Effectiveness of Extremity Exercise Program with Nerve Gliding to Improve Chemotherapy-Induced Peripheral Neuropathy Symptoms in Breast Cancer Women

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Abstract

The most popular and successful cancer treatment is chemotherapy. Chemotherapy-induced peripheral neuropathy (CIPN) is a remarkably significant adverse effect relevant to cancer treatment.Developing efficient treatments to control neuropathic symptoms is essential given the detrimental a nd long-term effects of CIPN. **Aim:** To investigate effectiveness of extremity exercise program with nerve gliding in order to mitigate symptoms of chemotherapy-induced peripheral neuropathy in breast cancer women. **Research design:** A quasi-experimental design was employed. **Setting:** The study was conducted at Nuclear Medicine Unit affiliated to Mansoura University Hospitals, Egypt. **Study subject:** A purposive sample consists of 100 breast cancer women undergoing standard chemotherapy with taxanes, vinca alkaloids and platinum compounds was chosen to accomplish the aim of the current study. **Tools:** Four tools were used to gather the study's pertinent data: **Tool I:** A structured interview Questionnaire, **Tool II:** Neuropathy Scale-clinical version (TNSc), **Tool III:** Peripheral Neuropathy Scale (PNS) and **Tool IV:** Neuropathic Pain Scale (NPS). **Results:** The study group demonstrated statistically significant improvement in terms of the intensity of neuropathic pain after intervention, physical function and role function (0.005* and 000.0*), and symptom severity (P=0001*) when compared to the control group. Neuropathy symptoms and indicators were positively correlated with functional interference (P=<0.001*). **Conclusion:** The current study came to a conclusion that using an exercise program combined with nerve gliding as a treatment paradigm improves functional abilities and neuropathic symptoms. It also shows promise as a treatment that may be used to help people with breast cancer during chemotherapy. **Recommendations:** Using an extremities exercise program combined with nerve gliding as an adjunctive therapy or interventional treatment for patients with CIPN. An in-service educational program regarding extremity exercise program with nerve gliding should be established at an organizational level to expand the nurses' awareness regarding its importance for patients with CIPN.
Keywords: Breast Cancer Women, Chemotherapy-Induced Peripheral Neuropathy Symptoms, Extremity Exercise Program, Nerve Gliding.

Introduction:

Breast cancer is the most diagnosed cancer worldwide **(Sung et al., 2021),** and continues to be the common type of women's cancer in Egypt with high prevalence rate. roughly 46,000 incident cases are anticipated in 2050**.** Chemotherapy is the most frequently encountered and efficient technique for managing cancer. As many as 40% of breast cancer survivors who undergo neurotoxic chemotherapy, such as taxanes, vinca alkaloids, and platinum-based compounds, are expected to be affected by chemotherapy-induced peripheral neuropathy (CIPN) **(Hamdy et al., 2023).**

There is greater evidence of pharmacological side effects as the number of survivors of various tumor types increases. In fact, survivors frequently develop physical restrictions or pathological disorders induced by chemotherapeutic treatment, and quite often, these side effects are long-lasting, well beyond the completion of the chemotherapy treatment. Despite being highly efficient in treating cancer, antitumor

medications can have very serious side effects that may impair quality of life (QoL) **(Miller et al., 2019).** Chemotherapeutic drugs' effects on nerves can result in a variety of symptoms associated with CIPN. Sensory elements like numbness, pervasive pain, hypersensitivity to cold and mechanical stimuli, paresthesia, and proprioception loss are frequently present in these symptoms **(Diotti et al., 2022).**

Chemotherapy-induced peripheral neuropathy (CIPN) is a incapacitating pain complaint resulting from chemotherapy which require dose reduction or cessation. The neurotoxic alterations in nerves and its pathways, persuaded by chemotherapeutic agents resulting in disruptions of the intracellular homeostasis, signaling and neurotransmission, eventually resulting in the development of CIPN **(Burgess, et al., 2021).**

