Effect of Nursing Interventions on Pain and Anxiety among Women undergoing Screening Mammography

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Abstract: **Breast cancer (BC) is the most common cause of female cancer-related mortality worldwide. Mammography is the primary test recommended for early detection of BC. Pain and anxiety are the most reported feelings during screening mammography. Aim of the study: To determine the effect of nursing interventions, based on providing health education, and teaching deep breathing exercise, on pain and anxiety related to screening mammography. Research design: A quasi- experimental research design was utilized in this study. Setting: This study was carried out at the Alexandria Regional Center for Women Health and Development, Alexandria, Egypt. Subjects: 100 adult women scheduled for screening mammography in the above mentioned study setting. Tools: Three tools were developed ,adapted and adopted for data collection: a-Women' Knowledge Structured Interview Questionnaire to assess subjects' educational needs related to mammography, b-Visual Analog Scale (VAS) for anxiety to evaluate women's anxiety levels before, and during mammography. c- Pain Assessment Scale to evaluate pain intensity. Results: The mean age of the participants was (39.96 ± 10.40), and 41.54 ± 10.45 years old in both study, and control groups respectively. The nursing interventions had statistical significant reduction on pain, and anxiety levels of women undergoing screening mammography, as 60.0% of women in the study group experienced mild pain during the procedure, and 32% of them reported feeling relaxed or not anxious. Conclusion: Nursing interventions have the potential to south pain and anxiety in women undergoing screening mammography. Recommendations: Development of mammography comfort practices should be considered equal to other imaging examinations assisted by nurses.**

Keywords: **Nursing interventions, Pain, Anxiety, Health education, Relaxation techniques, Screening mammography.**

I. INTRODUCTION

Breast cancer (BC) is the fifth cause of death from all cancers and the second most common cause of female cancer-related mortality worldwide[1,2]. The incidence of breast cancer is increasing in the developing countries due to increased life expectancy, increased urbanization, and adoption of western lifestyles [3-5]. In Egypt, BC accounts for 29.1% of the total cancer related mortality[6].

The etiology of breast cancer is still unknown. However, older age, family history, oral contraceptives , hormonal replacement therapy, early menarche, late first full-term pregnancy, late menopause, and tobacco smoking have been shown to impact women' risk of developing BC [7-9].

Early detection is the most suitable approach to decrease breast cancer related mortality, as BC ordinarily produces no symptoms when the tumor is small and most easily treated[10-12]. The American Cancer Society (2017) recommends annual mammography for early diagnosis of breast cancer, as they decline mortality by 20-30% in adult women [13].

Mammography is the primary test recommended for early detection of BC [14-16]. It is a low-dose x-ray procedure that permits visualization of the internal structure of the breast. [17-19]. In mammography, a specific amount of breast compression is applied to separate overlapping structures, to improve image quality, decrease the radiation dose, and reduce motion artifact [20,21].

Despite the fact that, mammography is the most reliable approach to discover breast cancer early, pain (whether expected or experienced) is the most important barrier to mammography [14]. It impacts negatively on women' willingness to screening mammography due to compression of breast tissue between the pressure plates of the mammography apparatus [22]. Several studies on pain related mammography revealed that 0.2 to 85% of women experience pain during the procedure, that varies from mild to severe [23-25].

Anxiety is the most reported feeling during screening mammography [26]. It stems from expected pain, fear from exposure to high doses of radiation, fear from the results, and lack of knowledge related to procedure [27,28]. Furthermore, screening mammography is considered a sensitive procedure that can create anxiety among women because of its embarrassing nature based on women' cultural believes [29]

Managing pain, anxiety related mammography is challenging not only because of its sources of unpleasantness, but also because of their negative consequences on women including poor cooperation and more difficult or painful procedure. Anxiety and pain associated with mammography; both have been found to be a barrier in undergoing mammography by women [30].

Nurses as health educators have an important role to decrease pain and anxiety levels associated with screening mammography [31]. Their holistic perspective and advanced practice skills enable them to educate women at all levels of health care [32]. Offering information to women is one of the most significant responsibility and independent role of nurses which can diminish severity of their pain and anxiety [33,34].

Several studies revealed that health education about the mammography experience has been suggested as a method of southing women' pain, and anxiety, where they are able to express their feelings, as well as to receive the answers to their questions regarding the procedure which improves their mental and physical health[32-34].

In addition, nurses play a crucial role in improving the overall experience related to mammography through teaching women how to practice appropriate relaxation techniques that can reduce tension induced pain [14, 35]. Relaxation techniques are simple, inexpensive, noninvasive interventions that could have been used successfully in reducing pain and anxiety during radiologic procedures, including endoscopy, MRI, and mammography [36]. Deep breathing exercise is commonly used form of relaxation techniques that can help participants better manage pain, and anxiety related screening. It improves women' coping with pain, and anxiety by changing their thoughts, feelings and behaviors [37-39].

