

Effectiveness of Multi-modal Nursing Practices on Pain, Functional Ability and Emotional Distress among Women with Peripheral Neuropathy related Chemotherapy

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Abstract

Background: Peripheral neuropathy is common unpleasant events associated with cancer treatment, the use of multi non-pharmacological methods in the prevention and treatment of that problem provide advantages like controlling neuropathy pain, as well enhancing functional ability and emotional distress. **Aim:** To examine the effectiveness of multi-modal nursing practices on pain, functional ability and emotional distress among women with peripheral neuropathy related chemotherapy. **Design:** Quasi experimental design was used. **Setting:** Chemotherapy unit at National Cancer Institute in Menoufia University, Egypt. **Subject:** A purposive sample of 90 women receives chemotherapy induced peripheral neuropathy were chosen. **Tools for data collection:** Five tools encompassed: Sociodemographic Properties Questionnaire; Chemotherapy Induced Peripheral Neuropathy Scale, The Brief Pain Inventory, Functional Ability Scale and Perceived Emotional Distress Scale. **Results:** There were statistical significant differences on post intervention among study compared to control groups respectively, in the total mean scores of pain 4.73 ± 1.80 & 6.20 ± 1.60 ; functional abilities' scale 93.33 ± 10.19 & 79.93 ± 15.66 ; perceived emotional distress 21.58 ± 5.92 & 24.9 ± 8.1 and chemotherapy induced peripheral 76.00 ± 11.32 & 82.89 ± 12.66 ($p < 0.05$). In addition, there were positive significance correlation between pain; emotional distress and level of chemotherapy-induced peripheral neuropathy. Alongside, there was negative significant correlation between functional ability and level of chemotherapy-induced peripheral neuropathy $p < 0.001$ on post intervention among study than in control groups. **Conclusion:** Multimodal nursing practices are beneficial in the management of women with cancer breast receiving chemo-therapy induced peripheral neuropathy. **Recommendation:** Implement multimodal nursing practices as standard protocol in managing breast cancer women with peripheral neuropathy related chemotherapy in the different study settings.

Key words: cancer in women, Chemotherapy induced peripheral neuropathy, Multimodal Nursing practices.

Introduction:

Cancer is characterized by atypical and uncontrolled cell growth. According to recent statistics show that, there are 18.1 million cancer cases and 9.6 million cancer deaths globally (Bhoo-Pathy et al., 2021). Furthermore, reports indicate that breast cancer is the most common cancer type in women, with up to 2.1 million new cases reported (Danon et al., 2022). According to Siegel, Miller, and Fuchs (2022), breast

cancer has develop as the most prevalent malignant tumor globally, with the highest incidence rate ranking first and the second mortality rate, behind lung cancer (Siegel, Miller, Fuchs, 2022). The aim of cancer treating is to stop the primary tumour from growing and proliferating while causing the least amount of damage to the patient's healthy cells (Klafke et al., 2023)

One common adverse effect of chemotherapy is chemotherapy-induced

peripheral neuropathy (CIPN), in which the chemotherapy drugs damage the peripheral nerve system (**Hao, Zhu & Bensoussan, 2020**). Peripheral neuropathy (PN) is a recurrent neurological condition brought on by injury to the peripheral nerves (**Loprinzi et al., 2020**). CIPN affects woman physical, psychological, and social well-being; these symptoms have been found to be largely controlled with suitable nursing care (**Sarisoy & Owayolu, 2020**).

Drug-induced peripheral neuropathy has been shown to occur in 20% to 100% of cases (**Simsek & Demir, 2018**). Taxanes are the most often utilized family of chemotherapy medications for the treatment of breast cancer (**Crichton et al., 2022**). The neurological system is affected in different ways by these medications. Women who are affected may feel burning, tingling, numbness, or an (**Stolz & Klafke, 2020**). PN is a prevalent and disabling state in many cancer patients. In breast cancer, PN is firstly leading to neuropathic pain in the hands or feet and sensory peripheral neuropathy symptoms such as tingling and numbness, as well as motor peripheral neuropathy (MPN) symptoms (i.e., impaired movements, distal weakness, electric shock sensation and cramps) (**Stolz & Klafke, 2020 & Kamgar et al., 2021**).

Though, CIPN disappears in the most of patients after treatment, it gets a chronic condition in 30% of cancer patients. In addition, PN has been discovered in cancer patients who did not get chemotherapy, indicating that the cancer itself may also be related in PN development. PN correlating pain negatively affects patient-reported outcomes (PROs), including psychological and emotional distress, functional status, and fatigue (**Kamgar et al., 2021**). Chemotherapy induced peripheral neuropathy is not life dangerous. However, it limits everyday activities, which affects role functioning and physical. In a study that used secondary data analysis to examine significant health outcomes in women with cancer. **Mun & Park, (2022)** who conducted the research in the United States and illustrated that CIPN have an impact on physical function impairment.

Psychological distress symptoms can increase the intensity and perception of CIPN in breast cancer women. However, psychological distress symptoms (such as anxiety and depression symptoms) may worsen as a result of CIPN symptoms after chemotherapy (**National Cancer Institute, 2021**). Compared to survivors with low chemotherapy-induced PN, those with high chemotherapy-induced PN reported higher levels of fatigue, anxiety, and depression symptoms (**Siegel et al., 2020**).

Peripheral neuropathy can be effectively treated without the use of drugs by employing non-pharmacological techniques, which also have the advantage of being more affordable (**Yükseltürk Şimşek and Demir, 2021**). Integrated multimodal program is an effective, non-pharmacological, non-invasive well tolerated and safe, and do not interact with chemotherapeutic agents that have been widely tried intervention to manage the peripheral neuropathy arise from chemotherapy (**Liampas et al., 2020**). It ranges from herbals and dietary supplements to specific physiotherapeutic interventions (**Arora et al., 2019**).

This program including assimilation between different approaches of chemotherapy symptoms management together as physical exercise, nutrition, cold application and women cognitive behavioural counselling (**Bossert et al., 2022**). Combination of these modalities, collectively seeking the achievement of healthier practices for CIPN management, by conveying the ideas, thoughts, feelings, and opinions to be reflected on women knowledge, behaviours and attitudes fostering good prognosis (**Atri et al., 2020**).

Nurses play an active role in the application of chemotherapy medications and have a significant task to mitigate any side effects that may arise in treatment. In order to achieve positive outcomes, nurses should be aware of the symptoms of chemotherapy, provide efficient practices to prevent symptoms, encourage patients to follow their interventions plans (**Yükseltürk Şimşek and Demir, 2021**).