Chemotherapy-induced peripheral neuropathy (CIPN) is a crucial consequence of cancer therapy, causing numbness and stinging in the hands and feet and that result in deficiencies in satisfactory motor occupation and long-term incapacity, it is caused by injury to sensory, motor, autonomic, or cranial nerves. Due to these difficulties, survivors of cancer might experience emotional distress, limited activity, sleep changes and impaired quality of life (QOL). Taking into consideration the long-term adverse effects of CIPN, developing efficient interventions to control neuropathic pain is essential. **(Sung et al., 2021).**

In terms of functionality, CIPN is associated with a higher incidence of falls as well as deficiencies in mobility, gait (including gait speed and step length), and balance. CIPN severity has been shown to impact gait, balance, and mobility deficits, which may improve within 6–12 months after stopping neurotoxic therapy. However, symptoms may persist in some patients (**McCrary et al., 2019)**. Low patient QOL, detrimental effects on functional outcomes, and difficulties with treatment compliance result from a lack of knowledge about pathophysiology, proper dosage, and the advantages of rehabilitation in lessening the severity of CIPN **(Zhang, 2021).**

Exercise treatment, which involves adequate stretching succeeded by training of aerobic type and/or performance of strength training for main muscle groups, is a straightforward, affordable, and non-pharmacological rehabilitation technique to improve CIPN symptoms. Strength training, cardiovascular exercise, stretching, and sensory training are some of its general categories. Most of the recent research has demonstrated that exercise therapy can enhance quality of life, balance, and activity levels in addition to reducing the symptoms of peripheral neuropathy **(Huang et al., 2024).**

Exercise is a term used to describe physical activities intended to increase physical and cognitive function and correct disability, all of which can have a favorable impact on health. For patients with CIPN, exercise training appears to be an effective supplemental therapy or interventional treatment that can help heal damaged peripheral nerves, reduce pain, and improve physical status, particularly when paired with Nerve Gliding **(Zhang et al., 2021 and Gui, Li, Zhuge, and Xu., 2021).**

Significance of the study:

With an age-specific frequency rate of 48.8/105, breast cancer continues to be the most prevalent form of cancer in women in Egypt, notwithstanding the disparity in incidence rates between industrialized and poor nations. In 2050, over 46,000 incident cases are anticipated. Egypt has a lower incidence rate than the global average, but its age-standardized rate of death (20.4/100,0004) is higher than that of prosperous nations (12.8/105) and the United States (12.3/105) (Azim et al., 2025). Worldwide, female breast cancer is accounting for 6.9% of cancer deaths and 11.6% of all recently detected cancers **(Bray, et al., 2024).**

Among the primary adverse effects of chemotherapy is chemotherapy-induced peripheral neuropathy (CIPN) **(Burgess et al., 2021).** Because of its substantial impact, it might result in

harmful dose reductions and therapy termination, which lowers the quality of life for cancer patients who survive. CIPN was highly prevalent near the end of chemotherapy (72.9%), and two months after treatment ended, the incidence significantly decreased (31.1%) **(D'Souza, et al., 2025).**

This study investigates the potential benefits of a nerve gliding and extremity exercise program for breast cancer patients exhibiting symptoms of chemotherapy-induced peripheral neuropathy.

Operational definition

Nerve Gliding: is a therapeutic approach that uses special motions to decline peripheral neuropathy pain and encourage nerve regeneration and function.

Aim of the study

The current study aims to evaluate the effectiveness of extremity exercise program with nerve gliding to mitigate chemotherapy-induced peripheral neuropathy symptoms in breast cancer women.

Research hypotheses:

H1: Exercise therapy will have a significant positive impact on improving balance and activity levels while also considerably alleviating peripheral neuropathy symptoms.

H2: Exercise therapy will significantly improve the functioning capacities of women with breast cancer who are experiencing CIPN.

Method

Research design

The study's design is quasi-experimental. To determine the contributing effect of an intervention on its target population, this empirical interventional design is employed. Thus, this design evaluates the effectiveness of nerve gliding and an extremity exercise program in improving the symptoms of chemotherapy-induced peripheral neuropathy in women with breast cancer **(Ngusie, et al., 2023)**.

