

▪ **Basic Research**

**Effects of Tai Chi Chuan (TCC) Exercise on the Physiological and Psychosocial Wellbeing, and the Quality of Life (QOL) of Breast Cancer Patients on Adjuvant Chemotherapy**

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**Abstract**

**Background:** Breast cancer is a worldwide leading cause of morbidity and deaths. Non-pharmacological interventions accompanying conventional may help in improving patients' Quality of Life (QoL). **Aim of study:** to evaluate the effects of Tai-Chi Chuan (TCC) exercise on the Quality of Life (QOL) and the physiological and psychological wellbeing of breast cancer patients on adjuvant chemotherapy. **Subjects and Methods:** The study was carried out at Oncology Center in Fayoum, Egypt using a one-group quasi-experimental design with pre-post assessment on 115 breast cancer patients on regular attendance in the clinic. Data was collected using an interview questionnaire form with scales assessing symptoms, QOL, anxiety, and depression. The study intervention (Tai Chi Exercise [TCC] program) was applied through small group training sessions. Its effect was evaluated at the end of the intervention. **Results:** Patients' age ranged between 28 and 75, 94.8% women. The duration of illness was mostly <12 months (79.1%), and at an intermediate stage (60.0%). The pretest scores of frequency and severity of symptoms were high, QOL scores were very low, and at least a half were having high levels of anxiety and depression. At the post-intervention phase, statistically significant improvements were revealed in all four scales ( $p < 0.001$ ), with the only exception regarding the physical domain of QOL, which improved but with no statistically significant difference. In the multivariate analysis, the study intervention was a main negative predictor of the score of symptoms frequency and severity score, and a positive predictor of the QOL score. **Conclusion and Recommendations:** The practice of TCC exercises is effective in reducing the frequency and severity of chemotherapy side effects among cancer patients, with alleviation of their anxiety and depression symptoms, leading to improvement of their QOL. The study recommends wide application and use of TCC exercise in patients with breast cancer as well as other cancers. Further research is proposed to assess the effect of TCC exercise on the recurrence and survival of breast cancer. **Keywords:** Breast Cancer, Anxiety, Depression, Tai Chi Chuan (TCC) Exercise, Quality of Life

## Introduction

Breast cancer is a leading cause of morbidity and deaths in developing countries, where newly diagnosed cases constitute 62% of the universal new cases (*Al-Sukhun et al., 2022*). In the Middle East and North Africa (MENA) region, the age-standardized incidence and death rates of breast cancer in women were 37.5 and 15.2 per 100,000, respectively. Significant increases in these rates were witnessed over the last three decades (*Safiri et al., 2022*).

Although the incidence rates of breast cancer are higher among women in more developed countries, these rates are on the rise in almost all regions worldwide (*Gilchrist et al., 2019*). Egypt has incidence rates close to those in surrounding Arab countries, yet, its breast cancer mortality rate is higher (*Gany et al., 2020*). This has been attributed to wide disparities in racial and socioeconomic factors influencing treatment, and outcomes (*Moubadder et al., 2022*).

The management of breast cancer has greatly evolved during the last few years, with new treatment modalities and approaches (*Martínez-Sáez and Prat, 2021*). These advances have results in a steadily decreasing breast cancer death rates, along with improvements in patients' quality of life (QOL). These advances involved the refinement of systemic treatment options, as well as the recent advances in molecular biomarkers for more precision medicine, along with guidelines for supportive care to achieve the best outcomes (*El Masri and Phadke, 2021*).

Nonetheless, despite the major improvements in the survival rates of women suffering from breast cancer, the disease itself as well as its various treatments methods are associated with a wide spectrum of negative side effects, both physical like fatigue, nausea and vomiting, loss of hair, etc., as well as psychological as anxiety and depression, poor body image, and low self-esteem (*Park et al., 2018; Fabi et al., 2020*). This would certainly have a negative impact on their Quality of Life (QoL) as this is affected by such physical and psychological factors (*Couwenberg et al., 2019*). The QoL of breast cancer patients was shown to be greatly affected by the disease and its management modalities (*Drageset et al., 2021*).