Significance of the Study

Chemotherapy induced peripheral neuropathy is one side effect of many frequently prescribed chemotherapeutic drugs (Chen & Hertz, 2023). It is the most popular treatment, and it may have be joined with different adverse effects.

Peripheral neuropathy is a most known, disabling condition and very prevalent in cancer patients; however the underlying pathophysiological mechanisms vary significantly in cancer women (Guo et al., 2023). Women activities may be negatively impacted by these symptoms which in turn affecting on women functional status and emotional stability (Simsek & Demir, 2018).

Multi modal nursing practices of CIPN are regarded as a neglected field by both nurses and doctors. Despite being safe, non-invasive, and generally seen to have free adverse effects. Therefore, it is essential for increasing awareness, enhancing treatment plans, and might improving outcomes for women (Moawed et al., 2024). Beside, enhancing quality of life and raising support to foster better understanding of non-pharmacological therapy and offering most effective and accessible intervention options (Dhawan et al., 2020).

Unfortunately, there is shortage of studies in that area so, the current study was carried out to examine the effectiveness of multi-modal nursing practices intervention on pain, functional ability and emotional distress among breast cancer women with chemotherapy induced peripheral neuropathy.

Aim of the study

To examine the effectiveness of multi-modal nursing practices on pain, functional ability and emotional distress among women with peripheral neuropathy related chemotherapy.

The power of the study and sample size:

To compute the required size of the sample in a community of N=1000 individuals, we used the Epi website (Open Source Statistics for Public Health, USA). Our assumptions were:

Methods:

Research Hypotheses

H₁: The study group will have significant decrease in pain levels and total mean score after multimodal nursing practices than control group.

H₂: The study group will have significant increase in functional ability total mean scores after multimodal nursing practices than control group.

H₃: The study group will have significant reduction in total man score and levels of emotional distress after multimodal nursing practices than control group.

H₄: There will be a significant improvement in total mean score and levels of chemotherapy induced peripheral neuropathy among study than control groups.

Operational definition:

Multimodal nursing practices: interference that combines more than one method of nursing management. Also called combination therapy and multimodality therapy like; physical activity, cold therapy, diet management and cognitive training.

Design: A quasi experimental design was used to accomplish the aim of the study.

Setting:

The outpatients' clinic of chemotherapy unit at National Cancer Institute in Menoufia University Hospital, Egypt was chosen for conducting this study. This setting specializes in treating a wide number of patients diagnosed with cancer. It concerns treating both inpatient and outpatient cases. It comprises several floors, with the fourth one (chemotherapy unit) devoted to chemotherapy medications for a variety of cancer including women with breast cancer.

Population size N=1000

Frequency of experience in the population (p) = 20%+/-5%

A power (1- β) or (% chance of detecting) of 80%.

Confidence limits (d) = 5%

Design effect (for cluster surveys- DEFF): 1

n = size of sample from population
 d = 2 as the least significant difference.
 Z = Standard normal deviate for two-tailed test based on alpha level (relates to the confidence interval level).
 α = type I error of 0.05, β type II error of 0.20 (Vorderstrasse et al., 2015).

$$\text{Sample size } n = \frac{[DEFF * Np(1-p)]}{[(d^2/Z^2)_{1-\alpha/2} * (N-1) + p * (1-p)]}$$

Results were presented in different confidence levels. We used 95% confidence level with sample size of 122 women. To overcome dropout 20%, sample size was (146) breast cancer women, only 90 out of 146 breast cancer women were agreed to include in the study.

Subjects:

Purposive sample of 90 women with breast cancer in receipt of chemotherapy-induced peripheral neuropathy were chosen and divided equally by random selection to study and control groups. They were chosen according to the following criteria:-

Inclusion criteria:-

- Women under 60 years, diagnosed with breast cancer and receiving chemotherapy induced peripheral neuropathy including taxanes drug.
- Accept to participate in the study.

Exclusion criteria:-

- Women diagnosed with any cases including neurological damage (such as diabetes, nutritional issues (low thiamine and B12), Lyme disease, lupus), as this excess the adversity of (CIPN).
- As well, women suffer from any psychiatric problems that affect the ability of them to implement the intervention guidelines.

Tools of data collection

In order to collect the needed data; there a five interviewing tools were used:

Tool I: Sociodemographic properties interviewing questionnaire: - It involving age,

marital status, education level, work status, monthly income and number of children.

Tool II: Brief Pain Inventory (BPI):- Brief Pain Inventory (BPI):-was developed by **Kumar, (2011)** as pain assessment tool for use with cancer patients. It measures both the intensity of pain and its interference in the patient's life. BPI consisted of 10 rating scale of 0 (no pain) to 10 (worst pain imaginable). The studied women was asked to make three pain ratings, confronting to current, best and worst pain experienced over the previous 24 hours. The average of the 3 ratings was used to represent the patient's level of pain over the past 24 hours.

Scoring system: The total score was computed by summation of scores in which the higher score indicated the worst pain. **Reliability:** - High internal consistency of the BPI subscales of pain, activity interference, and Affect interference was indicating by Cronbach's alpha ranged from 0.81 and 0.89

Tool III: Perceived Emotional Distress: - Perceived Emotional Distress Inventory (PEDI) was adapted from **Moscato, Lengacher & Reheiser, (2012)**. PEDI is a brief screening inventory designed to measure the presence and intensity of emotional distress as well evaluated anxiety, anger, depression, and hopelessness, making distinctions distinguishes between the expression and suppression of angry feelings. When answering each PEDI item, Women in the study indicated how much they had experienced each symptom associated with emotional distress ("during the past month, including the day of filling the tool")

Scoring system: PEDI consisted of 15-item on a 4-points scale; (0) not at all; (1) sometimes; (2) often; (3) very much so. The total score was 45 which calculated by summing of scale items responses. The levels of emotional distress was considered by dividing the total score on three levels in which; mild level was <15 score, moderate 15-30 and severe distress was >30-45 score. The higher score indicates the higher perceived emotional distress. **Reliability:** High internal consistency with 0.92 coefficient alpha for the 15-item tool.

Tools IV: Functional Abilities

Assessment: - Functional status was measured by the inventory of Functional Status Cancer (IFS-CA) adopted by **Tulman et al., (1991) and El sayed & Badr (2015)**. It includes of 39 items, designed to measure functional status accordance with its four subscales items that tap functional status pertinent to cancer patients : (a) Personal care activities (10 items) such as bathing, dressing , eating, exercising, relaxing, resting, and sleeping; (b) Household and family activities (15 items) including cooking, cleaning, dishwashing, shopping, and taking care of the husband and kids; (c) Occupation activities (8items) such as the quantity of work completed, amount of the level of responsibility, the number of hours worked, and; (d) Social and community activities (6items) such as involvement in religious and community organizations, interacting with friends and family, and time spent on hobbies.