Study setting:

The study was conducted in Mansoura Nuclear Medicine Unit affiliated to Mansoura University Hospitals, Egypt.

Study sample:

The current study involved a purposive sample of 100 breast cancer patients undergoing standard chemotherapy with vinca alkaloids, platinum compounds, and taxanes. These patients were split into two even groups (control and study), each with 50 patients, using computer-generated randomization. The control group was treated as usual. Following the start of chemotherapy, the study group received regular care along with an exercise regimen that included nerve gliding. ***The following inclusion criteria were used to choose the women in the study:***

Began chemotherapy after enrollment with treatment cycles of 2, 3, or 4 weeks, female patients with breast cancer between the ages of 20 and 60 years old who did not have distant metastases and were receiving conventional adjuvant taxanes chemotherapy, and their willingness to participate in the study.

The exclusion criteria will include:

Participants who had physical limitations that precluded engaging in a low-to-moderate-intensity, progressive exercise program, those with comorbid conditions that resulted in peripheral neuropathic symptoms (such as diabetes and prior chemotherapy), those with a prior history of neurological disorders or diabetes, or those undergoing other treatments that could cause peripheral neurotoxicity were all excluded.

Sample size calculation formula:

MedCalc Software 15.8. Calculation was employed in order to calculate the sample size based on previous research by **Wang et al., (2021)**, considering that $\alpha = 0.05$, testing power was 80%, and the effect size was 0.6 so, 88 patients are required. To account for expected drop-outs, additional patients will be added, so the sample

size will be 100 patients, divided into two equal groups (50).

Tools of the study:

Four instruments will be utilized for data gathering:

Tool I: A structured Interview Questionnaire:

This questionnaire was designed by the researchers following a thorough literature review **(Wang et al., 2021).** There are two components to this tool: Part 1: Patient demographic data, such as age, marital status, educational level, place of residence, and working status. Part 2: Data related health status, including menopausal status, regular exercise, hormone therapy, cancer stage, and family history of cancer.

Tool II: Neuropathy Scale-Clinical Version (TNSc)

Cavaletti et al. (2006) created this instrument to evaluate the motor and sensory symptoms of neuropathy. The seven-item measure, which includes sensory symptoms, motor symptoms, automatic symptoms, pin feeling, vibration sensitivity, strength, and tendon reflexes, is simple for oncology nurses to perform. Each item has a score between 0 and 4, with a total score ranging from 0 to 28. The CIPN gets worse as the TNSc score rises.

Tool III: Peripheral Neuropathy Scale (PNS)

A 19-item scale was created by **Almadrones et al. (2004)** to evaluate the degree of CIPN and functional interference by CIPN as reported by patients. It includes questions about physical function (6 questions), role function (2 questions), and the last three days (11 questions). Each item is assigned a score between 1 and 4, leading to a total PNS score that ranges from 19 to 76. A higher score reflects increased PN severity and greater functional disruption.

Tool IV: Neuropathic Pain Scale (NPS):

The Neuropathic Pain Scale (NPS) was created by Bradley Galer and Mark Jensen in 1997 as the first instrument created especially to assess the many aspects of pain linked to neuropathic pain. To improve comprehension and therapy, the NPS is a tool used to rate the severity of neuropathic pain. Ten items are part of the NPS. The final two measure the degree and discomfort of pain, while the remaining eight assess the quality of neuropathic pain. The NPS rates these pain metrics on a scale of 1 to 10, where 1 represents the least amount of pain and 10 represents the most.