New non-pharmacologic approaches are recently examined to help breast cancer patients cope with the physical and psychological ailments associated with their illness and treatments. For instance, a recent systematic review with meta-analysis demonstrated that recreational physical activities were associated with better outcomes among breast cancer patients, and even prevented recurrence among them (*Zagalaz-Anula et al., 2022*). Tai Chi Chuan (TCC) is an old type of exercise with multicomponent mind-body involvement at low to medium intensity (*Tao et al., 2017*). It involves physical activity,

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controlled breathing, and meditation, along with imagery to relax mind and body (*Liu et al., 2018*). It is also safe and low-cost with a high continuance rate (*Li et al., 2021*). It has shown effectiveness in alleviating pain and fatigue, even fibromyalgia (*Wang et al., 2018*), as well as in cancer therapy (*Ding et al., 2020*). It can thus be considered as a logical therapeutic approach (*Hissa et al., 2020*).

### **Significance of the study**

Although breast cancer is a dreadful event, it is a curable disease with early diagnosis and proper management. However, cancer fighters need physical and psychological conditioning to deal with their stress and phobias. This could be through non-pharmacological interventions accompanying their conventional therapies. The role of nursing is evident in such interventions. The effectiveness of TCC exercise was shown in certain chronic conditions, but there is a paucity of studies applying it to breast cancer patients.

### **Aim of the study**

The aim of this study was to evaluate the effects of Tai-Chi Chuan (TCC) exercise on the Quality of Life (QOL) and the physiological and psychological wellbeing of breast cancer patients on adjuvant chemotherapy.

### **Research Hypotheses**

H1: The scores of the frequency and severity of symptoms among breast cancer patients on adjuvant chemotherapy will decrease after implementation of Tai Chi Chuan Exercise.

H2: The scores of QOL among breast cancer patients on adjuvant chemotherapy will increase after implementation of Tai Chi Chuan Exercise.

H3: The scores of anxiety among breast cancer patients on adjuvant chemotherapy will decrease after implementation of Tai Chi Chuan Exercise.

H4: The scores of depression symptoms among breast cancer patients on adjuvant chemotherapy will decrease after implementation of Tai Chi Chuan Exercise.

### **Methodology**

**Research design:** An open label one-group quasi-experimental design with pre-post assessment was utilized to conduct this study.

**Setting:** The study was carried out at outpatients' clinics in Oncology Center in Fayoum, Egypt. It is a follow-up clinic for breast cancer patients on adjuvant chemotherapy. Total time for data collection was conducted over a period of five months from first January to the end of May 2023.

**Sample:** All patients on regular attendance in the clinic were eligible for inclusion in the study sample. Those with disabling physical or psychological ailments not allowing them to participate in the intervention were excluded. The required sample size was calculated to detect a group difference in the scores of Toronto Side Effects Scale or QoL with a moderate effect size (0.50). Using the G-Power software program for a-priori sample size determination at 95% level of confidence and 80% power, the required sample size was 105 patients. This was increased to 115 to compensate for an expected dropout rate of around 10%. Patients were recruited using a non-probability consecutive sampling technique.

**Data collection tool:** An interviewing questionnaire form with scales assessing symptoms, QOL, anxiety, and depression was used in collecting the data. It comprised the following parts.

*Part I:* This was for the demographic characteristics as age, education, marital and job status, residence, income, and crowding index.

*Part II:* This assessed the details of the present illness such as the duration of illness, cancer stage, treatment type, doses, and side-effects, as well as the history of chronic diseases and previous surgery.

*Part III:* This consisted of Toronto Side Effects Scale modified from *Healy (2001)*. It assesses the frequency and severity of 25 symptoms covering side-effects in most body systems in the preceding two weeks. Examples are nervousness, tremors, gastritis, anorexia, fatigue, insomnia, blurring, dry mouth, low sexual desire, etc. Each symptom is assessed on two different scales, one for its frequency and another for its severity. The two-scales are 5-point Likert type, ranging from "never" to "always" and from "no effect" to "unbearable", respectively. For scoring, the sums of each of the frequency and severity are calculated for a maximal score of 125. A higher score indicates more frequency and more severity of symptoms.

*Part IV:* The widely used QOL-RANDSF-36 tool developed by (*WHO, 1996*) was utilized to assess the health-related quality of life. This short form has 36 items assessing physical functioning (10 items), role limitations caused by physical (4 items) and emotional (3 items) health problems, social functioning (2 items), emotional wellbeing (5 items), energy/fatigue (4 items), pain (2 items), and general health perceptions (5 items), in addition to one item assessing the change in overall perceived health. The Arabic

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version of the scale was used. According to its guidelines, scoring is done through transforming each item to a possible range from zero to 100 and averaging the items of the same area together.