Scoring system: A 4-point rating scale, ranging from 1 (never) to 4 (all of the time) was used for the personal care activities and occupational activities subscales. whilst, household and family activities subscale and the social and community activities subscale using a 4 –point rating scale ranging from, 1 (not at all) to 4 (full time), which was related to each statement. The total scores range from 39 to 156, the higher scores indicate better function status. **Reliability:** The test–retest reliability coefficient for the total IFS-CA was 0.985. In addition, content validity was 0.91.

Tool V: Chemotherapy-induced peripheral neuropathy assessment tool:- Developed by **Tofthagen et al., (2011)**. This tool was used to early detect and intervention of CIPN symptoms and CIPN symptoms. It was divided into two sections. In the first part, four categories with frequent 11 questions were included; category one dealt with sensory and motor problems (such as numbness, itching, and balance disorders). If these questions (Over the last week, have you experienced) were answered as “Yes,” then the studied women also answered the same questions in category two (How severe were it?), then category three (How distressing emotionally upsetting were it?), and category

four (How frequently did you have it?). Each category was scored between 0 and 4 responses. In the second part of the tool, the problems encountered in the daily life activities of the patients. It included of 10 questions (e.g. dressing, walking, picking up things, and enjoying of life) and scored between 0 = (no not at all) and 1= (yes effect on my life).

Scoring system: - The total scores were obtained by summing of all questions' scores in all four divisions of two parts; it was 0-142 score in which a higher score reported a higher level of neuropathy due to chemotherapy. The levels of neuropathy were divided to mild, moderate, severe and disabling or life threatening levels. **Reliability:** -The Cronbach's alpha value was calculated as 0.87. The test–retest reliability of the CIPN rating scale was found to be 0.90–0.96 for all tool dimensions.

The validity of the tools:

The researchers translated the study's tools into Arabic. A jury of five experts; one professor in medical-surgical nursing, one professor in medicine, two professors in community health nursing, and one expert in psychiatric nursing. The revisions were made based on the panel's recommendations for sentence clarity and topic fit.

A pilot study:

A pilot study was conducted in order to test the reliability and validity of the questionnaire items and clarity of questions. The pilot trial included 9 cancer breast women, or 10% of the entire sample. The pilot study revealed only minor changes to the tool four, and subjects in the pilot study were omitted from the main study sample.

Ethical and administrative considerations:

On May17, 2023, the Menoufia University, Egypt's Faculty of Nursing's Ethical Committee for Scientific Research Review approved the study under the registration number N: 891. Furthermore, after outlining the study's purpose and data collection procedures, the researchers were granted official approval by the authorities to conduct the current investigation. Furthermore, the

women under research gave written, informed consent. All information was guaranteed to stay confidential. The women who were being studied were assured that their involvement in the study was fully voluntary and that they might withdraw at any time.

Procedure

Data collection procedure: -The data was acquired through a sequence of steps:

- Permission to conduct the study was obtained from the provost of Oncology Institute of Menoufia University, Egypt.
- The researchers introduced themselves to the women and the purpose of the study was explained.
- Interviews with selected women were scheduled based on the date of their chemotherapy doses or follow-up time. Then, they were divided randomly to study and control groups; 45 women for each group.
- A specific room in the oncology chemotherapy unit was prepared for the implementing the multimodal nursing practices
- The researchers conducted an individualized interview with each woman in study and control groups to collect pre-test data via using a pre designed data collection tools. Also, phone numbers were obtained to facilitate contacting with the women.
- Posttest was administered to the studied women to assess the effectiveness of multi-modal nursing practices.
- The study was done from the beginning of December 2023 to the end of November 2024.

Intervention group:

- After revising the related literature; the researchers adapted the multimodal nursing practices. It was administered combined with routine care for studied women in study group.
- The intervention was done through arrangement of many sessions. It was

included group discussions, lectures, and brainstorming. A laptop PowerPoint presentations, videos and pictures about the management of PN were used.

- The illustrative booklets were available and given to all studied women in study groups that contained information related to pain management, functional abilities practices and emotional distress adaptive behaviors.
- At the end of each session summary, feedback and time were permitted for asking any questions and explaining the required home interventions activities. The intervention was applied once a week according to schedule of chemotherapy doses, each session of intervention lasted between 60-90 minutes.
- The multimodal nursing practices encompassed 8 sessions about the following: Physical exercise, Cold Application, Nutritional education and Mindful Intervention. The study groups were divided into 5 groups (n= 9 women) in order to attain better achievement.

▪ **Physical exercise:-** (1st & 2nd session): -

- Exercise therapy aims to improve physical endurance and preventing potential muscle weakness (Souza et al., 2021). With the help of a physiotherapist, the exercise intervention to be applied was prepared.
- Initially, all training sessions were led by researchers who had previously learned exercise training.
- The exercise was initially started in the form of strengthening and stretching exercises (e.g. foot dorsiflexion, and hand flexion). Extension put up with balance exercises (e.g. hip flexion, extension, abduction, and knee flexion).
- Exercise was beginning by 10 repetitions for the first 3 weeks, the repetitions were increased to 20 for 4, 5,

- and 6 weeks, and to 30 repetitions for 7, 8 weeks.
- The written exercise instructions were given to be two bottles water each one contain 500 cc water. Also, sheets and towels were utilized as supportive equipment. Every monitored exercise was done at home, and the researchers checked on it once a week.
 - The reported exercise intercession was progressive according to exercise tolerance.
 - On the day of the chemotherapy, the study women and their relatives informed instructions on how to apply previous instructions. The 15 min exercise practice was planned as 5 times per week and continued for 12 weeks.
- **Cold application :(3rd & 4th session): -**
- When the women arrived at the chemotherapy unit, the researchers applied cold therapy first. The procedure was explained to the women and their associated family. Infection, scar tissue, inflammation, and incision were examined in the area that will be treated.
 - The women were position appropriately while maintaining their privacy, and the application area was exposed
 - The compresses packs were stored in the freezer for at least two hours before to use. Packages of frozen cold compresses were applied for 15 minutes prior to infusion and for 15 minutes during chemotherapy. The application areas were covered with gauze to avoid direct contact with the cold compress.
 - Each application was separated by 45 minutes. During every intervention of cold application; pain, aberrant sensation and other discomforts due to cold application were checked. There were 45 minutes break time between each application
- Women sent home with these compresses and were told to freeze compresses before using them. The application lasted for 24 hours following the infusion of chemotherapy.
 - Women were advised to avert from (hot food and drink consumption, cold drink consumption, and contact with hot water for 72 hours). With family assistance, the cold applications were carried out at home following chemotherapy. The following week, when they arrived for chemotherapy, they were asked whether they could perform the compresses for 24hrs or not.
- **Nutritional education (5th & 6th session):**
- - The studied women were received education about the significance of nutrition as it plays an important role in both preventing and treating peripheral neuropathy.
 - The studied women were received education about importance of the omega-3 fatty acids, curcumin supplementation, vitamins B, E, and unsaturated fatty acids (**Szklener et al., 2022**). As well as, the women were educated about the beneficial effect of food with phyto-chemicals, vitamin D, iron and vitamin C on pain intensity and reduction in the need for medication (**Papadopoulou et al., 2023**).
 - Medically supervised therapeutic fasting, an alkaline diet that includes fruits, nuts, and leafy vegetables, a Mediterranean diet as fresh tomatoes, olives, and fish, and vitamin B1 or folic acid supplementation (**Toftthagen et al., 2022**).
- **Mindful intervention (7th & 8th session):**
- The cognitive restructuring helps the women see their basic irrational beliefs and patterns of maladaptive emotion (**Ronconi et al., 2024**).