Validity and Reliability:

A panel consisting of two oncology medical specialists and five medical surgical nursing professionals evaluated the Arabic version of the study tools for comprehensiveness, clarity, relevance, and ease of use. The necessary changes were made in response to the advice of experts. In cancer survivors with CIPN, the Neuropathy Scale-Clinical Version (TNSc) has been evaluated for convergent validity, discriminant validity, and intra-rater (0.86–0.88) and inter-rater (0.86) reliability **(Cavaletti et al., 2013).** The present investigation found that TNSc's internal consistency was acceptable, with a Cronbach's α ranging from 0.41 to 0.57. When the Peripheral Neuropathy Scale (PNS) was examined for internal consistency, its Cronbach's α varied from 0.52 to 0.88, indicating acceptable to good internal consistency (α = 0.83–0.96). Cronbach's alpha for the Neuropathic Pain Scale (NPS) was 0.78 (95% CI 0.69; 0.83), suggesting a good level of internal consistency. The three components that were recovered, "Familiar," "Superficial," and "Alien Perception," accounted for 64 percent of the variance **(Rog, et al., 2007).**

Method

Procedure:

1. The Faculty of Nursing at Mansoura University's Research Ethics Committee granted ethical permission.

2. Based on a current, pertinent literature review, the researcher created the study tools.
3. Cronbach's alpha coefficient and other suitable statistical tests were used to assess the tools' reliability.
4. To assess the feasibility and applicability of the study tool, A pilot study was carried out on 10% of the study sample, involving 10 patients and those patients were not included in the study sample. As a result, the necessary modifications were implemented.
5. Gathering data: Data collection began in early May 2024 and continued until the end of November 2024.

The following four phases comprise the study's execution:

Phase I: Preparatory phase:

- After explaining the study's purpose and ma intaining confidentiality, patients gave their

Writteninformed consent to participate. Us ing a computerbased selection program, subjects w ho met the sampling criteria and agreed to particip ate were randomly assigned to two treatment group s (control group, n = 50) and (study group, n = 50) with a 1:1 assignment: (1) the study group received standard care plus exercise program, and (2) the c ontrol group received standard care by the nurse. E ach participant then gave their oral consent.

- A jury of seven experts from the medical an d nursing fields reviewed the study's tools to

ensure they were valid and reliable, and any ne cessary modifications were made accordingly.

- After analyzing recent related literature, the researcher created a session plan, a colored brochure, and an instructional video in easy Arabic.

Phase II: Assessment phase:

- During this phase, using tool (I) to gather demographic and me dical data, tool (II) to

assess

neuropathy signs and symptoms, Tool (III) was used to assess the severity of patient-reported CIPN and its impact on function, and tool (IV) to assess various pain attributes assoc iated with neuropathic pain, the researcher collecte d data for both groups of the study sample.

- To avoid contamination, data from the study group was gathered after data from the

control group's patients.

Phase III: Implementation phase:

- The nuclear medicine unit was the location of the research sample interview. Choosing a cozy, private setting for the interview, the researcher began by introducing herself to the patients and providing them with a quick overview of the purpose and design of the study.
- Those in the control group were given standard medical attention. In contrast, the study group was given an exercise regimen before the start of chemotherapy that included range-of-motion exercises, strength training, aerobic exercise, stretching, nerve gliding, and sensory training.
- The study group's patients underwent a 4-week fitness regimen based on standard therapy as follows: **a.** doing thorough training each morning and evening, which includes reclining down and performing ten repetitions of the hand, finger, and foot movements in turn10 times, then standing, slowly raising arms, stretching out and drawing back fingers ten times, and then slowly falling arms; placing hands on hips, heeling slowly after falling off the ground ten times). **b.** walking training (based on the patient's physical condition), **c.** aerobics,

strength, range of motion, and sensorimotor training. During exercise, patients should cease exercising right away if they experience lightheadedness, tightness in their chest, or any other physical discomfort **(Gui, Li, Zhuge and Xu., 2021)**.

- A variety of instructional techniques, including brainstorming, discussion, handouts, and the use of illustrated media (video, images, and PowerPoint presentation), were employed to provide all instructions regarding the exercise program and address any queries. Each patient needs 30 to 45 minutes of time.
- Depending on the patient's state, protocols were followed two to five times each week. Stabilization tasks, such surface instability, required a special focus and increased difficulty. Additionally, a shorter workout program targeted balance control particularly.
- The home program's focus was on nerve gliding exercises, which women were encouraged to perform three times a day for five to ten minutes each time. These exercises were recommended to be performed both during and after chemotherapy sessions.
- In order to promote contact and give the patient a chance for any assistance, a follow-up meeting was conducted at the hospital and the women's phone number was obtained. To encourage women to continue their fitness regimens and exchange experiences, a WhatsApp group was established.