*Part V:* The Hospital Anxiety and Depression Scale (HADS), developed by **Zigmond and Snaith (1983)** and modified by **Bjelland et al. (2002)** was used to assess psychological wellbeing (anxiety and depression). The Arabic version of the scale was used. The scale has 7 items assessing anxiety and 7 items assessing depression. The response to each item has four choices indicating its frequency and intensity. These are scored from zero to three, with reverse scoring for positive items, and each summed to a possible maximum of 21. A higher score indicates more severity of anxiety/depression symptoms.

***Tools validity and reliability:*** The three scales used in data collection are standardized with documented validity and reliability. The Toronto scale was translated into Arabic using translation-back-translation. The prepared data collection form was presented to five experts in Community Health and Psychiatric Nursing to evaluate the appropriateness of the scales, and to review the first two parts of the form for validation. They approved the form and suggested only minor changes.

The reliability of the scales was also examined in the present study. Their computed Cronbach's alpha coefficients demonstrated good reliability: Frequency of side effects (0.96), severity of side effects (0.98), QOL (0.56), anxiety (0.72), and depression (0.51).

***Pilot study:*** A pilot study was carried out on 11 patients with breast cancer, about 10% of the main study sample. It was done to test the clarity and applicability of the tool and to estimate the time needed for the interview. Also, it helped detect any obstacles that might arise in data collection. Although no modification was needed in the data collection form, these were not included in the main study sample to avoid any bias.

#### ***Ethical considerations:***

The Fayoum University; Faculty of Medicine Research Ethics Committee granted clearance for the studies with reference number (R467). All research ethics principles were fulfilled according to **(Helsinki Declaration (1983))**. The patients were briefed with the purpose of the study and the data collection procedures.

Each patient participating in the study provided a verbal informed consent for inclusion in the study sample. This was done after obtaining a clear and simple explanation of the purpose of the study and the intervention. They were reassured about the confidentiality of any collected information and were informed about their rights to

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refuse participation or withdraw at any time.

**Fieldwork:** Once all administrative matters were completed, the researcher started recruitment of the patients in the study sample, introducing herself, explaining the purpose of the study and its benefits to each patient to obtain her

informed consent. Patients were also oriented about the concept of the Tai Chi Exercise program. Those who gave their consent to participate were interviewed using the data collection form in collaboration with the clinic staff responsible for their care. The average time needed to fill in the tool was 20-25 minutes. The data obtained constituted the baseline or pretest information.

The researcher then set a schedule for teaching sessions to train patients in carrying out the Tai Chi Exercise (TCC). This exercise comprises six steps: 1) *Getting ready*: patient asked to stand upright with feet together and knees straight but not closed; 2) *Moving step with arms moving*: Take a step to the left with left foot while keeping right foot in place so that the toes of left foot touch the ground, then the second and third toes, etc.; 3) *Move the body to the left*: Move foot at 45 degrees angle and move body weight towards right foot, make an imaginary circle in the foot with the right hand raised to the top, then turn left and take an empty step towards the north with left foot; 4) *Ball catching position*: The initial posture of this model is to stand with the ball facing you in the east. This form is one of the most important things about tai chi because it encompasses most of its basic principles; *Feng*: At the same time, take an empty step forward at a 45-degree angle so that the heel does not touch the ground, and then return by moving the weight forward; 6) *Lowe*: Turn foot slightly backward, transfer your weight, and then pull your hands in front of the center. Repeating these set of rules is important for beginners.

The training sessions were conducted in patients' waiting area in small groups. Each group of patients met three times a week for 30 minutes in a classroom in the same chemotherapy building. The training session started with a theoretical part about the Tai Chai exercise meaning and benefits for breast cancer patients, and this was followed by practical application of the exercise then re-application by patients. The training sessions also included videos, and role play methods. During the last part of each session, participants were trained in regulatory breathing, imagery, and meditation in order to enhance their TCC skills and provide an exercise cool-down. At session closure, patients were asked for their feedback, and were encouraged to practice the TCC.

