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Effectiveness of Rehabilitation Nursing Protocol on Phantom Pain and Lifestyle Modification Among Patients with Lower Limb Amputation

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Abstract: Background: Phantom Limb Pain affects a significant percentage of patients with amputation. Nurses are in unexclusive position to care these patients during hospitalization and follow up after discharge to have good quality of life [(1)]. This study aimed to evaluate effectiveness of rehabilitation nursing protocol on phantom pain and lifestyle modification among patients with lower limb amputation. **Methods;** Research **Design:** Quasi Experimental design was utilized for this study. **Setting:** study was carried out at vascular outpatient clinic and in an inpatient rehabilitation unit At Menoufia University Hospital, Egypt. **Subjects:** A purposive sample of 100 patients suffering from phantom pain due to lower limb amputation **Tools for data collection:** four tools were applied; Socio demographic characteristics tool, Defense and veterans pain rating scale, RAND 36 item health surveys related to quality of life scale, and Barthel Index Scale**. Results;**76% of study group and 64% of control group were male with mean grades of pain 2.76±2.65 and 6.40±2.11 of study and control groups respectively at post-intervention. There were statistically significant improvements related to mean emotional wellness, social functioning and general health at post-intervention as p- value <0.001. The means total scores of Barthel Index scale were 77.0±17.26 and 33.80±17.88 for study and control groups respectively. **Conclusion**: nursing rehabilitation protocol after lower limb amputation was effective in reducing phantom pain, improving performance of activities of daily living and enhancing better lifestyle. **Recommendation**: Offering a planned continuous standard rehabilitation programs regularly to improve phantom pain and lifestyle for patients with lower limb amputation at outpatient vascular clinic**.**
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Key words; Phantom Pain; Amputation; Rehabilitation

Introduction:

Lower limb amputation (LLA) is a restricting disorder that recently showed a fixed growth in their number which disturbs individuals' health and quality of life. [(2-3)]. Lower limb amputation results in changes in the individuals' mobility functionality, daily activities, and sociality [(4)]. Individuals with LLA had to adapt to modified lifestyle and modify the physical and interpersonal activities; as the activities of daily living [(5-6)]. amputees with more mobility impairment are more likely to present lower life satisfaction [(7)].

Phantom limb pain (PLP) affects a great proportion of individuals after loss of a limb which occurring in 45–85% of these patients [(8)]. PLP occurs soon after surgery and expressed as throbbing, shooting, squeezing, or burning pains may sometimes be felt in the missing leg. The length of time this pain lasts differs from person to another. It can last from seconds to minutes, to hours, to days. For most patients, PLP diminishes in both frequency and duration during the first six months, but many continue to experience some level of these sensations for years. Moreover, these individuals suffering from chronic stump pain and unfavorable sensations in the amputated limb, that are described as quite prevalent [(9)] and resists treatment [(10)].

Phantom pain can worsen the patient's quality of life post amputation. It becomes important reason that patient should get medical treatment. The management include pharmacology treatment, operation, anesthesia also psychotherapy. Physical medicine and rehabilitation also have role in treating the pain, such as physical therapy, biofeedback, desensitization, occupational therapy, mirror therapy [(11)]. Although the objectives of amputation are to reduce unpleasant manifestation, [(10)]. There is no evident about any dependable treatment for peripheral nerve stump pain and phantom limb pain [(12)]. Effective amputation program must consider pain management. The perfect rehabilitation team should be aware of pain perception and must assess pain as part of their routine health care work [(13)].

After LLA, rehabilitation programs should be tailored for all individuals to restore abilities and

recover functions before amputation [4]. Patients should be wholly individualized informed when making choices about management. On discharge, patients should be instructed to follow rehabilitation program [14].

The lower limbs amputation rehabilitation is restructuring of all functional systems, decreasing the body's reserve capacity, and tolerance to physical performance [15-16]. the Multifactorial methods of rehabilitation for amputation consider solutions for sociality, health, emotionally, new lifestyle, and other issues [3, 17- 18]. Therefore, complete rehabilitation is identical important to reeducate physical and functional abilities, to support with psychological and emotional adjustment and to ensure social and community integration [19].