- The researchers were taught the women how to confront and change these maladaptive perceptions through some behavioral strategies.
- These behavioral strategies involved training women a range of behavioral coping strategies, such as deep progressive muscle relaxation and effective communication assertiveness techniques.

Control group: -

Routine treatment follow-up care and nursing care were given to the control group, which included the following:-

1. Admission education: teaching women about on the goal, precautions, side effects, and preventive ways of chemotherapy.
2. Life guidance: developing healthy lifestyle practices, stopping smoking, and focusing on balancing between work, relaxation, and warmth.
3. Dietary guidance: Chemotherapy medications can cause gastrointestinal side effects for patients, including nausea, vomiting, diarrhea, and constipation. Therefore, patients needed to eat a light and easily digestible diet before and after chemotherapy.

Posttest: -

The researchers used the pre-test tools (II, III, IV, and V) to collect post-test data. This was carried out in order to assess the variations, overlaps, and gaps in practice. The posttest was collected after three months of intervention.

Statistical data analysis:

The acquired data were tabulated and analyzed using SPSS version 22. Graphics were created using the Excel application. Descriptive statistics for quantitative data were expressed as mean and standard deviation ($X \pm SD$), whereas qualitative data were expressed as number and percentage. Inferential statistics were calculated and presented as mean and standard deviation ($X \pm SD$). A paired sample t-test was performed to compare the means of the pre- and post-

intervention study groups. Chi-Square (χ^2) was utilized for qualitative variables. Independent t test was also used to compare the quantitative data between study and control groups. The significance level was set at $p \leq 0.05$. Pearson correlation was used to measure the strength of the linear relationship between the study variables. It has a value between -1 to 1, with a value of -1 meaning a total negative linear correlation, 0 being no correlation, and + 1 meaning a total positive correlation the significance level was set at $p \leq 0.001$.

Results

Table 1:- represents that, the main age among study group is 40 to < 50 years (37.8%) while, the main age among control group is 50-59 (40.0%) years old with mean score 43.82 ± 8.82 and 43.27 ± 9.14 among study and control groups respectively. In addition, the majority (75.6%) of studied women in study and control groups are married. Moreover, the main level of education is secondary among study and control groups (53.3% and 55.6%) correspondingly. In relation to work status, about 62.2% and 53.3 of study and control groups respectively is employee beside; more than half of study (60.0%) and control groups (66.7%) have not enough monthly income. Furthermore, more than two third of study (64.4%) and control groups (66.7%) have 3 and more child. However, there are no statistical significance differences among study and control groups regarding to sociodemographic properties.

Table 2:- reveals that, 44.4% and 53.3% of study and control groups are in first stage of disease. In relation to duration of disease; more than half (55.6%) of study group is from 8 to less than 2 years. Although 46.7% of control group the duration of disease is less than 8 months. Beside, more than half of study and control groups; 55.6% and 64.4% respectively had mastectomy operation. Concerning to the total number of doses taken; 53.3% and 48.9% respectively of study and control groups took more than 12 doses of chemotherapy. As well, there is no statistical significant difference ($p > 0.05$) among study and control groups regarding to items of medical data.

Table 3:- support hypothesis 1 that states; the study group will have significant decrease in pain levels and total mean score after multimodal nursing practices than control group. It shows that, on pre intervention the total mean score of pain among study and control groups is 6.07 ± 1.6 , 6.62 ± 1.53 respectively with no statistical significant differences ($P > 0.05$). While, on post intervention; there is considerable decreasing in total mean score of pain 4.73 ± 1.80 among study group ($P < 0.05$) comparing to 6.20 ± 1.60 among control group. In addition, a statistical significant differences ($P < 0.05$) among both groups are present.

Table 4:- supports hypothesis 1 else and reveals that, on pre intervention there are no statistical significant differences ($p > 0.05$) among study and control groups regarding to pain levels. Whilst on post intervention; it shows statistical significant decreasing ($P < 0.05$) among study and control groups concerning to pain levels.

Figure 1:- supports hypothesis 1 too and illustrates that, there are significant observable improvement in three levels of pain (mild, moderate and severe) on post intervention than on pre intervention among study group.

Table 5:- goes along with hypothesis 2 which states that, the study group will have significant increase in functional abilities' total mean scores after multimodal nursing practices than control group. It demonstrates that, on pre intervention; there are no statistical significant differences ($P > 0.05$) among study and control groups regarding the total mean score of functional abilities' subscales including (personal care activities, household and family activities, occupational activities and social and community activities). On the other hand, on post intervention; there are statistical significant increases in total mean score of functional abilities' subscales ($P < 0.05$) among study than control groups. Furthermore, there is statistical markable improvement ($P < 0.05$) among study comparing to control groups regarding the total mean score of functional abilities' assessment on post intervention than on pre intervention.

Table 6:- achieves the hypothesis 3 which declares that, the study group will have significant reduction in total mean score of emotional distress after multimodal nursing practices than control group. Accordingly this table shows that, on pre intervention the total mean score of perceived emotional distress among study and control groups are 24.867 ± 8.1 and 25.13 ± 8.27 respectively. As well, there is no statistical significant difference ($P > 0.05$). On the other hand, on post intervention the total mean score of perceived emotional distress is decreased significantly to 21.58 ± 5.92 among study than control groups and the difference between both groups on post intervention in total mean score of perceived emotional distress is significant ($P < 0.05$).

Figure 2:- supports also hypothesis 3 and displays that, on pre intervention 13.3% of study group have severe level of perceived emotional distress; which significantly decreases to 0.1% on post intervention. In addition, the control group on pre intervention 17.8% has severe level of perceived emotional distress which slightly changed to 15.6%.