Phase III: Evaluation phase:

Tool II, Tool III, and Tool IV were used to compare the study and control groups one month after the suggested exercise program was put into place in order to evaluate the effect of the program on the symptoms of chemotherapy-induced peripheral neuropathy in patients.

Ethical considerations:

Ethical approval was granted by the Research Ethical Committee of the Faculty of Nursing at Mansoura University in Egypt. Once the nature of the study has been explained to each patient, their informed written consent was sought. Participation is voluntary, the researcher reminded the patients. Confidentiality, safety, privacy, and anonymity were all guaranteed during the study. Patients were free to leave the trial whenever they wanted.

Statistical Analysis:

Version 20.0 of IBM SPSS software was used to conduct the statistical analysis of the data. In terms of caterogical data, both numbers and percentages were employed to summarize them. The Kolmogorov-Smirnov test was utilized to determine whether continuous data was normal. The mean, standard deviation, and range (minimum and maximum) were used to characterize quantitative data.

Results

Table (1) Regarding age, the majority of the subjects were over 40 (52.0 for the control group and 50.0 for the study group); the majority were married (80.0% and 72.0%, respectively); over half of the study group (54.0%) and control group (60.0) lived in a rural area; roughly two thirds (64.0%) of the control group and slightly more than half (57.0%) of the study group had a high level of education; over half were unemployed (56.0% for the control group and 58.0% for the study group); and post-menopausal (control 52.0% and study 54.0%). In relation to exercise, more than two-thirds of the control group (72.0%) and half of the study group (52.0%) do not regularly exercise, and roughly one-third of both groups were on hormonal therapy (30.0% and 24.0%, respectively). According to cancer staging, stage I and stage II cancers predominate among the groups under study, and slightly more than half of the control group (52.0%) and study group (54.0%) have no family history of cancer.

Table (2) In the posttest, the study group's symptom severity was statistically significantly better than that of the control group (P=0001*), with 18.0% of the control group experiencing severe neuropathy symptoms compared to just 2.0% in the research group. Mild symptoms affected 46.0 of the control group compared to 50.0% of the study group, and moderate symptoms affected 36.0% of the control group compared to 48.0.

Table (3) Demonstrates that the study group's physical function and role function significantly improved after the intervention when brought into comparison to the control group (0.005* and 0.004*, respectively).

Table (4) Clarifies that study group had a statistically significant decrease in intensity of neuropathic pain post intervention compared with control group (0.001*)

Table (5) Shows a positive correlation between neuropathy signs and symptoms and functional interference (P= <0.001*)

Table (1): Frequency and percentage distribution of demographic characteristics among control and study groups (N=100)

Variables	Control group (n = 50)		Study group (n = 50)		χ^2	p
	No	%	No	%		
Patient's age (Years)						
20 – <30	11	22.0	10	20.0	0.210	0.900
30 – <40	13	26.0	15	30.0		
40 or More	26	52.0	25	50.0		
Marital status						
Married	40	80.0	36	72.0	0.985	^{MC}p=
Single	3	6.0	5	10.0		0.651
Widow	7	14.0	9	18.0		
Educational level					1.149	0.563
Not educate	8	16.0	9	18.0		
High school	10	20.0	14	28.0		
University	32	64.0	27	54.0		
Residence						
Urban	23	46.0	20	40.0	0.367	0.545
Rural	27	54.0	30	60.0		
Working status						
Not working	28	56.0	29	58.0	0.070	0.966
Part time	12	24.0	12	24.0		
Full time	10	20.0	9	18.0		
Family history of cancer						
Yes	24	48.0	23	46.0	0.040	0.841
No	26	52.0	27	54.0		
Menopausal status						
Pre	21	42.0	24	48.0	0.364	0.546
post	29	58.0	26	52.0		
Regular exercise						
Yes	14	28.0	24	48.0	6.000*	0.014*
No	36	72.0	26	52.0		
Hormone therapy						
Yes	15	30.0	12	24.0	0.457	0.499
No	35	70.0	38	76.0		
Cancer stage						
I	17	34.0	17	34.0	2.374	0.498
II	20	40.0	24	48.0		
III	13	26.0	9	18.0		