Quality of life after LLA is affected by many factors as physical, psychological state, level of independence, sociality and environmental factors. the perception of quality of life is more linked with pain and how to adapt to it. The ability to walk is considered crucial to the perception of quality of life, as it directly affects the ability to live independently and community sharing [20]. Also, activities of daily living (ADL) negatively affected following a lower-limb amputation. The ADL training improves learning and efficient strategies aimed to come back to patients' essential activities; consequently, this intervention may improve self-confidence. The early and short-term ADL practice in rehabilitation setting is an effective method for functional recovery, led to significant improvements in the ability to perform self-care activities regardless of the level of amputation [21]. So, after a lower limb amputation (LLA), Persons with amputation are linked to specialized inpatient rehabilitation programs to have better outcomes, such as home or nursing home [22].

Nurses are unique for caring individuals with amputation and caregivers who need support during hospitalization and follow up after discharge to have good quality of life with persist disability. Nurses can react to patients' needs, values and hearten whole attention from hospitalization to home convalescence, by concerning a multidisciplinary team and sharing available resources [1]. So, this study was carried out to evaluate effectiveness of rehabilitation nursing protocol on phantom pain and lifestyle modification among patients with amputation.

Significance of study:

Prevalence rate for amputation as informed by World Health Organization [23]. is approximately 1.9 million people in USA. Approximately 2.0 million individuals lost limb in the United States, the number of US individuals lost limb is predictable to rise to 3.6 million by 2050[24]. Unfortunately, no available recent census found in Egypt, but according to review of the medical and statistical records of Menoufia University prevalence of amputation was 4 cases of amputation monthly at year 2018.

In addition, there is an abundance of medical research focused on the types, methods of treatment, the perioperative care of the amputee and a rehabilitation program after healing process and does not offer comprehensive recommendations for showing a rounded procedure of rehabilitation after discharge [25].

Aim of the Study was to evaluate effectiveness of rehabilitation nursing protocol on phantom pain and lifestyle modification among patients with lower limb amputation.

Research hypothesis: The following hypotheses would be formulated:

1- Patients with lower limp amputation who are exposed to rehabilitation program will have a reduction of phantom pain than those who don't.

2- Daily activities of patients with lower limp amputation who are exposed to rehabilitation program will be improved than those who don't.

3- Patients with lower limp amputation who are exposed to rehabilitation program will have better functional abilities than those who don't.

Subjects and Method

Design:

Quasi Experimental design was utilized for this study.

Setting:

The current study was carried out at vascular outpatient clinic and in an inpatient rehabilitation unit At Menoufia University Hospital, Egypt.

Subject:

A purposive sample of 100 patients suffering from phantom pain due to amputation of both sexes that was available during the time of data collection, in the previously mentioned setting was selected according to the following criteria:

Eligibility of the study:

- **Inclusion criteria:**
  - Age between 18years and 60 years.
  - Adult patients suffering from unilateral right or left lower limb amputation.
- **Exclusion criteria:** conditions that may interfere with the rehabilitation nursing protocol that can affect patients' the outcome include the following:
  - Patients who suffered further amputation
  - Major trauma patients who have cerebrovascular accidents, spinal cord injuries or head injuries.
  - Patients who suffered from mental or psychological problem.
  - Patients who received awareness amputation rehabilitation from other sources.

Estimated sample size:

Concerning patients with limb amputation' studies [26-27]. a conservative effect size of 0.40 was estimated. 29, 20 using the statistical software, the statistical power of 0.81 and statistical significance 0.05, the estimated sample size required were 100 subjects.

Instruments:

Tool I: Socio demographic characteristics to assess characteristics of subjects. It includes; gender, age, educational level, marital status, living with whom, diagnosis, and amputation site.

Tool II: Defense and veterans pain rating scale (DVPRS): developed by The Defense and Veterans Center for Integrative Pain Management (2010) [28]. To evaluate pain levels, to consider pain strength, and to advance communication. It is a scale used numerical rating, descriptive words, coding colors, and symbol. The scale applies numbers and "traffic color" coded blocks to explain pain as:" Mild (1 to 4, green), Moderate (5 to 6, yellow), and Severe (7 to 10, red)".