In Egypt, no previous studies had evaluated the effect of nursing interventions on pain, and anxiety related to screening mammography, which is arguably the best way to approach effectiveness. Thus, the aim of this study was to determine the effect of nursing interventions, based on providing health education, and teaching deep breathing exercise, on pain and anxiety related to screening mammography.

Aim of the study: To determine the effect of nursing interventions, which incorporate health education, and teaching deep breathing exercises, on pain and anxiety among women undergoing screening mammography.

Hypotheses:

H 1 : women who receive the nursing interventions before mammography exhibit less pain intensity during screening mammography than those who don't.

H2: women who receive the nursing interventions before mammography exhibit less anxiety level before and during screening mammography than those who don't.

II.   MATERIALS AND METHOD

Materials:

Design: A quasi- experimental research design was used to fulfill the aim of the present study.

Setting: This study was conducted at Alexandria Regional Center for Women's Health and Development.

Subjects: Participants of this study included a convenience sample of 100 adult women, among those admitted to the above mentioned study setting, and scheduled for mammography. Women were divided randomly using a computer program to either control or study group, fifty women each. All women were selected according to the following criteria:

- Adult women aged 20-60 years.

- Able to communicate verbally.

- No hearing, vision, or perception problems.

- No pain or anxiety medication before mammography.

- No history of breast cancer, no mammography before.

Sample size calculation: Epi info -7 programs was used to estimate the sample size using the following parameters:

Population size = 325/ 3 months

Expected frequency = 50 %

Acceptable error = 5%

Confidence co efficient =95 %

Minimum sample size = 74 patients

Tools:

Tool (I) "Women' Knowledge Structured Interview Questionnaire": An Arabic structured questionnaire sheet was developed by the researchers based on a review the relevant literature[40-43], to assess subjects' educational needs related to mammography, and to develop the health education booklet accordingly: It included two parts:

Part (I): This part included women' socio-demographic and clinical data; as age, marital status, level of education, working status , area of residence , family history of breast cancer**,** breast tenderness , regular caffeine consumption.

Part (II): This part included 10 closed ended questions about the definition of mammography, indications, side effects, advantages, duration of session and precautions before and during the procedure. Women' levels of knowledge were scored as "two" for "Correct, complete answer", "One" for "Correct, incomplete answer", "zero" for "incorrect/ no response answer". The total score value of women' knowledge ranged from zero to 20. Total women' knowledge score were summed up and converted into a percent score as follows: $\geq$ 60% satisfactory and unsatisfactory if less than 60%.

Tool (II) Visual Analog Scale (VAS) for anxiety: This scale was adapted from Miller et al (2015) [44] to evaluate women's anxiety levels before, and during mammography. The 10 cm vertical line of the VAS was anchored on each end with the descriptors "not anxious at all" and "extremely anxious." A score of zero means no anxiety; score of 1- 3 indicated mild anxiety, 4-6 indicates moderate anxiety and 7- 10 indicated severe anxiety.

Tool (III) Pain assessment Scale: This scale was adopted from Hjermstad (2011)[45], to evaluate pain intensity. It is a standardized linear scale ranged from 0-10. A score of zero means "no pain" , score of 1up to 3 indicates "mild pain" , 4 up to 6 indicate "moderate pain" and 7 up to 10 indicate "severe pain" (worst possible pain).

-**Nursing Intervention Protocol:** consisted of two areas:

1. Informational area.

- Based on the assessment findings, the researcher presented an educational unit about mammography for 15 minutes including: definition, indications, advantages, limitations, precautions carried out before, and during procedure , and steps of the procedure.

2. Practical area : included teaching women in the study group deep breathing exercises

Method:

▪ Official permissions to carry out the study from the identified setting authorities were obtained, after explaining the purpose of the study.

▪ The study tools were developed, adapted and adopted based on recent review of relevant literature.

▪ Content and construct validity of the developed tools were ascertained by a jury of five experts in the fields of Medical Surgical Nursing, and Oncology. The necessary modifications were introduced, accordingly.

▪ Reliability of the tools was established by using Cronbach's Alpha Coefficient Test (= 0.852) which indicated that, the tools were reliable.

▪ A Pilot study was conducted on 10% of subjects for testing feasibility and applicability of the developed tools and modifications were introduced accordingly. Pilot study subjects were excluded from the study sample.

▪ **Data collection and implementation of the study:**

- After securing the administrative approval, data collection was started and continued for a period of five months (from January to May 2019).

- Before interventions:

- All subjects were asked to participate in an interview-administered questionnaire to collect their socio-demographic and clinical data, and to assess their knowledge related to mammography using tool (I).