χ^2: **Chi square test** **MC: Monte Carlo test** p: p value for comparing between the studied groups

*: Statistically significant at $p \leq 0.05$

Table (2): Comparison among control and study groups in accordance with severity of neuropathy symptoms (N = 100)

Symptoms severity	Control (n = 50)				Study (n = 50)				Test of Sig. (p_1)	Test of Sig. (p_2)
	Pre		**Post**		**Pre**		**Post**			
	No	**%**	**No**	**%**	**No**	**%**	**No**	**%**		
Mild	2	4.0	23	46.0	0	0.0	25	50.0	χ^2=2.041	χ^2=7.340*
Moderate	48	96.0	18	36.0	50	100.0	24	48.0	(^{FE}p=	(0.025*)
Sever	0	0.0	9	18.0	0	0.0	1	2.0	0.495)	
Total Score										
Min. – Max.	4.0 – 29.0		6.0 – 24.0		4.0 – 23.0		6.0 – 24.0		t=2.248*	t=1.881
Mean ± SD.	15.66 ± 6.73		14.90 ± 5.64		15.40 ± 5.18		12.82 ± 5.32		(0.027*)	(0.063)
Median	16.50		14.50		12.50		13.0			
Test of Sig. (p_0)	1.444 (0.155)				8.186 (<0.001*)					

SD: **Standard deviation** **t: Student t-test** **t: Paired t-test** χ^2: **Chi square test** **FET: Fisher Exact**

p_0: p value for comparing between **Pre** and **Post**

p_1: p value for comparing between the studied groups in **Pre**

p_2: p value for comparing between the studied groups in **Post**

Table (3): Comparison among control and study groups according to functional interference by peripheral neuropathy

Functional interference	Control group (n = 50)		Study group (n = 50)		U (p_1)	U (p_2)
	Pre	**Post**	**Pre**	**Post**		
Physical Function						
Min. – Max.	6.0 – 24.0	6.0 – 23.0	6.0 – 24.0	6.0 – 19.0	1223.500	851.000*
Mean ± SD.	13.90 ± 5.64	12.84 ± 5.18	13.82 ± 5.32	10.22 ± 4.12	(0.855)	(0.005*)
Median	14.50	12.0	13.0	11.0		
Z (p_0)	4.010* (<0.001*)		6.052* (<0.001*)			
Role Function						
Min. – Max.	2.0 – 8.0	2.0 – 8.0	2.0 – 8.0	2.0 – 6.0	1224.000	851.000*
Mean ± SD.	4.76 ± 1.74	4.56 ± 1.95	4.66 ± 1.83	3.46 ± 1.43	(0.854)	(0.004*)
Median	5.0	4.0	4.50	4.0		
Z (p_0)	1.404 (0.160)		4.886* (<0.001*)			
Total Score						
Min. – Max.	11.0 – 40.0	11.0 – 43.0	11.0 – 42.0	11.0 – 36.0	1196.500	988.000*
Mean ± SD.	24.26 ± 8.87	22.28± 10.50	25.08 ± 9.73	18.34 ± 7.86	(0.711)	(0.064)
Median	24.0	22.0	25.0	18.50		
Z (p_0)	1.984* (0.047*)		5.524* (<0.001*)			

U: Mann Whitney test Z: **Wilcoxon signed ranks test**

Table (4): Comparison among control and study groups according to neuropathic pain severity