Tool III: RAND 36 item health surveys related to quality of life scale: RAND developed the 36-Item Short Form Health Survey (SF-36). SF-36 is a set of common, and simply administered quality-of-life. It is consisting of 36 items that evaluate overall health status: "physical functioning, role limitations produced by physical health problems, role limitations result from emotional problems, social functioning, emotional well-being, energy/fatigue, pain, and general health perceptions". Physical and mental health extract scores are similarly resulting from the eight RAND-36 scales.

Scoring the RAND 36-Item Health Survey:

The scoring indicates total quality of life were linearly changed to: a range of 0 (worst quality of life) to 100 (best quality of life). The score of all eight items, as well as the final comprehensive score, of the scale range between 0 and 100, indicating Inverse relationship " the lower the score the more the disability and the higher the score the less the disability".

Tool IV: Assessment of Activities of Daily Living " Barthel Index Scale". (ADLs), first developed in **1965 (Mahoney FI, Barthel)** [29] and later modified by **Granger CV, Dewis LS, Peters; 1979)** [30], evaluating functional disability through measuring patient performance in daily life activities. It uses ten variables relating to " Feeding, controlling of bladder and bowels, Bathing, Moving (ascending and descending stairs), Transfers (bed and chair), personal toileting, Dressing, Grooming)"

Scoring system of tool (II)

Scoring of Barthel index scale; a score (100) indicates patient should be able to live independently, while a score of (75-90) is minimally dependent, a score of (50-70) is given when patient partially dependent, when a score (25-45) means very dependent and a score of (0-20) is given when patient is total dependence.

Validity and reliability:

Tools were tested for content validity "a measure where the actual content matches the measurement which is a logical method of measurement" by five experts in the field of Nursing, surgery, and physiotherapy. Modifications were done accordingly. Tool I; was tested for reliability using test retest method to ascertain consistency: interviewing questionnaire regarding sociodemographic data, r = 0.87.

- Tool II: Defense and veterans pain rating scale (DVPRS) 2.0 is a reliable and valid instrument according to **Polomano et al; 2016** [31]. Adequate internal consistency reliability (Cronbach's alpha = 0.871) and test-retest reliability (r = 0.637 to r = 0.774) for the five items. Construct validity was strengthened by an exploratory main component factor analysis and known groups validity testing. (Kendall's coefficient of concordance, W = 0.95 and 0.959, respectively) [31].
- Tool III: RAND 36; The questionnaire validity was determined by a panel of five experts in medical surgical nursing. Modifications were carried out according to the panel's judgment on the clarity of the sentences and appropriateness of the contents. The test-retest reliability coefficient for the total SF-36 was 86.5.
- Tool IV: "Assessment of Activities of Daily Living Through Barthel Index Scale: according to **bouwstra et al** [32] "The structural validity, reliability, and interpretability of the BI are considered enough for measuring and interpreting changes in physical function of patients' rehabilitation".

Data collection:

- **Written approval:** An official letter from the Faculty of Nursing was delivered to the responsible authorities of the hospital (chief executive and the director of vascular outpatient clinic and in an inpatient rehabilitation unit At Menoufia University Hospital) to conduct the study then a written approval was obtained after explaining the aim of study.
- Data collection extended over a period of 12 months from January 2018to January 2019.
- Patients who agreed to participate in the study and fulfilled the inclusion criteria were interviewed individually by the researcher at vascular outpatient clinic and in an inpatient rehabilitation unit At Menoufia University Hospital.
- The researcher dealt with the control group (П) firstly then the study group (I) to avoid the

contamination of results. The purpose of the study was explained to each subject of both study and control groups.