Table 7:- achieving hypothesis 4 which states that, there will be a significant improvement in total mean score and levels of chemotherapy induced peripheral neuropathy among study than control groups. Accordingly, on pre intervention the total mean score of CIPN among study group is 83.16 ± 11.68 which significantly reduces to 76.00 ± 11.32 on post intervention. As well, among control group the total mean score of CIPN is 86.36 ± 13.98 which also decreases to 82.89 ± 12.66 on post intervention. However, there is no statistical significant difference ($P > 0.05$) among study and control groups on pre intervention. Conversely, on post intervention; the difference between both groups on post intervention in total mean score of CIPN is statistically significant ($P < 0.05$).

Table 8:- supports hypothesis 4 as well and shows that, on pre intervention 40.0% of study group have severe level of CIPN comparing to 28.9% of control group and there is no statistical significant difference ($p > 0.05$) among both groups. Whereas, on post intervention the differences between both

groups are markedly significant ($P < 0.05$) in relation to levels of CIPN and this evidenced by 8.9 % of study group only become have severe level of CIPN in comparing to 28.9% of control group.

Figure 3:- supports hypothesis 4 too and shows that, on pre intervention; 24.4% of study group have disabling or life threatening level of CIPN which decreased to 2.2 % on post intervention. In addition, 40.0% of study group have severe levels of CIPN which

decreased significantly to 8.9 % on post intervention.

Table 9:- shows that, on pre intervention there is no significant correlation between pain, functional ability and emotional distress with CIPN total scores $p > 0.05$. However, on post intervention; there is positive significance correlation between pain with CIPN and between emotional distresses with CIPN total score. Beside, there is negative significant correlation between functional ability with CIPN total scores.

Table 1: Distribution of sociodemographic properties among study and control groups (n=90)

Sociodemographic properties	Study group (n=45)		Control group (n=45)		Test X ²	P value
	No.	%	No.	%		
Age group/years						
- 20	4	8.9	6	13.3	4.473	0.215
- 30	11	24.4	4	8.9		
- 40	17	37.8	17	37.8		
- 50-59	13	28.9	18	40.0		
X±SD	43.82±8.82		43.27±9.14		0.293	0.77
Marital status						
- Single	3	6.7	2	4.4	0.958	0.81
- Married	34	75.6	34	75.6		
- Divorced	2	4.4	4	8.9		
- Widowed	6	13.3	5	11.1		
Level of education						
- Illiterate	1	2.2	3	6.7	2.068	0.560
- Basic education	10	22.2	6	13.3		
- Secondary education	24	53.3	25	55.6		
- University education and above	10	22.2	11	24.4		
Work status						
- Employed	28	62.2	24	53.3	0.729	0.39
- House wife	17	37.8	21	46.7		
Monthly income						
- Enough	18	40.0	15	33.3	0.431	0.51
- Not enough	27	60.0	30	66.7		
No. of children						
- 0-2	16	35.6	15	33.3	0.049	0.82
- 3 and more	29	64.4	30	66.7		
Total	45	100%	45	100%		

Table 2: Distribution of medical data among study and control groups (n=90)

Item of medical data	Study group (n=45)		Control group (n=45)		Test X ²	P value
	No.	%	No.	%		
Stage of disease						
- First stage	20	44.4	24	53.3	2.167	0.539
- Second stage	11	24.4	13	28.9		
- Third stage	7	15.6	4	8.9		
- Last stage	7	15.6	4	8.9		
Duration of disease						
- Less than 8 months	11	24.4	21	46.7	5.625	0.06
- From 8 to less than 2 years	25	55.6	15	3.3		
- More than 2 years	9	20.0	9	20.0		
Mastectomy operation						
- Yes	25	55.6	29	64.4	0.741	0.389
- No	20	44.4	16	35.6		
Total number of doses taken						
- Less than 12 doses	9	20.0	8	17.8	0.479	0.787
- 12 doses	12	26.7	15	33.3		
- More than 12 doses	24	53.3	22	48.9		
Total	45	100	45	100		

Table 3: Distribution of total mean score of pain among study and control groups on pre and post intervention (n=90)

Total mean score of pain (0-10)	Pre intervention		T-test	P value	Post intervention		T-test	P value
	Study (n=45)	Control (n=45)			Study (n=45)	Control (n=45)		
		6.07±1.6	6.62±1.53	1.684	0.96	4.73±1.80	6.20±1.60	4.079*

*Significance difference at level < 0.05

Table 4: Distribution of pain levels among study and control groups on pre and post intervention (n=90)

Pain levels	Pre intervention (n=90)				Test X ²	P value	Post intervention (n=90)				Test X ²	P value
	Study (n=45)		Control (n=45)				Study (n=45)		Control (n=45)			
	No.	%	No.	%	No.	%	No.	%				
- Mild	2	4.4	2	4.4	LR= 0.454	0.797	12	26.7	2	4.4	13.22*	0.001
- Moderate	29	64.4	26	57.8			27	60	25	55.6		
- Severe	14	31.1	17	37.8			6	13.3	18	40		

*Significance difference at level < 0.05

Figure 1: Distribution of pain levels among study groups on pre and post intervention (n=45)

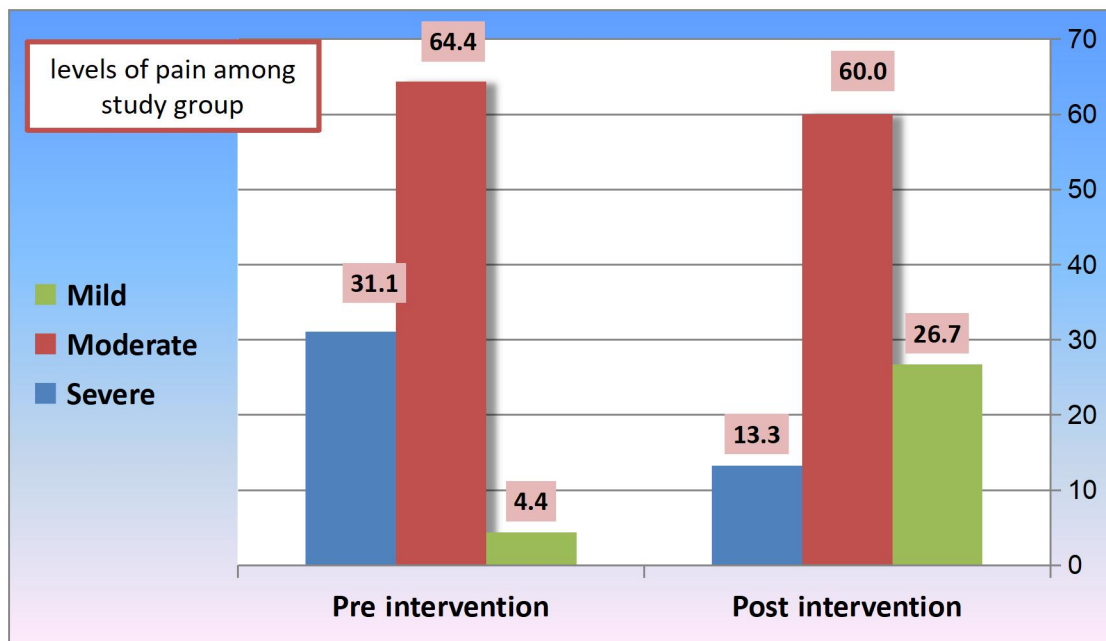


Table 5: Distribution of functional abilities' total mean score of subscales among study and control groups on pre and post intervention (n=90)