Neuropathic Pain severity	Control group (n = 50)		Study group (n = 50)		t (p_1)	t (p_2)
	Pre	Post	Pre	Post		
Total Score (0 – 100)						
Min. – Max.	8.0 – 86.0	8.0 – 74.0	9.0 – 85.0	0.0 – 51.0	0.235 (0.815)	3.725* (<0.001*)
Mean ± SD.	44.88± 21.17	37.12± 19.23	45.90± 22.25	24.66± 13.78		
Median	42.0	36.50	42.0	23.50		
Average Score (0 – 10) (Mean ± SD.)	4.49 ± 2.12	3.71 ± 1.92	4.59 ± 2.23	2.47 ± 1.38		
t_0 (p_0)	9.424* (<0.001*)		15.691* (<0.001*)			

t: Student t-test t_0: Paired t-test

Table (5): Correlation between neuropathy signs and symptoms and functional interference among the control and study groups

	Functional interference			
	Pre		Post	
	r	p	r	p
neuropathy signs and symptoms	0.910*	<0.001*	0.875*	<0.001*

r: Pearson coefficient

Discussion

One of the most significant side effects affecting the peripheral nerve system is CIPN. Exercise therapy has shown promise in the management of CIPN as a straightforward and practical non-pharmacological strategy. The precise effectiveness of exercise in enhancing CIPN is a topic that merits more research, though, as the conflicting and dispersed nature of the information makes it difficult for patients and doctors to make an informed decision **(Huang, et al., 2024).**

In order to improve the symptoms of peripheral neuropathy brought on by chemotherapy in women with breast cancer, the study set out to evaluate and compare the effectiveness of an extremities exercise program with nerve gliding.

Regarding the demographic traits of the studied participants, half of each group is over 40 years old. Additionally, **Giaquinto et al. (2024).** found that the majority of breast cancer cases founded in the same age group. Similarly, A systematic review and meta-analysis study by **Lin et al. (2021)** showed the majority of breast cancers are detected in women aged 50 and above. This outcome is linked to hormonal imbalance in this age range

As stated by this study half of the studied subjects were post-menopausal this is in line with the findings of (**Heer et al., 2020)**, who discovered that approximately two-thirds of women with breast cancer were post-menopausal. The recognized incidence trends for postmenopausal breast cancer are likely due to a rise in lifestyle and reproductive elements that are causally linked to occurrence of breast cancer.

According to study participants' routine exercise sedentary life style is more prevailing among studied groups it is supported by the findings of **García-Chico et al., (2023)**, who found an inverse correlation between physical activity and breast cancer rates, indicating that the likelihood of developing breast cancer is 20% less in the most active women compared to the least active ones. Concerning family history of the studied subjects, more than half of both groups have family history, this result suggesting the role of genetic inheritance in the development of breast cancer. The same results reported by, **Liu et al., (2021)** found that approximately 5–10% of the patients who were recently diagnosed with breast cancer will have a genetic basis of breast or ovarian cancer.

The study's findings regarding the subjects' symptoms related to peripheral neuropathy showed a statistically significant improvement in the study group compared to the control group. From the researchers ' perspective , this may be laid out by the fact that exercise is capable of promoting the peripheral nerves' regeneration. It is in agreement with **Andersen et al., (2020)**, who found that exercise program is well established for entrapment, neuropathic pain, nerve repair, and regeneration. Similar outcomes were reported by **Gui, Li, Zhuge & Xu, (2021)** speculate that, exercise increases peripheral blood circulation, that can enhance the metabolism of chemotherapy drugs and lessen its toxic drug effects, and aid in the regeneration of peripheral nerves.

Similarly, **Andersen et al., (2020)** emphasized Nerve gliding serves as a beneficial method before or during chemotherapy that enhances sensory symptoms of CIPN and alleviates disease burden. A randomised controlled trial by **Alharbi et al., (2023)** reported that Nerve gliding activates complicated neurophysiological modifications that improve nerve functionality and alleviate symptoms, including improving nerve's viscoelastic, nerve mobility, dispersion of intraneural fluids, stimulation of pain inhibition and decreased levels of inflammatory mediators associated with nerve pain

This is concurrent with the findings of **Diotti et al. (2022),** who discovered that resistance or endurance training combined with nerve gliding promots the alleviation of peripheral neuropathy symptoms. It is also supported by the findings of **Kanzawa-Lee, Larson, Resnicow & Smith, (2020) and Kneis et al., (2019)** highlighted that exercise happens to be outstandingly efficient in terms of counteracting the CIPN limiting effects. In addition to that, exercise therapy is capable of boosting balance and activity levels by altering the vascular function, in addition to positively impact the decreasing metabolic activity of peripheral nerves, according to a systematic review and meta-analysis of randomized controlled trials carried out by **Huang et al. in 2024**.