- Data were collected using four tools adapted or developed by the authors. The data obtained were used as a pretest and to aid in preparation for education of the rehabilitation nursing protocol.
- Use a rehabilitation nursing protocol during the interviews with the patients. The purpose of the interview was to provide an understanding of the protocol from researcher's point of view and it included:

The structure of the PROTOCOL as following:

- ✓ Stay active and keep blood circulating
- ✓ Skin checks and Things to look for and How to do the check
- ✓ Wrapping for Below Knee Amputation
- ✓ Things to do that may help ease the pain
- ✓ Positioning and Stretches
- ✓ Exercises and how to move

- The researcher interviewed each subject of study group individually at vascular outpatient clinic and inpatient rehabilitation unit. The researcher conducted at least three teaching sessions or more for each subject according to his/ her level of understanding.
- Each session was conducted using lecture and discussion and demonstration and re-demonstration were added. The researcher gave verbal instructions supplemented by written materials in form of booklet as an illustrative guide for more clarification to patients.
- The researcher distributed the prepared booklet for every subject of group 1 (study group) or his/her accompanying person before starting session I.
- **The first session (**pre the nursing rehabilitation protocol)**:** Information about aim of the study was given after assessing characteristics of the patients. Then education about nursing protocol was provided as following: a) Stay active (Do not stay in the same position for long periods of time, the proper positions for sitting and lying down, and Do not wear tight clothing on lower body), b) Skin checks to look for signs of inflammation, irritation. C) Wrapping for Below Knee Amputation (Use 4 or 6 inch ace wraps, Re-wrap residual limb with an ace wrap every 4 to 6 hours, Wash the ace wrap every 2 to 4 days, Dry flat and make sure there are no wrinkles, and Make sure all areas are covered). D) Things to do that may help ease the pain as: Use massage, tapping, and squeezing to desensitize residual limb, Slowly tighten and release the muscle in the limb, Keep the residual limb warm, Exercise residual limb, and if there is swelling, try an ace wrap or shrinker sock on the limb. E) Positioning and Stretches. And f) Exercises and how to move. It took about 45-60 minutes according to patients' level of understanding. At the end of the session the researchers allowed subjects to ask questions and provided them with the answers.
- **The second session (**after 4 weeks)**:** The researcher refreshed the previous information to reinforce the provided knowledge and respond to the nursing rehabilitation protocol. At the end of the session the researcher allowed subjects to ask questions and provided them with the answers. It took about 45 -60 minutes according to subjects' level of understanding.
- **The third session** (Follow up session after 12 weeks): In this session the researcher refreshed and reinforced the previous information as patients were asked to follow the nursing rehabilitation protocol learned several times until the researchers made sure that it was successfully mastered. Then evaluation of all subjects of both groups was carried out after 4weeks from the first interview.
- Each patient was assessed and monitored three times using all tools to evaluate the impact of the rehabilitation nursing protocol.

A pilot study passed with 10% of study sample (10 patients) to evaluate clarity and feasibility in addition to the applicability of the tool. Data obtained from the pilot study was excluded from the actual study.

Ethical considerations:

Ethical approval and permission to interview patients was allowed from the dean of faculty of nursing, Menofia University, director of at vascular outpatient clinic and in an inpatient rehabilitation unit At Menoufia University Hospital. Patient's written agreement to participate in this study was obtained after explanation of the purpose of study. Each patient was reassured that any information obtained would be confidential and would only be used for the study purpose. Privacy, confidentiality and right to withdraw at any time were assured.

Statistical analysis:

SPSS; statistical package version 20 on IBM compatible computer were used to analyze the tabulated data.

Results:

Table (1): Demographic characteristics of the studied groups:

Demographic characteristics	Studied groups				χ^2	P value
	Study group (n=50)		Control group (n=50)			
	NO.	%	NO.	%		
Age (years):						
Mean ± SD	55.92 ± 9.18		55.12 ±9.50		**t- test =**	0.67
Range	27.0– 65.0		23.0 – 65.0		0.42	NS
Gender:						
Male	38	76.0	32	64.0	1.71	0.19
Female	12	24.0	18	36.0		NS
Marital status:						
Single	2	4.0	2	4.0		
Married	41	82.0	37	74.0	1.20	0.75
Widowed	5	10.0	7	14.0		NS
Divorced	2	4.0	4	8.0		
Education level:						
Illiterate	27	54.0	30	60.0		
Basic	13	26.0	10	20.0		0.61
Secondary	9	18.0	7	14.0	1.79	NS
University	1	2.0	3	6.0		
Occupation:						
Unemployed	27	54.0	29	58.0		0.91
Manual work	19	38.0	17	34.0	0.18	NS
Employed	4	8.0	4	8.0		
Income:						
Satisfied	12	24.0	7	14.0	1.62	0.20
Not satisfied	38	76.0	43	86.0		NS
Living:						
Alone	3	6.0	4	8.0		1.0*
With others	47	94.0	46	92.0	0.15	NS
Diagnosis:						
Gangrene	5	10.0	3	6.0		
Trauma	6	12.0	4	8.0		
Diabetic foot	27	54.0	34	68.0	2.25	0.68
Ischemia	10	20.0	8	16.0		NS
Tumors	2	4.0	1	2.0		
Site:						
Rt lower leg	37	74.0	36	72.0	0.05	0.82
Lt lower leg	13	26.0	14	28.0		NS