- All subjects were asked to mark their anxiety they experienced before mammography examination using tool II).

- All subjects were asked to not let the radiology technologist know their group assignment.

- **The control group** was exposed to the routine study setting interventions provided to them by the radiology taff.

- **The study group** received the nursing interventions as follow:

➢ Before mammography, each woman received simple power point presented by the researchers for 15 minutes to inform them issues related to mammography exam.

➢ Women were instructed to practice deep breathing exercise while sitting in the waiting room before and again during the mammogram. Women were instructed to evacuate bladder, and relaxed in a comfortable position with her hands on her side with straight spine and closed eyes. The women were instructed to practice deep diaphragmatic breathing deeply using her diaphragm as follow:

- Place one hand on her abdomen and the other on the chest.

- Inhale slowly and deeply through nose, hold breath for a few seconds before exhaling. Begin exhaling slowly through pursed lips. Continue the deep breathing exercise for 5minutes.

➢ The researchers accompanied the women during the procedure to assure , and guide them in performing deep breathing exercises

➢ After mammography, every subject in both groups was interviewed by a research assistant in the waiting room. They were asked to mark the level of anxiety (using tool II) and/or pain they experienced (using tool III) during their mammography examination.

▪ **Ethical considerations:** Written consent was obtained from subjects before participation in the study after explaining the aim of the study. The studied women were ascertained that their participation in the study is voluntary and they could withdraw from the study at any time. Confidentiality and privacy were assured.

Statistical analysis of the data

Data were fed to computer and analyzed using IBM SPSS software package version 20.0.(Armonk, NY: IBM Corp) Qualitative data were described using number and percent. Quantitative data were described using range (minimum and maximum), mean and standard deviation. Significance of the obtained results was judged at the 5% level.

The tests were used as follows:

1 - Chi-square test: For categorical variables, to compare between different groups

2 - Monte Carlo correction, for correction for chi-square when more than 20% of the cells have expected count less than 5

3 - Marginal Homogeneity Test, to analyze the significance between the different stages

4 - Student t-test, for normally distributed quantitative variables, to compare between two studied groups

5 - F-test (ANOVA), for normally distributed quantitative variables, to compare between more than two groups.

III.   RESULTS

Table (1): shows frequency distribution of the studied women according to their socio-demographic (n=100).

The table illustrates that the mean age of the participants was (39.96 ± 10.40), and 41.54 ± 10.45 years old the study, and control groups respectively. Also, the majority of women in both study, and control groups were married (68%& 76%), and housewives (64%, 68%), respectively. Moreover, about one- third of women in both study, and control groups (32%, 38%) were diploma holders, respectively. Also, the majority of women (66%, 58%) in both groups live in urban areas, respectively.

Table (1): Frequency distribution of the studied women according to their socio-demographic characteristics (n=100).

Socio-demographic characteristics of the studied women	Study (n= 50)		Control (n= 50)	
	No.	%	No.	%
Age (years)				
20 <35	15	30.0	15	30.0
35 <50	25	50.0	21	42.0
50 – 60	10	20.0	14	28.0
Min. – Max.	20.0 – 60.0		20.0 – 60.0	
Mean ± SD.	39.96 ± 10.40		41.54 ± 10.45	
Marital status				
Never married	5	10.0	5	10.0
Married	34	68.0	38	76.0
Divorced/ Widow	11	22.0	7	14.0
Education level				
Illiterate	9	18.0	9	18.0
Read& write	12	24.0	8	16.0
Diploma degree	16	32.0	19	38.0
Bachelor degree	13	26.0	14	28.0
Working status				
Working	18	36.0	16	32.0
Not working (house wives)	32	64.0	34	68.0
Area of residence				
Urban	33	66.0	29	58.0
Rural	17	34.0	21	42.0

ISSN 2394-7330

International Journal of Novel Research in Healthcare and Nursing
Vol. 6, Issue 3, pp: (454-469), Month: September - December 2019, Available at: **www.noveltyjournals.com**

Table (2): **represents frequency distribution of the studied women according to their clinical characteristics (n=100).**

The table displays that the majority of women in the study and control groups didn't reach menopause, had neither family history of breast cancer, nor breast tenderness (76%, 68%), (54%,62%), (76%, 70%) respectively. Also, more than half of the respondents (56.0%, 62.0%) of the study subjects and controls were regularly caffeine consumers.

Table (2): Frequency distribution of the studied women according to their clinical characteristics (n=100).