Functional abilities' total mean score of subscales	Pre intervention		T-test	P value	Post intervention		T-test	P value
	Study (n=45)	Control (n=45)			Study (n=45)	Control (n=45)		
- Personal care activities (10-40)	22.27±6.56	20.80±6.65	1.053	0.26	25.53±4.24	21.07±6.32	3.939*	0.000
- Household and family activities (15-60)	27.96±8.44	27.16±10.59	0.396	0.69	30.98±5.43	27.69±10.2	1.908	0.060
- Occupational activities (8-32)	16.27±4.98	16.20±4.897	0.064	0.95	20.53±3.8	17.9±5.02	2.816*	0.006
- Social and community activities (6-24)	10.71±4.65	11.24±4.463	0.555	0.58	16.29±4.14	13.29±4.4	3.314*	0.001
- Functional abilities assessment total mean score (39-156)	77.20±15.53	75.40±16.38	0.535	0.594	93.33±10.19	79.93±15.66	4.815*	0.000

*Significance difference at level < 0.05

Table 6: Distribution of total mean score of perceived emotional distress among study and control groups on pre and post intervention (n=90)

Perceived emotional distress total score (0-45)	Pre intervention		T-test	P value	Post intervention		T-test	P value
	Study (n=45)	Control (n=45)			Study (n=45)	Control (n=45)		
	24.867±8.1	25.13±8.27			21.58±5.92	24.9±8.1		

*Significance difference at level < 0.05

Figure 2: Distribution of perceived emotional distress Levels among study and control groups on pre and post intervention (n=90)

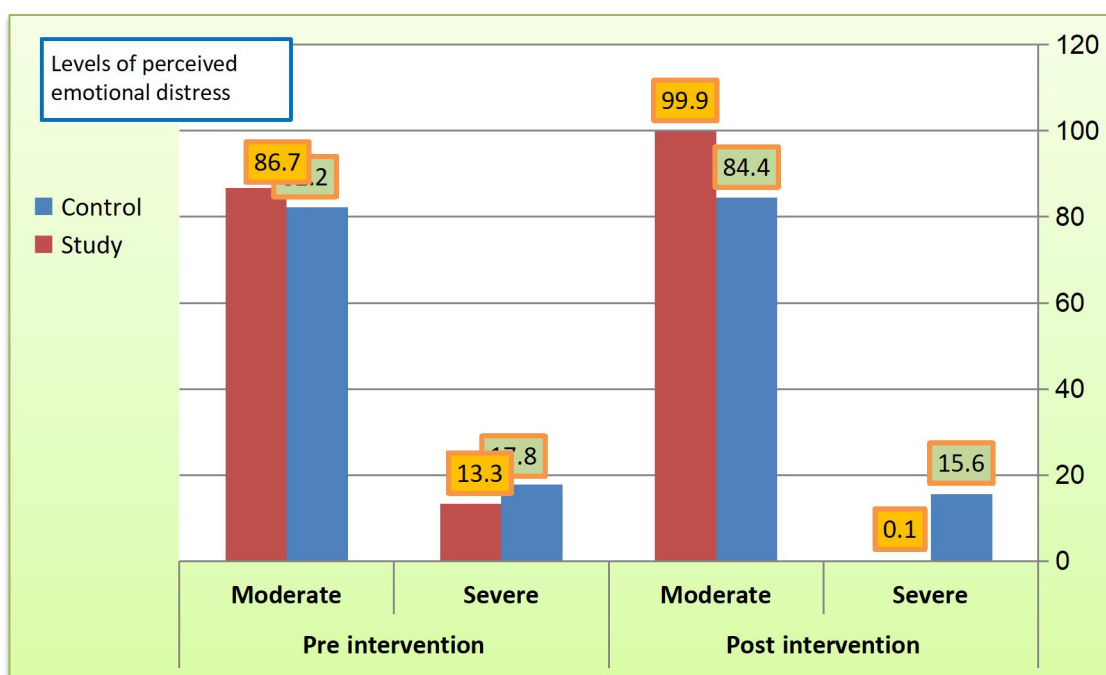


Table 7: Distribution of Chemotherapy Induced Peripheral Neuropathy (CIPN) total mean score among study and control groups on pre and post intervention (n=90)

Chemotherapy Induced Peripheral Neuropathy total score (0-142)	Pre intervention		T-test	P value	Post intervention		T-test	P value
	Study (n=45)	Control (n=45)			Study (n=45)	Control (n=45)		
	83.16±11.68	86.36±13.98	1.179	0.242	76.00±11.32	82.89±12.66	2.721*	0.008

*Significance difference at level < 0.05

Table 8: Distribution of Chemotherapy Induced Peripheral Neuropathy levels of among study and control groups on pre and post intervention (n=90)

Levels of Chemotherapy Induced Neuropathy (CIPN)	Pre intervention (n=90)				Test X ²	P value	Post intervention (n=90)				Test X ²	P value
	Study (n=45)		Control (n=45)				Study (n=45)		Control (n=45)			
	No.	%	No.	%			No.	%	No.	%		
- Mild	3	6.7	6	13.3	3.82	0.282	17	37.8	6	13.3	12.78*	0.005
- Moderate	13	28.9	19	42.2			23	51.1	21	46.7		
- Severe	18	40.0	13	28.9			4	8.9	13	28.9		
- Disabling or life threatening	11	24.4	7	15.6			1	2.2	5	11.1		

*Significance difference at level < 0.05

Figure 3: Distribution of Chemotherapy Induced Peripheral Neuropathy (CIPN) levels among study group on pre and post intervention (n=45)