After the end of the training program and the application of the TCC by patients, the researcher re-assessed their physical and psychological status using the same data collection form used in the pretest.

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**Statistical analysis:** The collected data were organized, tabulated and analyzed using the Statistical Package for the Social Sciences, version 16, SPSS Inc. Chicago, IL, USA. For quantitative data, the range, means and standard deviation, and medians were computed. For comparisons between two means, Mann-Whitney test was used. Spearman rank correlation analysis was used for ranked and quantitative data. Multiple regression analysis was applied for identification of the predictors of the scores of the various scales. The level of statistical significance was adopted at  $p < 0.05$ .

## Results

Table (1) shows that patients' age ranged between 28 and 75, median 49 years, with a great majority of women (94.8%). Around two-fifth of them were either with no (39.1%) or basic/secondary (42.6%) education. Most of them were married (68.7%), not working (72.2%), residing in rural areas (60.0%), with high crowding index (71.3%), and sufficient income (60.0%).

Table (2) shows the duration of illness was mostly <12 months (79.1%), and at an intermediate stage (60.0%). Very few of them had radiation (7.8%) or hormonal (1.7%) treatment. All patients reported having side-effects, mostly moderate to severe. Around a half of the patients had chronic diseases (53.9%), and the majority gave a history of previous surgery (85.2%).

Table (3) demonstrates that the pretest scores of patients' frequency and severity of symptoms were high exceeding the middle of the max scale score of 125. On the other hand, their pretest QOL scores were very low, way below the middle of the max scale score of 100. This was most evident in the domains of physical and emotional role, as well as the fatigue domain. As for the pretest anxiety and depression scores, their medians were 12 indicating that at least a half of them were having high levels of anxiety and depression. At the post-intervention phase, statistically significant improvements were revealed in all four scales ( $p < 0.001$ ), with the only exception regarding the physical domain of QOL, which improved but with no statistically significant difference. Meanwhile, the median score of the emotional role domain of QOL increased from 0.00 at pretest to 100.0 at posttest. Also, the posttest anxiety and depression median scores of 8.00 imply that at least a half of them were having no anxiety or depression.

Table (4) shows a statistically significant strong positive correlation between the scores of symptoms frequency and severity ( $r = 0.788$ ). It also demonstrates statistically significant moderate to strong negative correlations between the scores of symptoms frequency and severity and all domains and total of QOL, except for the physical domain. On the other hand, there were statistically significant moderate positive correlations between the scores of symptoms frequency and severity and each of the anxiety and depression scores.

Table (5) illustrated that patients' level of education had a statistically significant weak positive correlation with the score of symptoms frequency, while their crowding index correlated positively with their depression. The duration of cancer correlated positively with the score of symptoms, and negatively with QOL. The number of doses taken correlated positively with the scores of symptoms frequency and severity, and negatively with the QOL score. Lastly, the number of chronic diseases correlated positively with the scores of symptoms frequency, and negatively with depression.

Table (6) shows the study intervention was the main statistically significant independent negative predictor of the score of symptoms frequency, while the cancer stage and number of chronic diseases were positive predictors, and the model explained 48% of its variation. As for the severity score, the study intervention was its main negative predictor, while the hormonal therapy and the number of doses taken were positive predictors, and the model explained 81% of its variation.

As for the anxiety and depression scores, the table shows the score of severity of symptoms was their main statistically significant independent positive predictors. Meanwhile, the female gender, radiation, and chemotherapy treatments were positive predictors of the anxiety score, and the crowding index for the depression score. Lastly, the study intervention was a main statistically significant independent positive predictor of the QOL score, whereas the score of severity of symptoms was a negative predictor, and they explained 63% of the variation of this score.