Clinical characteristics of the studied women	Study (n= 50)		Control (n= 50)	
	No.	%	No.	%
(Hormonal status) Menopause				
Yes	12	24.0	16	32.0
No	38	76.0	34	68.0
Family history of breast cancer				
Yes	23	46.0	19	38.0
No	27	54.0	31	62.0
Breast tenderness				
Yes	38	76.0	35	70.0
No	12	24.0	15	30.0
Regular caffeine consumption				
Yes	28	56.0	31	62.0
No	22	44.0	19	38.0

Table (3): shows distribution of the studied women according to their mean knowledge scores (before interventions) related to mammography (n=100)

The table illustrates that the mean knowledge percent score was unsatisfactory in both study, and control groups before interventions (28.8%, 23.3% respectively). No statistical significant differences were found in women's knowledge scores about mammography in both study and control groups as P = 0.228.

Table (3): Distribution of the studied women according to their mean knowledge scores (before interventions) related to mammography(n=100)

Group	total knowledge score (Mean± SD)	Mean % score	t	p
Study (n = 50)	5.76± 4.70	28.80%	1.214	0.228
Control (n = 50)	4.66± 4.35	23.30%		

t: **Student t-test**

p: p value for comparing between the studied groups

≥ 60% satisfactory knowledge & < 60% unsatisfactory.

Table (4): displays comparison between the study and control subjects according to level of pain during mammography

The table shows that, the nursing intervention had a positive overall effect on pain experienced by women during the mammography, as 60.0% of women in the study group experienced mild pain during the procedure, compared to 54.0% of them in the control group who experienced moderate pain, and these results are highly statistical significant different, as (p= <0.001*).
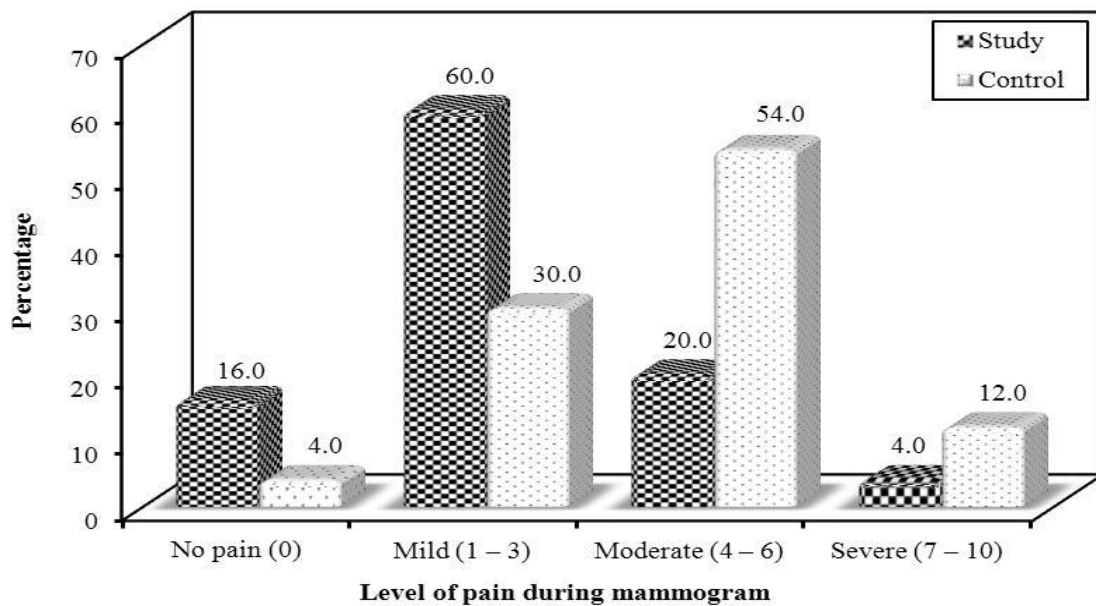
Table (4): Comparison between the study and control subjects according to level of pain during mammography.

Level of pain during mammography	Study (n = 50)		Control (n = 50)		χ^2	p
	No.	%	No.	%		
No pain (0)	8	16.0	2	4.0	18.271*	<0.001*
Mild (1 – 3)	30	60.0	15	30.0		
Moderate (4 – 6)	10	20.0	27	54.0		
Severe (7 – 10)	2	4.0	6	12.0		
% Reduction	**47.7%**					

χ^2: **Chi square test**

p: p value for comparing between the studied groups

*: Statistically significant at $p \leq 0.05$

Figures (1): Comparison between the two studied groups according to level of pain during mammography

Table (5) & Fig (2): shows distribution of the studied women according to their levels of anxiety pre, and during mammography (n = 100)

The table reflects the role of the nursing interventions in reducing women's level of anxiety, as 32% of women in the study group reported feeling relaxed or not anxious during procedure. Also, nearly three quarter of women (74%) in the study group reported moderate to severe anxiety pre procedure, compared to 26% of them who reported moderate to severe anxiety during procedure. Also, the table illustrates that, high statistical significant differences are detected between the study and the control subjects during mammography, as χ^2 (p_2) = 28.407* (<0.001*). No significant differences were detected in anxiety levels between the study subjects and their control pre procedure, as $\chi^2(p_1)$ = 1.020 (0.601).