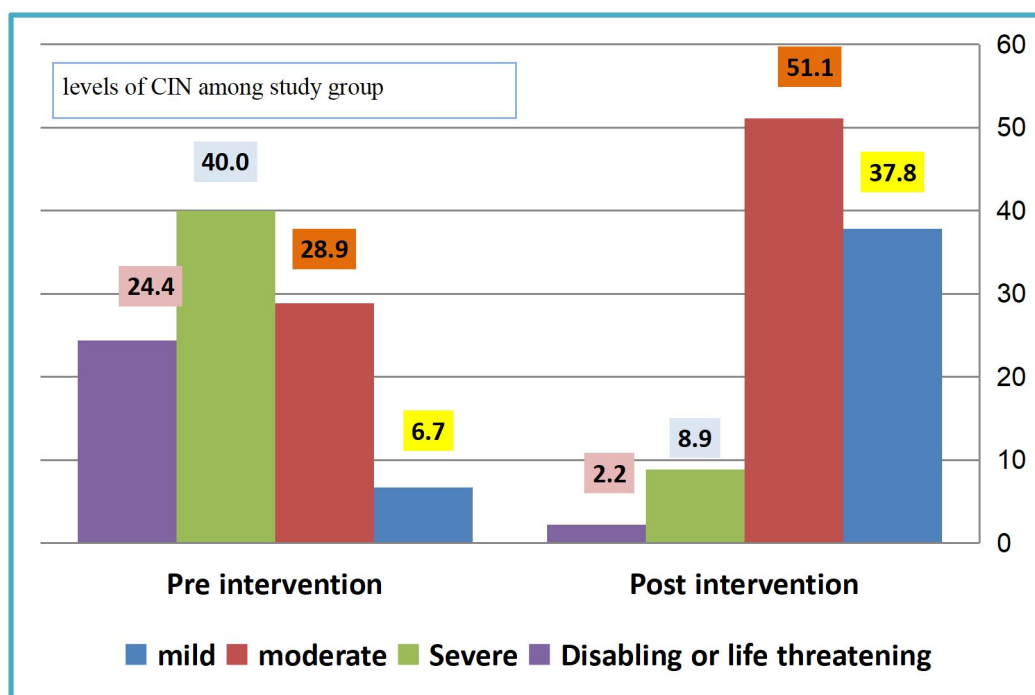


Table (9) Correlation between (pain, functional ability, emotional distress) and CIPN total scores on pre and post intervention among study group (n=45)

Pain, Functional ability and Emotional distress of study group	CIPN total score			
	Pre		Post	
	R	P value	R	P value
Pain	-0.56	0.045	0.49	<0.001
Functional Ability	-0.29	0.051	-0.23	0.009
Emotional Distress	-0.31	0.143	0.16	0.005

Discussion

Unfavorable side effects from breast cancer and its therapy include upper and lower extremities restriction, fatigue and pain can severely impact women quality of life and emotional wellbeing, ability to go about their daily activities and ability to manage with the illness and its therapy, beside ultimately prognosis and survival outcomes (Klafke et al., 2023). There are no effective or approved pharmaceutical treatments available for treating or preventing CIPN properly. Multimodal nursing practices are the program of choice to be used together with communication multimode for optimal effectiveness (Klafke et al., 2023).

Regarding to the effect of multimodal nursing practices on pain among studied

women on pre - post intervention, the findings of current study revealed that, there was statistical significant effect ($p < 0.05$) on total mean score of pain on post intervention than pre intervention among study than control group. This finding similar with Romeyke & Stummer, (2024) on Multimodal Approaches in the Treatment of Chronic Peripheral Neuropathy in Germany and revealed that, patients with acutely exacerbated pain and those with the highest level of chronicity from multi-modal and complex treatments have demonstrated a significant benefit from multimodal approaches that incorporate elements such as nutrition, exercise, and traditional Chinese medicine in the treatment of chronic peripheral neuropathy.

In addition, the present study result agreed with study carried out by Zhou, et al., (2020), in China, they who conducted a

clinical randomized controlled trial on the benefits of a wechat-based multimodal nursing program in women with breast cancer, and found a significant improvement in the health-related quality of life and pain related to neuropathy of women with breast cancer who involved in multimodal nursing program.

These consistencies might be due to that, the multimodal practice including physical exercise, nutritional education, cold application and mindful intervention is an effective and holistic intervention for managing neuropathy associated pain among women with CIPN.

Concerning to the effect of multi-modal nursing practices on total mean score of functional ability among study and control groups before and after intervention, the result of current study showed that there were a significant increase ($p < 0.05$) in the overall mean score of the functional ability's subscales among study than control groups on post than pre intervention. Furthermore, there was a statistical significant improvement ($p < 0.05$) in the total functional abilities assessment score between the study and control groups after the intervention compared to before it.

This outcome was consistent with the result of **Crichton et al., (2022)** who studied the Non-pharmacological self-management strategies for chemotherapy-induced peripheral neuropathy in people with advanced cancer in Australia and concluded that, there is a strongest evidence for non-pharmacological treatment of CIPN to improve the functional capacity of women with breast cancer.

Additionally, the current study recommends exercise interventions for women as a non-pharmacological, safe, easy, comfortable, and non-invasive means of improving their functional abilities and physiological capacities as well as their quality of life. This result was in line with the findings of **Mostafaei et al. (2021)**, who study effect of exercise on depression and fatigue in breast cancer women undergoing chemotherapy in Iran and found that exercise and physical activities reduce patients' feelings of

exhaustion. Consequently, improve their quality of life.

Furthermore, in the current study's findings there an improvement in personal care, household, and social activities ($p < 0.001$). These findings were consistent with **Mohammed (2019)** who studied the effects of Exercise Intervention on Pain, Shoulder Movement, and Functional Status in Women after Breast Cancer Surgery and reported that there was a statistically significant improvement in women's overall functional status scores over time ($p < 0.010$). ($p < 0.010$).

These similarities could be related to the multimodal nursing practices are crucial for managing breast cancer, responding to nursing interventions, rehabilitation and lowering symptoms of CIPN, including functional capacities. Besides, there is a strongest evidence that taking glutamine supplements and drinking a packed with omega-3 polyunsaturated fatty acids can beneficial women with breast cancer. Interactive education has also been shown to improve functional capacity

On the other hand, the finding of current study conflicted with those of **Al-Majid et al., (2018)**, who conducted a study on the effects of exercise on bio-behavioral outcomes of fatigue during cancer treatment and reported that that the Quality of Life (QoL) and functional status of breast cancer patients with CIPN were not significantly impacted by treadmill exercises.

This discrepancy might be due to that the adverse effects related chemotherapy inducing PN requiring comprehensive, tailored and multi modal intervention practices as in the present study rather than other intervention that targeted one intervention like treadmill exercises.