With regards to Physical Function and role function among studied groups, a significant improvement was noticed in study group compared to control group. From the researcher point of view this might be attributed to effect of chemotherapy on the nerve fiber involved in light touch and vibration sense, thermal detection, and thermal pain, which is in line with the findings of **Andersen et al., (2020)** who found that exercise is associated with cutaneous nerve reinnervation in neuropathy, alleviated painful neuropathy symptoms, enhanced gait, reaction time, and postural stability.

A systematic review and meta-analysis of randomized controlled trials by **Huang et al., (2023).** emphasized that physical activity can encourage the brain to generate endorphins, balance hormone levels, and consistently improve muscle oxygenation, allowing exercise to create a positive and enjoyable experience, thereby lessening the effects of CIPN on patients' everyday activities and ultimately enhancing their quality of life. Similarly, **Andersen et al., (2020)** pointed out that Physical therapy involving nerve gliding exercises before or during chemotherapy is an effective approach for treating neuropathies and neuropathic pain, enhancing nerve movement

across joints, alleviating pain, and reducing inflammation.

A narrative review by **Diotti et al., (2022)** revealed That exercise therapy is a highly effective treatment for neuropathy, enhancing postural stability and improving functional skills. It is in agreement with **Müller et al., (2021)** highlighting that individuals with neuropathy showed improvement from the exercise program in terms of overall fatigue, physical fatigue, decreased activity, and lowered motivation.

With respect to the neuropathic pain the findings of the present study reveal a statistically significant enhancement in pain severity post intervention in study group compared to control group. It is in agreement with **Hammond, Pitz, Lambert & Shay, (2019)** concluded that exercise therapy group demonstrated clinically meaningful enhancements in CIPN pain, along with statistically notable advancements in pain pressure thresholds and strength of grip when brought into comparison to the control group. Additionally, **Wu et al., (2021)** added that, taking into account the advantages of physical activity, including reductions in blood glucose and lipid levels, exercise-induced hypoalgesia, and enhancements in emotional well-being, it may serve as an efficient method to prevent and manage neuropathic pain. Moreover, **Huang et al., (2024)** reported that instantaneous short-term hypoalgesia has been observed with nerve gliding exercises and might clarify the decrease in reported neuropathic pain in the treatment group

As stated by this study a strong positive correlation founded between neuropathic symptoms, neuropathic pain and activity level among studied groups which is statistically significant.

It is in agreement with **Moran et al., (2020)** reported that Patients with cancer suffering from CIPN commonly experience symptoms related to motor and sensory disturbances, including lower limb dysesthesia and fatigue. These issues lead to a decreased ability to perform precise movements, which can impair the patient's balance and heighten the risk of falls. Similarly, **Charles et al., (2020)** pointed that it is sensible to deliberate physical therapy approaches for patients with CIPN-related disabilities. Moreover **Gui, Li, Zhuge & Xu (2021) and Dixit et al., (2023)** concluded that therapeutic exercise leads to a notable decrease in peripheral neuropathy symptoms in both short and long-term follow-ups, enhancing women's capacity to perform everyday activities

Conclusion:

This initial study's exploration design indicates that using an exercise program in conjunction with nerve gliding as a treatment paradigm can enhance neuropathic symptoms and functional capacities. It also has the potential to be a successful therapy for breast cancer patients undergoing chemotherapy.

Recommendations:

- Using nerve gliding in conjunction with an extremities exercise regimen as an interventional or supplemental therapy for patients with CIPN.
- To raise nurses' understanding of the value of nerve gliding in extremities exercise programs for patients with CIPN, an organizational-level ongoing training program should be created.
- For the results to be generalizable, the current study should be conducted again at a diversified healing center with a larger sample size and a longer follow-up.

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