Table (5): Distribution of the studied women according to their levels of anxiety pre, and during mammography (n = 100)

Level of anxiety	Study (n = 50)				Control (n = 50)				$\chi^2(p_1)$	$\chi^2(p_2)$
	Pre		During		Pre		during			
	No	%	No	%	No	%	No	%		
Not anxious (0)	0	0.0	16	32.0	0	0.0	0	0.0	1.020 (0.601)	28.407[*] (<0.001[*])
Mild (1 – 3)	13	26.0	21	42.0	16	32.0	14	28.0		
Moderate (4 – 6)	25	50.0	9	18.0	20	40.0	22	44.0		
Severe (7 – 10)	12	24.0	4	8.0	14	28.0	14	28.0		
% reduction pre procedure	0.4%									
% reduction during procedure	60.3%									

χ^2: Chi square test   MH: Marginal Homogeneity Test

p_1: p value for comparing between the Study and Control pre mammography

p_2: p value for comparing between the Study and Control during mammography
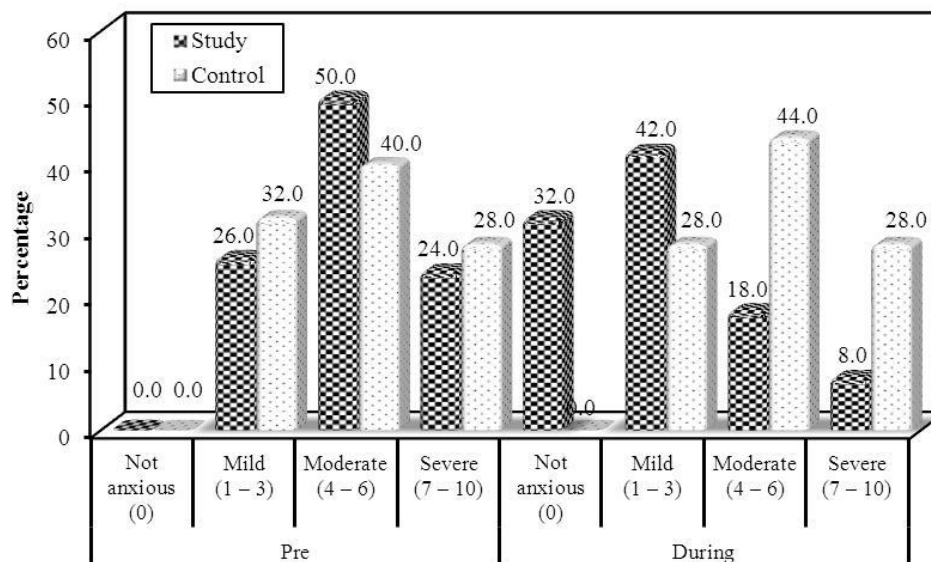
*: Statistically significant at $p \le 0.05$

Figure (2): Distribution of the studied women according to their levels of anxiety pre, and during mammography (n = 100).

Figure (3): Distribution of the studied women according to percent reduction in pain, and anxiety levels after applying the nursing interventions.

As regards mean percent reduction in pain, and anxiety after applying the nursing interventions, the figure reveals that the study group achieved mean percent reduction in pain equal to 47.7%. Also, the study group achieved a mean percent reduction in anxiety score levels pre, and during mammography i.e (0.4%, 60.3%) respectively.
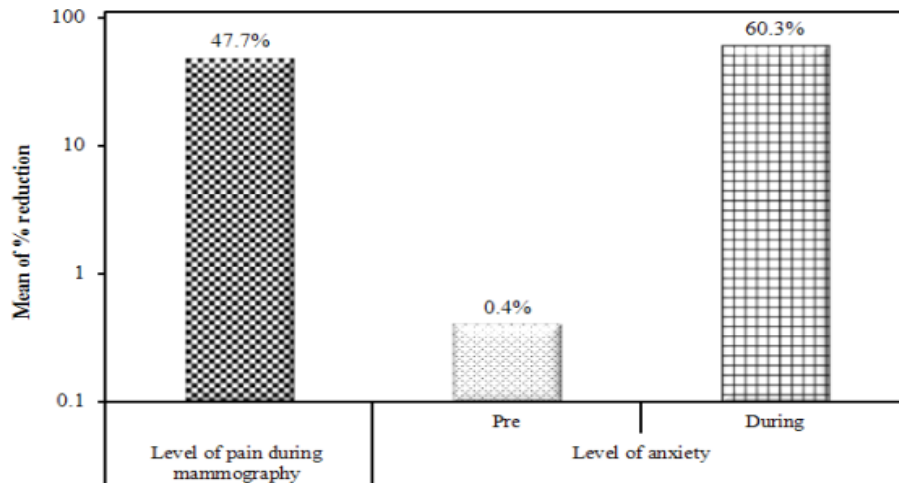
Figure (3): Distribution of the studied women according to percent reduction in pain, and anxiety levels after applying the nursing interventions.