The result of current study revealed that, there was a statistical significant improvement ($p < 0.05$) in total mean score of perceived emotional distress including the items of Anxiety, Depression, Hopelessness, Demoralization and Anger feelings on post intervention among study than in control

groups. This result congruent with **Zhou et al., (2020)** in China who illustrated that, early in the postoperative phase, a multimodal nursing program based on WeChat enhanced the patients' emotional health.

In addition the finding of present study showed that, there was a statistical significant decrease ($p < 0.05$) in the perceived emotional distress levels among study than control groups after multimodal intervention. This finding agreed with **Ronconi et al., (2024)** who studied Conservative non-pharmacological treatments for CIPN in women treated for breast cancer in Italy and concluded that, all forms of stress-reduction activities, including moderate exercise, have a favorable impact on cancer patients physical and mental health.

These similarities could be approved that, the multimodal nursing practice as an non pharmacological treatment was effective strategy for early psychological intervention in women with breast cancer especially women having mastectomy. Also, in the present study more than half of the studied women were in first stage of disease and this gave privilege to the multimodal nursing practice to manage the women psychologically early before the condition worsens.

However, these results contradicted with a study conducted by **Goldschmidt, Schmidt, & Steindorf, (2023)**. Who examine long-term effects of exercise interventions on physical activity in breast cancer patients in USA and illustrated that, the effects of physical activity on breast cancer women were mild to moderate and diminished over time and small, non-significant impacts on total physical activity at 6 months.

This discrepancy could be the result of variations in the exercise techniques, intervention durations, and sample sizes. Beside, also these inconsistencies might be due to that the adverse effects related chemotherapy inducing PN requiring comprehensive, tailored and multi modal

intervention practices as in the present study rather than other intervention that targeted one intervention like treadmill exercises.

The present study revealed that, there was a significant improvement in levels of chemotherapy induced peripheral neuropathy among study than control groups after implementing multimodal nursing practices. This result came in agreement with study carried by **Lam et al., (2021)** on a recent meta-analysis of cancer patients in China and declared that, CIPN was 80% less common in those who used Omega-3 PUFA supplements. CIPN was 80% less common in those who used Omega-3 PUFA supplements. This similarity related that the use of nutritional supplements is an emerging field of research for the prevention and therapy of CIPN in advanced cancer.

In addition, the finding of concurrent study supported by a randomized trial conducted by **Shigematsu et al., (2020)** who compared the application of cold mittens and slippers versus standard care in Italy and clarified that, the experimental arm showed a marked decrease in sensory and motor neuropathy symptoms compared to the control group. Moreover, no serious side effects were reported associated with Cryo-therapy. Similar result was obtained in study carried out by **Nisar, (2022)** on Impact of Cold Therapy on Peripheral Neuropathy and Quality of Life in Patients With Breast Cancer who stated that, Cryo-therapy help in reduce of peripheral neuropathy severity and frequency.

This harmony in results might be related that cold application has advantage in non-pharmacological technique and is crucial for managing symptoms. Vasoconstriction brought on by the cold's localised effects slows down blood flow, which in turn slows down cellular metabolism (**Kotani et al., 2021**).

Alongside, the concurrent study agreed with study conducted by **Bonhof et al., (2022)** who carried out a study on Mindfulness is associated with severity of peripheral neuropathy and related patient-reported outcomes and concluded that, mindfulness was linked to less severe Peripheral neuropathy

(PN) and cancer patients with chronic were PN better outcome. These similarities could be due to the multimodal nursing practice contained the mindful intervention has beneficial effect of CIPN among cancer breast women.

Regarding to, the correlation between pain and CIPN total score on pre and post intervention among study group. The current study showed that, on pre intervention there were no significant correlations between Pain and CIPN total scores $P > 0.001$. However, on post intervention; there was positive significance correlation between Pain and CIPN total score. This result was consistent with **Heywood, McCarthy, and Skinner (2019)** in their study on efficacy of exercise interventions in patients with advanced cancer in Australia; who stated that the exercise is safe and beneficial, as it improves psychosocial function, pain sensation, quality of sleep, and quality of life for patients with advanced cancer. This similarity highlighted the impact of multimodal nursing practices on management of symptoms associated to chemotherapy which in turn reduce both levels of pain sensation and PN among breast cancer women.

Furthermore, the present study outcomes represented that, there was a significant correlation between Functional ability and CIPN total scores on post intervention than pre intervention among study group. These findings come on same line with study carried by **Guo, (2022)** who conduct study on effects of exercise on chemotherapy-induced peripheral neuropathy in cancer patients in China and revealed that physical exercise interventions in patients with cancer at any stage improved physical function and CIPN.

In addition, the current study finding represented that, there was a significant correlation between emotional distresses and CIPN total scores on post intervention than pre intervention among study group. This result was constant with study carried by **Nakagawa et al., (2024)**. Who conducted a study on exercise intervention for the management of chemotherapy-induced peripheral neuropathy and indicated that, there were a significant correlation between exercise and emotional

disturbance, CIPN symptoms, and quality of life.

The overall finding of present study approved that, multi modal nursing practice can contribute to improve the tasks of everyday life in its all physical and psychological dimensions. This finding supported by **Yadav, Varadharajulu & Gudurn, (2024)** in New York. Who conducted a study on Multimodal Therapeutic Exercises and Their Role in Mitigating Chemotherapy-Induced Peripheral Neuropathy and revealed that, the multimodal exercise program demonstrated in reducing CIPN symptoms and improving functional and emotional outcomes.

These similarities could be due to the pain, functional ability and emotional distresses are most common symptoms associated with chemotherapy, so multimodal nursing practices that addresses these symptoms and helps in improving of CIPN.

Conclusion:

Multi-modal nursing practices consisted physical exercise; cold application; nutritional education and mindful intervention have beneficial effectiveness in the management of pain, improving functional ability and reduce emotional distress in women with breast cancer receiving CIPN among study compared to control groups.

Recommendations:

Based on these findings it is recommended to:-

- Implement multimodal nursing practices as standard protocol in managing breast cancer women with peripheral neuropathy related chemotherapy in the different study settings.
- Similar studied should be conducted for breast cancer women in different settings to generalize the findings
- The illustrative booklet of multimodal nursing practices needs to be given to breast cancer women.

Implications for Nursing Practice

The multimodal nursing practices has a simple, understandable, and inexpensive design; thus, it can be implemented at different settings on a large sample.

Implications for Future Research

Future research is needed to evaluate the sustainability and long-term effectiveness of multimodal nursing practices directed to women with CIPN.

Conflicts of Interest

The Authors declared no potential conflicts of interest in relation to this study.

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