**Table 1: Demographic characteristics of patients in the study sample (n=115)**

Item	Frequency	Percent
Age:		
<40	39	24.3
40-	68	59.1
60+	19	16.5
Range	28-75	
Mean±SD	49.2±10.1	
Median	49.0	
Gender:		
Male	6	5.2
Female	109	94.8
Education:		
None	45	39.1
Basic/secondary	49	42.6
University	21	18.3
Currently married:		
No	36	31.3
Yes	79	68.7
Currently working:		
No	83	72.2
Yes	32	27.8
Job affected by illness (n=32):		
No	2	6.3
Partially	20	62.5
Quit	10	31.3
Residence:		
Rural	69	60.0
Urban	46	40.0
Crowding index:		
<2	33	28.7
2+	82	71.3
Income:		
Insufficient	46	40.0
Sufficient	69	60.0

**Table 2: Disease characteristics of patients in the study sample (n=115)**

Item	Frequency	Percent
Duration of illness (months):		
<12	91	79.1
12+	24	20.9
Range	2-24	
Mean±SD	7.5±4.2	
Median	7.0	
Cancer stage:		
Early	36	31.3
Intermediate	69	60.0
Advanced	10	8.7
Treatment:		
Chemotherapy (only)	113	98.3
+ Surgery	57	49.6
+ Radiation	9	7.8
+ Hormonal	2	1.7
Doses taken:		
1-3	40	34.8
4+	75	65.2
Have side effects	115	100.0
Side effects:		
Slight	27	23.5
Moderate	45	39.1
Severe	43	37.4
Chronic diseases	62	53.9
Previous surgery	98	85.2

**Table 3: Scores of symptoms frequency/severity, Quality of Life (QOL), anxiety, and depression among patients in the study sample before and after Tai-Chi intervention**

Scores	Time				Mann-Whitney Test	p-value
	Pre (n=115)		Post (n=115)			
	Mean±SD	Median	Mean±SD	Median		
Symptoms (max=125):						
Frequency	71.8±24.0	70.00	41.5±8.7	41.00	98.76	<0.001*
Severity	73.7±12.0	75.00	34.0±7.0	34.00	90.00	<0.001*
QOL (max=100):						
Physical	45.5±1089.9	50.00	53.3±414.0	40.00	1.87	0.17
Physical role limitation	11.3±28.7	0.00	62.2±32.3	75.00	100.07	<0.001*
Emotional role limitation	16.2±35.4	0.00	70.2±36.5	100.00	83.71	<0.001*
Fatigue	26.1±19.7	25.00	54.0±11.9	50.00	94.86	<0.001*
Wellbeing	30.7±22.0	32.00	67.4±12.7	68.00	119.27	<0.001*
Social functioning	46.1±18.9	50.00	65.8±17.3	70.00	56.23	<0.001*
Pain	43.8±16.8	50.00	62.4±15.7	60.00	54.66	<0.001*
General	42.0±5.7	40.00	55.9±8.0	56.70	121.41	<0.001*
Total	32.7±11.4	31.40	61.4±12.0	63.70	139.82	<0.001*
Anxiety (max=21)	11.9±3.7	12.00	7.4±2.8	8.00	71.01	<0.001*
Depression (max=21)	11.3±3.1	12.00	8.2±3.0	8.00	52.04	<0.001*

(\*) Statistically significant at  $p < 0.05$

**Table 4: Correlations between patients' scores of severity and frequency of side effects and their Quality of Life (QOL), anxiety, and depression**

Item	Spearman's rank correlation coefficient	
	Frequency	Severity
Severity	.788**	
QOL:		
Physical	.120	.054
Physical role	-.521**	-.646**
Emotional role	-.489**	-.595**
Fatigue	-.596**	-.674**
Wellbeing	-.650**	-.737**
Social functioning	-.427**	-.544**
Pain	-.508**	-.611**
General	-.594**	-.717**
Total	-.619**	-.770**
Anxiety	.529**	.585**
Depression	.506**	.534**

(\*) Statistically significant at  $p < 0.05$ (\*\*) Statistically significant at  $p < 0.01$ **Table 5: Correlations between patients' scores of severity and frequency of side effects and their Quality of Life (QOL), anxiety, and depression and their characteristics**

Characteristics	Spearman's rank correlation coefficient				
	Frequency	Severity	QOL	Anxiety	Depression
Age	.045	.086	.078	-.082	.171
Educational level	.194*	-.061	-.055	-.019	.000
Crowding index	.114	.051	.002	-.031	.239**
Duration of cancer	.236*	.138	-.297**	.090	.175
Doses taken	.205*	.235*	-.238*	.065	-.019
No. of chronic diseases	.245**	.004	-.004	-.121	.237*

(\*) Statistically significant at  $p < 0.05$ (\*\*) Statistically significant at  $p < 0.01$

**Table 6: Multiple linear regression models for patients' scores of side effects severity and frequency, Quality of Life (QOL), anxiety, and depression and their characteristics**