Table (6): shows relationship between pain, and anxiety of women (study group) undergoing mammography (n = 50).

The table represents a high statistical significant relationship between women's level of pain and their level of anxiety during mammography, as women with mild anxiety had mild pain ($\chi^2= 19.337^*$, $^{MC}p = 0.004^*$). No significant relationship was detected between women's level of pain during mammography and their level of anxiety pre mammography.

Table (6): Relationship between pain, and anxiety of women (study group) undergoing mammography (n = 50).

Level of anxiety	Level of pain during procedure (n = 50)								χ^2	^{MC}p
	No pain (n = 8)		Mild (n = 30)		Moderate (n = 10)		Severe (n = 2)			
	No.	%	No.	%	No.	%	No.	%		
Pre procedure										
Not anxious (0)	0	0.0	0	0.0	0	0.0	0	0.0	7.085	0.265
Mild (1 – 3)	1	12.5	7	23.3	3	30.0	2	100.0		
Moderate (4 – 6)	3	37.5	17	56.7	5	50.0	0	0.0		
Severe (7 – 10)	4	50.0	6	20.0	2	20.0	0	0.0		
During procedure										
Not anxious (0)	7	87.5	8	26.7	1	10.0	0	0.0	19.337^*	0.004^*
Mild (1 – 3)	1	12.5	16	53.3	4	40.0	0	0.0		
Moderate (4 – 6)	0	0.0	4	13.3	3	30.0	2	100.0		
Severe (7 – 10)	0	0.0	2	6.7	2	20.0	0	0.0		

χ^2: **Chi square test**   MC: **Monte Carlo**

*: Statistically significant at $p \leq 0.05$

Table (7): shows relationships between level of pain during mammography and socio-demographic & clinical characteristics of women in the study group (n = 50).

The table displays that there is a statistical significant relationship between women' mean age, and their level of pain during mammography, as older women (52.0 ± 11.31) had severe pain during the procedure, where (F= 2.855^* & p=0.047*). However, no statistical significant relationship between women' education, history of breast cancer, caffeine consumption and their level of pain during mammography.

Table (7): Relationships between level of pain during mammograhy and socio-demographic & clinical characteristics of women in the study group (n = 50).

socio-demographic & clinical characteristics	Level of pain during procedure (n = 50)								Test of Sig.	p
	No pain (n = 8)		Mild (n = 30)		Moderate (n = 10)		Severe (n = 2)			
	No.	%	No.	%	No.	%	No.	%		
Age (years)										
20 –<35	0	0.0	10	33.3	0	0.0	0	0.0	$\chi^2=$ 7.856	^{MC}p= 0.184
35 –<50	5	62.5	15	50.0	4	40.0	1	50.0		
50 – 60	3	37.5	5	16.7	1	10.0	1	50.0		
Min. – Max.	38.0– 60.0		20.0– 60.0		30.0– 55.0		44.0– 60.0		F= 2.855*	0.047*
Mean ± SD.	46.75 ± 8.55		38.40 ± 10.52		36.80 ± 8.28		52.0 ± 11.31			
Education level										
Illiterate	2	25.0	5	16.7	1	10.0	1	50.0	$\chi^2=$ 9.673	^{MC}p= 0.298
Low education	0	0.0	9	30.0	3	30.0	0	0.0		
Moderate education	2	25.0	11	36.7	2	20.0	1	50.0		
High education	4	50.0	5	16.7	4	40.0	0	0.0		
Family history of breast cancer										
Yes	2	25.0	14	46.7	7	70.0	0	0.0	$\chi^2=$ 4.898	^{MC}p= 0.152
No	6	75.0	16	53.3	3	30.0	2	100.0		
Regular caffeine consumption										
Yes	4	50.0	17	56.7	7	70.0	0	0.0	$\chi^2=$ 3.084	^{MC}p= 0.417
No	4	50.0	13	43.3	3	30.0	2	100.0		

χ^2: **Chi square test**   MC: **Monte Carlo**   F: **F for ANOVA test**

p: p value for comparing between different categories

*: Statistically significant at p ≤ 0.05

Table (8): relationships between level of anxiety and socio-demographic & clinical characteristics of the studied women in the experimental group pre, and during mammography (n = 50).

