriatric patients to have higher self-efficacy in managing chemotherapy side effects. This is supported by a study conducted in Malaysia by Yahaya el al., (2022), who revealed that self-care education intervention program could improve patients' activation level, psychological distress, and treatment-related concerns during chemotherapy. Conversely, a recent study demonstrated positive effects of internet-based interventions on patient's quality of life but inconsistent effectiveness has been found on their self-efficacy (Huang et al., 2023).

Regarding the effect of the educational program on psychological distress, the present study findings revealed significant reduction in severity scores of psychological distress among the study group as compared with the control group after the educational interventions (Table VI). The current study findings can be interpreted as; providing mobile education and psychological interventions increased the geriatric patients' chemotherapy side effects management self-efficacy (Table V). Higher self-efficacy was associated with reduced the severity of psychological distress among female geriatric patients in the study group (Table VIII). This may be explained by the fact that self-efficacy plays a vital role in the regulation of thoughts and behavior and helps cancer patients to utilize effective strategies to cope with life-threating disease and achieve a positive psychological outcome and consequently reduced their psychological distress (Taheri& Falavarjani, 2019).

The present study finding is supported by Ye et al., (2018); Viveiros, (2020); Badger et al., (2020), and Yahaya et al., (2022) who reported that psycho-educational interventions for cancer patients improved their psychological well-being. Similar finding also reported by a study done in Mexico by Pintado (2017), who reported that higher levels of self-efficacy are associated with better mood and lower health-related distress in breast cancer women who had received chemotherapy. Conversely, Huang et al., (2023) reported that internet-based support interventions have demonstrated positive effects on women's quality of life but has no impact on both their psychological distress and symptoms of anxiety and/or depression.

A noteworthy strength of the present study is that it not only assessed the severity of psychological distress but also identified psychological distress related causes among the study and control subjects before implementing the program to provide targeted and tailored interventions for the study group. Worry was the most common cause of psychological distress among both study and control groups followed by sadness, fatigue, and eating problems (figure 1). Management of such problems is integral components of the educational program. This result is supported by other studies (Mehnert et al., 2018; Guan et al., 2019).

Regarding chemotherapy side effects among female geriatric patients, a statistically significant reduction is evident among the study group post interventions as compared with the control group in relation to anxiety, fatigue, and insomnia. It is also found that gastrointestinal side effects including anorexia, nausea and/or vomiting, dry mouth, and constipation or diarrhea are statistically significant different among the two groups (table VII). These results may be due to increased chemotherapy side effects management self-efficacy and reduced psychological distress among the study group following interventions which allowed them to discuss and seek any information related to chemotherapy side effects self-care, thus enhancing better side effects management. Such results are in line with studies done by Uppu et al., (2021) in India and Yahaya, (2022) in Malaysia. Therefore, the present study has provided greater promise for female geriatric patients with breast cancer undergoing chemotherapy; as it is evident that the implementation of the mobile based educational program is successful in improving the patients' self-efficacy, decreasing their psychological distress, and reducing chemotherapy side effects.

**Conclusion**:

The study hypothesis is supported by the current study findings; thus, it can be concluded that implementing the mobile based educational program through WhatsApp significantly improves chemotherapy management self-efficacy and reduces psychological distress among female geriatric patients with breast cancer undergoing chemotherapy.

**Recommendations:**

Based on the findings of the present study, the following recommendations are suggested:

1. Screening of side effect management self-efficacy and psychological distress among female geriatric patients with cancer undergoing chemotherapy should be an essential part of the gerontological nurses' regular assessment and evaluation, and should be incorporated into the routine care of those patients to identify self-care needs.
2. Development of mobile based educational program based on recent researches by the gerontological nurses for female geriatric patients with breast cancer undergoing

chemotherapy to improve their self-efficacy, and reduce psychological distress related to chemotherapy side effects.

3. Implementation of mobile based educational program by gerontological nurses at different oncology settings for female geriatric patients with breast cancer undergoing chemotherapy to enhance home-based management of chemotherapy side effects.

4. Developing large-print educational materials about how to deal with the side effects of chemotherapy to be available by gerontological nurses for educating female geriatric patients with breast cancer and their caregivers who attend to the different chemotherapy oncology clinics.

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