Item	Unstandardized Coefficients		Standardized Coefficients	t-test	p-value	95% Confidence Interval for B	
	B	Std. Error				Lower	Upper
Side effects frequency score							
Constant	88.93	4.98		17.869	<0.001	79.12	98.74
Intervention	-29.59	2.24	-0.64	13.187	0.000	-34.02	-25.17
Cancer stage	4.29	1.89	0.11	2.272	0.024	0.57	8.02
No. of chronic diseases	2.32	0.50	0.22	4.602	<0.001	1.32	3.31
r-square=0.48 Model ANOVA: F=50.75, p<0.001 Variables entered and excluded: age, gender, education, residence, crowding index, work, duration of cancer, doses taken, treatment types							
Side effects severity score							
Constant	109.72	2.38		46.073	<0.001	105.03	114.42
Intervention	-39.31	1.28	-0.90	30.761	<0.001	-41.83	-36.79
Hormonal therapy	9.85	4.85	0.06	2.032	0.043	0.30	19.40
No. of doses taken	0.58	0.26	0.07	2.232	0.027	0.07	1.09
r-square=0.81 Model ANOVA: F=318.48, p<0.001 Variables entered and excluded: age, gender, education, residence, crowding index, work, stage and duration of cancer, treatment other than hormonal							
Anxiety score							
Constant	-3.53	2.46		-1.435	0.153	-8.38	1.32
Female gender	1.96	0.92	0.12	2.132	0.034	0.15	3.77
Radiation	1.94	0.76	0.14	2.557	0.011	0.45	3.44
Chemotherapy only	3.89	1.56	0.13	2.502	0.013	0.83	6.96
Severity score	0.10	0.01	0.56	10.339	<0.001	0.08	0.12
r-square=0.36 Model ANOVA: F=31.03, p<0.001 Variables entered and excluded: age, education, residence, crowding index, work, stage and duration of cancer, surgical/hormonal treatment, symptoms frequency, intervention							
Depression score							
Constant	4.28	0.78		5.482	0.000	2.74	5.82
Crowding index	0.66	0.31	0.12	2.135	0.034	0.05	1.26
Severity score	0.08	0.01	0.50	8.749	<0.001	0.06	0.10
r-square=0.27 Model ANOVA: F=41.30, p<0.001 Variables entered and excluded: age, gender, education, residence, work, chronic diseases, stage and duration of cancer, doses taken, treatment types, symptoms frequency, intervention							
QOL score							
Constant	50.49	10.34		4.884	<0.001	30.11	70.86
Intervention	15.99	3.37	0.44	4.748	<0.001	9.36	22.63
Severity score	-0.31	0.08	-0.37	-4.073	<0.001	-0.46	-0.16
r-square=0.63 Model ANOVA: F=127.01, p<0.001 Variables entered and excluded: age, gender, education, residence, work, chronic diseases, stage and duration of cancer, doses taken, treatment types, symptoms frequency							

## Discussion

The diagnosis of having breast cancer implies the start of a series of stressors related to related symptoms, treatment side effects, and phobias of possible recurrence and death, in addition to the family, social, and financial burdens (*Yamani Ardakani et al., 2020*). This study aim was to evaluate the effects of Tai-Chi Chuan (TCC) exercise on the Quality of Life (QOL) and the physiological and psychological wellbeing of breast cancer patients on adjuvant chemotherapy. The findings indicate that the implementation of this intervention lead to significant decreases in the scores of side-effects symptoms frequency and severity, increases in the QOL scores, and decreases in the scores of anxiety and depression symptoms. These findings lead to acceptance of the set research hypotheses.

At the pre-intervention phase, the physical wellbeing of the patients in the present study was low as indicated by their high scores of frequencies and severity of symptoms. This is expected given that more than two-thirds of them were at intermediate or advanced stages of cancer. The most prevalent side effects reported were those of headache, dizziness, postural hypotension, muscle spasm, nervousness, as well as the symptoms of nausea and vomiting. These are all common side-effects of chemotherapy associated with mental distress as previously reported (*Jacobs et al., 2022; Phoosuan and Lundberg, 2022*).