The table elicits, a statistical significant relationship between women' level of anxiety during mammography, and their family history of breast cancer as all women with severe anxiety during the procedure had family history of breast cancer where (χ^2=7.731*& p=0.041*). No statistically significant differences are detected between women' anxiety pre procedure, and their family history of breast cancer.

Also, a high statistical significant relationship was found between women' level of anxiety pre procedure, and their regular caffeine consumption, as women who aren't caffeine consumers had higher levels of anxiety, where (χ^2=9.919*& p=0.007*). No statistical significant relationship was detected between women' anxiety during procedure, and their regular caffeine consumption. Also, there are no statistical significant relationship was between women' age, education, and their level of anxiety could be detected neither prior to, nor during the procedure.

Table (8): Relationship between level of anxiety and socio-demographic & clinical characteristics of the studied women in the experimental group pre, and during mammography (n = 50).

socio-demographic & clinical characteristics	Level of anxiety													
	Pre procedure						During procedure							
	Mild (n = 13)		Moderate (n = 25)		Severe (n = 12)		No anxiety (n = 16)		Mild (n = 21)		Moderate (n = 9)		Severe (n = 4)	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Age (years)														
20 –<35	4	30.8	8	32.0	3	25.0	4	25.0	6	28.6	2	22.2	3	75.0
35 –<50	5	38.5	14	56.0	6	50.0	8	50.0	10	47.6	6	66.7	1	25.0
50 – 60	4	30.8	3	12.0	3	25.0	4	25.0	5	23.8	1	11.1	0	0.0
χ^2 (^{MC}p)	2.591 (0.644)						4.384 (0.638)							
Min. – Max.	20.0 – 60.0		22.0 – 60.0		22.0 – 57.0		22.0 – 60.0		20.0 – 60.0		30.0 – 60.0		30.0 – 35.0	
Mean ± SD.	42.0±14.33		39.20±8.48		39.33±9.70		42.13 ± 10.41		39.71±11.59		40.33±8.85		31.75±2.22	
F (p)	0.329 (0.721)						1.075 (0.369)							
Education level														
Illiterate	4	30.8	2	8.0	3	25.0	3	18.8	4	19.0	2	22.2	0	0.0
Read& write	3	23.1	7	28.0	2	16.7	2	12.5	6	28.6	3	33.3	1	25.0
Diploma degree	6	46.2	7	28.0	3	25.0	5	31.3	6	28.6	4	44.4	1	25.0
Bachelor degree	0	0.0	9	36.0	4	33.3	6	37.5	5	23.8	0	0.0	2	50.0
χ^2 (^{MC}p)	10.101 (0.103)						7.408 (0.598)							
Family history of breast cancer														
Yes	4	30.8	13	52.0	6	50.0	5	31.3	8	38.1	6	66.7	4	100.0
No	9	69.2	12	48.0	6	50.0	11	68.8	13	61.9	3	33.3	0	0.0
χ^2 (p)	1.654 (0.437)						7.731* (0.041*)							
Regular caffeine consumption														
Yes	9	69.2	17	68.0	2	16.7	7	43.8	13	61.9	4	44.4	4	100.0
No	4	30.8	8	32.0	10	83.3	9	56.3	8	38.1	5	55.6	0	0.0
χ^2 (p)	9.919* (0.007*)						4.625 (^{MC}p=0.190)							

χ^2: **Chi square test**   MC: **Monte Carlo**   F: **F for ANOVA test**

p: p value for comparing between different categories   *: Statistically significant at $p \leq 0.05$

IV. DISCUSSION

Mammography can be a painful and stressful procedure, which raises the question of how best to improve the experience. The present study has shown some promise in reducing pain, and anxiety of women undergoing screening mammography through effective nursing interventions in the form of health education related to mammography, and practicing relaxation technique. The present study highlighted significant reduction in pain, and anxiety levels among participants in the study group compared to their controls. Also, the mean women' knowledge percent scores related to mammography were unsatisfactory in both groups before applying the nursing interventions, with no statistical significant differences between the two groups. This could be related to the fact that explaining procedure alleviates participant's fear, as they are able to express their feelings, as well as to receive the answers to their questions regarding the procedure. Relaxation techniques are simple, inexpensive, noninvasive interventions that could have been successfully used in reducing pain and anxiety during radiologic procedures, including endoscopy, MRI, and mammography[36].

In this regard, Fernández-Feito et al (2015), and Lana et al (2015), found that nursing interventions involving health education, and relaxation technique , for women undergoing screening mammography reduced their reported mammographic pain, and anxiety[22,28]. Also, Shrestha et al (2001),and Miller et al (2015), demonstrated that nursing interventions which incorporated educational videotapes related to mammogram, and relaxation techniques could have a positive impact among women attending a routine screening mammography [42, 44].