The practice of TCC exercises led to significant improvements in the scores of side-effects symptoms frequency and severity among the cancer patients in the current study. This might be explained by the fact that the TCC exercise is not just a physical activity but rather a mind-body activity that can improve individual's physical and mental wellbeing. In congruence with this, *Wang et al., (2018)* in a study in the United States demonstrated significant improvements in pain severity, with its supremacy when compared to aerobic exercises.

The present study cancer patients' QOL was also very low before the intervention. The limitations of their physical and emotional roles were the most affected domains of their QOL, which could be attributed to their fatigue, both physical and mental, not allowing them to fully achieve their usual activities. Added to this is the time spent in the administration of various treatment modalities. Moreover, the fatigue domain of QOL also was one of the lowest in pre-intervention scores. In agreement with this, a study of the QOL of breast cancer patients in Germany found that their QOL is significantly lower in comparison with the general population (*Hinz et al., 2022*). Moreover, a systematic review and meta-analysis reported lower QOL levels among those breast cancer patients on chemotherapy, as our patients, in comparison with those who completed it (*Javan Biparva et al., 2022*).

The implementation of the current study intervention of TCC exercise practice was associated with significant improvements in their QOL scores. This was revealed in all its domains as well as the total score. However, the physical functioning domain of QOL improved but did not reach statistical significance. This might be due to that this domain had the highest pretest score among them as it involves all activities of daily life. On the other hand, the emotional role domain of QOL demonstrated the highest improvement, reflecting the important role of TCC exercise on their mind health. Nonetheless, the improved QOL among our patients could be induced indirectly by the effect of the TCC exercise in reducing their fatigue, which could have a positive impact on their QOL. In line with this, a study in the United States demonstrated that a community-based exercise improved the QOL of breast cancer patients through alleviating their fatigue symptoms (*Wagoner et al., 2022*).

The present study has also addressed the psychosocial wellbeing of breast cancer patients through assessment of their anxiety and depression symptoms. The study results revealed high scores and levels of these symptoms at the pretest phase. Actually, more than a half of the sample had their median score exceeding the cutoff level of severe symptoms. The findings are quite conceivable given the psychological burdens of the disease itself, in addition to the effects of chemotherapy and other treatment modalities administered. In agreement with these results, a systematic review and meta-analysis reported that the prevalence of depression among Iranian women with breast cancer was around 50% (*Rezaghali et al., 2022*). On the same line, a study in the United States reported high rates of anxiety and depression among breast cancer patient survivors, and this was related to the initiation of their chemotherapy treatment (*McNeish et al., 2022*).

Meanwhile, at the post-intervention phase, the anxiety and depression scores showed statistically significant decreases, with approximately one half of them having their medians of anxiety or depression dropped below the cutoff point of diagnosis of these psychological ailments. This could be explained by the alleviating effects of TCC exercise on their side effects symptoms. In fact, the severity score correlated positively with the scores of anxiety and depression scores, and it was identified as a positive predictor of the anxiety and depression scores being a mind-body exercise. A similar effect of interventions combining physical and mental components were reported as effective in the alleviation of anxiety and depression symptoms among breast cancer patients such as the use of a 16-week dance intervention in China (*He et al., 2022*), Qigong training in Brazil (*Quixadá et al., 2022*), and mindfulness Yoga in China (*Liu et al., 2022*), and Baduanjin exercise in China (*Wei et al., 2022*).

Overall, the present study intervention led to significant improvements in breast cancer patients physical and mental wellbeing. The intervention had a direct impact on the frequency and severity scores of their symptoms of side effects being a negative predictor

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of their scores. On the other hand, the beneficial effect of the intervention on their anxiety and depression was indirect through the improvement of their severity scores. Meanwhile, the intervention acted on the scores of QOL both directly, being its main positive predictor, and also indirectly again through alleviating the severity score. In agreement with this, a randomized clinical trial in the United States demonstrated that the application of a TCC intervention led to significant improvements in the physical and mental wellbeing of breast cancer patients, and these improvements were maintained at the follow-up phase of the study (*Gao et al., 2022*).

On the same line, another study using an online TCC exercise intervention during the COVID-19 pandemic in the United States reported beneficial effects on breast cancer patients' pain symptoms and depression (*Gomaa et al., 2022*). Furthermore, another randomized clinical in the United States demonstrated statistically significant improvements in the level of physical activity of breast cancer patients following two interventions, namely Latin dance, and Qigong/Tai Chi (*Soltero et al., 2022*).