Jepson et al (2007), and Tehran et al (2013) found that women health education about the mammography experience is effective for southing their pain, and anxiety , where they can improve mental and physical health [33,43]. On the other hand, Domar et al (2005) found that subjects who practiced relaxation technique before and during their screening mammography did not report any benefits from the intervention when compared to their controls [36].

The present study has been developed to help participants better manage pain, which is evident by the current findings. The applied nursing interventions decreased pain experienced by women in the study group during the mammography, as nearly two third of them experienced mild pain during the procedure, compared to about half of them in the control group who experienced moderate pain, and these results were highly statistical significant differences. In this context, Domar et al (2005), and Whelehan et al (2013) found that pain has been cited as the most commonly reported reason that may hinder women from involving in periodically recommended mammography follow up screening[36, 46].

Sapir et al (2003), who studied pain occurrence during mammography, found that their subjects experienced moderate pain during mammography, which emphasized the need for appropriate pre procedure nursing interventions [47]. Also, Keefe et al (1992) reported that, pain coping skill training provides participants with strategies as: building knowledge, and relaxation training to help women better cope with pain by changing their thoughts, feelings and behaviors[48]. Several randomized controlled trials of pain coping skills training protocols have found these interventions to be associated with reductions in pain during mammography [49-51].

Also , the present study findings displayed that there were statistical significant relationships between women' mean age, and their level of pain during mammography, as older women had more severe pain during the procedure. Contrary to our findings, Whitney et al (2019) found that pain was not associated with age in women undergoing screening mammography [51]. No doubts, individual differences in pain threshold could have its impact in this context.

Although women who participate in screening mammography are usually asymptomatic, anxiety is the most reported feelings, due to expected pain during the mammography, and fear of cancer [27,28]. The results of the present study reflect the role of the nursing interventions in reducing women' level of anxiety, as about one third of women in the study group reported feeling relaxed or not anxious during procedure. High statistical significant differences were detected between the study and the control subjects during mammography. Contrary to the present findings, nursing interventions investigated by Mainiero et al (2001), and Domar et al (2005), that included an educational unit about mammography, and practicing relaxation techniques did not achieve a positive impact on women' anxiety level[32, 36].

Fernández-Feito et al (2015) found that expected pain is the main cause of anxiety during screening mammography [22]. the present study results support the conclusion that the more anxious a patient is, the more likely she is to experience pain with mammography, as high significant relationships between women' level of pain and their level of anxiety during mammography, were detected. Similar findings were reported by Lana et al (2015) who found that anxiety reduction during screening mammography is significantly associated with pain reduction, and added that this reduction in anxiety could be the only factor responsible for lower pain levels during the procedure [28]. Also, Mainiero et al (2001) measured pain and anxiety during screening mammography and found that these concepts were strongly related, as anxiety contributes to the experience of pain from the procedure [32].

In addition, the present study results denoted that there were statistical significant differences between women' level of anxiety during mammography, and their family history of breast cancer as all women with severe pain during the procedure had family history of breast cancer. Similarly, Whitney et al (2019) found that, women with a family history of breast cancer reported elevated levels of anxiety during mammography as they overestimated their risk of developing breast cancer [51]. However, the present study findings illustrated that there were no statistical significant differences between women' education, and their level of anxiety neither pre nor during mammography. Interestingly, Mainiero (2001) found higher education to be associated with lower anxiety levels [32].

ISSN 2394-7330

International Journal of Novel Research in Healthcare and Nursing
Vol. 6, Issue 3, pp: (454-469), Month: September - December 2019, Available at: **www.noveltyjournals.com**

V.   CONCLUSION

Based on the finding of the present study, it can be concluded that providing nursing interventions based on precise health education regarding various aspects of mammography screening, and teaching relaxation technique are simple interventions that have the potential to south pain and anxiety among women undergoing screening mammography. The present study highlighted significant reduction in pain, and anxiety levels among women in the study group. Around two thirds of women in the studied subjects experienced mild pain during the procedure, compared to more than half of them in the controls who experienced moderate pain. About half of women in the studied group reported mild anxiety during mammography, while around half of the controls group who reported moderate anxiety level during procedure. Statistical significant relationships between women' level of anxiety during mammography, and their family history of breast cancer were detected.

VI.   RECOMMENDATIONS

➢ Trained staff should accompany women as they arrive at the radiology department to adequately equip them to function as role models

➢ Further research should test the hypothesis that lower anxiety, and pain could improve adherence to the screening program

➢ Development of mammography comfort practices should be considered equal to other imaging examinations assisted by nurses.

➢ Plan and implement periodic organizational teaching programs about mammography for women undergoing the procedure.

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