### **Conclusion**

The study findings indicate that the practice of TCC exercises is effective in reducing the frequency and severity of chemotherapy side effects among cancer patients, with alleviation of their anxiety and depression symptoms, leading to improvement of their QOL.

### **Recommendations**

The study recommends wide application and use of TCC exercise in patients with breast cancer as well as other cancers. Proper teaching and training materials and resources need to be available in all settings providing care to such patients. Nurses have a major role in the application of such modalities. Further research is proposed to assess the effect of TCC exercise on the recurrence and survival of breast cancer.

### **Limitation of the study**

Some of the patients were from rural areas, and far distance areas sometimes they were not available for all training sessions and needed to repeat individually that took more effort to conduct to them. Five participants did not show up in follow up and didn't explain why. Also scattered sources of published research about this topic.

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## Conflicts of interest

There are no conflicts of interest.

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### الملخص العربي

#### تقييم آثار تمرين تاي تشي تشوان (TCC) على جودة الحياة (QOL) الصحة الجسمانية والنفسية لمرضى سرطان الثدي على العلاج الكيميائي المساعد

**مقدمة:** سرطان الثدي هو سبب عالمي رئيسي يؤدي الى الوفاة وقد تساعد التدخلات غير الدوائية المصاحبة للطرق التقليدية في تحسين جودة حياة المرضى. **هدف الدراسة:** تقييم آثار تمرين تاي تشي تشوان (TCC) على جودة الحياة (QOL) الصحة الجسمانية والنفسية لمرضى سرطان الثدي على العلاج الكيميائي المساعد. **تصميم الدراسة:** أجريت الدراسة باستخدام تصميم شبه تجريبي على مجموعة واحدة تحتوي على عدد 115 مريضة من مرضى سرطان الثدي الذين يحضرون بانتظام في العيادة. وتم عمل تقييم للمرضى قبل وبعد استخدام تمرين تاي تشي تشوان (TCC) وتم جمع البيانات باستخدام نموذج استبيان المقابلة الشخصية و مقاييس تقييم الأعراض و جودة حياة المرضى والقلق والاكتئاب. تم تطبيق تدخل الدراسة (برنامج تمرين تاي تشي [TCC]) من خلال جلسات تدريبيه جماعية صغيرة. تم تقييم تأثيره في نهاية التدخل. **النتائج:** تراوحت أعمار المرضى ما بين 28 و 75 (94.8%) و كانت مدة المرض في الغالب أقل من 12 شهرًا (79.1%) ، وفي المرحلة المتوسطة (60.0%). كانت درجات الاختبار المسبق لتكرار الأعراض وشدتها عالية ، وكانت درجات جودة الحياة منخفضة للغاية ، وكان النصف على الأقل يعانون من مستويات عالية من القلق والاكتئاب. بينما في مرحلة ما بعد التدخل ، تم الكشف عن تحسينات ذات دلالة إحصائية في جميع المقاييس الأربعة ( $P < 0.001$ ) ، مع الاستثناء الوحيد فيما يتعلق بالجانب الجسمانى فوجد تحسن في جودة الحياة ولكن بدون فرق معتد به إحصائيًا. في التحليل متعدد المتغيرات ، كان تدخل الدراسة مؤثرًا سلبيًا رئيسيًا لدرجة تكرار الأعراض ودرجة الشدة ، ومؤثرًا إيجابيًا لدرجة جودة الحياة. **الخلاصة والتوصيات:** ممارسة تمارين تاي تشي تشوان TCC فعالة في تقليل تكرار وشددة الآثار الجانبية للعلاج الكيميائي بين مرضى السرطان ، مع تخفيف أعراض القلق والاكتئاب لديهم ، مما يؤدي إلى تحسين جودة حياة المرضى. توصي الدراسة بتطبيق واستخدام تمارين TCC على نطاق واسع في مرضى سرطان الثدي وأنواع السرطان الأخرى. تم اقتراح مزيد من اجراء البحث لتقييم تأثير تمرين TCC على تكرار وبقاء سرطان الثدي.

**الكلمات الرئيسية:** تمرين تاي تشي تشوان (TCC) ، جودة الحياة ، سرطان الثدي ، القلق ، الاكتئاب