t: student`s t test * Fishers` Exact test

Table (1) shows that the mean age of both groups was 55.92 ± 9.18 and 55.12 ±9.50 Years respectively. Majority of study group (76%) and about two thirds of control group (64%) were male. Regarding patient's occupation, more than half of study (54%) and control group (58%) were unoccupied. As regards to patient's diagnosis more than half of the study group (54%) and about two thirds of the control group (68%) had diabetic foot.

Table (2): pain scale of the studied groups pre- and post-intervention:

Items	Pre-intervention		Post- intervention		Test of sig.	P value
	Study group N =50	Control group N =50	Study group N =50	Control group N =50		
	N (%)	N (%)	N (%)	N (%)		
Pain grade:						
No pain	1 (2.0)	1 (2.0)	15 (30.0)	1 (2.0)		
Hardly noticed pain	2 (4.0)	2 (4.0)	6 (12.0)	1 (2.0)		
Notice Pain, not interfere with activity	0 (0.0)	0 (0.0)	7 (14.0)	0 (0.0)		
Sometimes distracts me	0 (0.0)	3 (6.0)	3 (6.0)	2 (4.0)		
Distracts me, do my activities	3 (6.0)	6 (12.0)	2 (4.0)	4 (8.0)	χ^2= 43.26[a]	<0.001[a] HS
Interrupts some activities	10(20.0)	9 (18.0)	10 (20.0)	7 (14.0)		
Hard to ignore, avoid some activity	12 (24.0)	7 (14.0)	2 (4.0)	7 (14.0)		
Focus attention, prevent daily activity	10 (20.0)	11 (22.0)	3 (6.0)	14 (28.0)	χ^2= 2.62[b]	0.97[b] NS
Awful, hard to do activity	6 (12.0)	6 (12.0)	1 (2.0)	7 (14.0)		
Can`t bear pain, unable to do anything	4 (8.0)	4 (8.0)	0 (0.0)	4 (8.0)		
It could be nothing else matter	2 (4.0)	1 (2.0)	1 (2.0)	3 (6.0)		
χ^2 --- P value	5.74 --- 0.76 NS		43.61 --- <0.001 HS			
Mean ± SD	6.20±2.06	5.86±2.17	2.76±2.65	6.40±2.11		
Test of sig. - P value	U=0.80 ----- 0.42 NS		U= 6.05 ----- <0.001 HS			
Pain categories:					χ^2= 32.33[a]	<0.001[a] HS
Mild	6 (12.0)	12 (24.0)	33 (66.0)	8 (16.0)		
Moderate	22 (44.0)	16 (32.0)	12 (24.0)	14 (28.0)		
Severe	22 (44.0)	22 (44.0)	5 (10.0)	28 (56.0)	χ^2= 1.65[b]	0.43[b] NS
χ^2 --- P value	2.94 --- 0.22		31.42 --- <0.001 HS			

a: comparison between pre and post intervention among study group
b: comparison between pre and post intervention among control group
U: Mann-Whitney test

Table (2) reveals that near half of both groups (44% of study and 44% of control group) had severe pain at pre-intervention. But about two thirds of study group (66%) had mild pain and more than half of the control group (56%) had severe pain at post-intervention. The mean grades of pain of study and control group were 6.20±2.06 and 5.86±2.17 respectively at pre-intervention. But it was 2.76±2.65 and 6.40±2.11 of both groups respectively at post-intervention. There were statistical significance decreases of pain grade among study group than their control at post-intervention.

Figure (1): Pain categories of the studied groups pre- and post-intervention

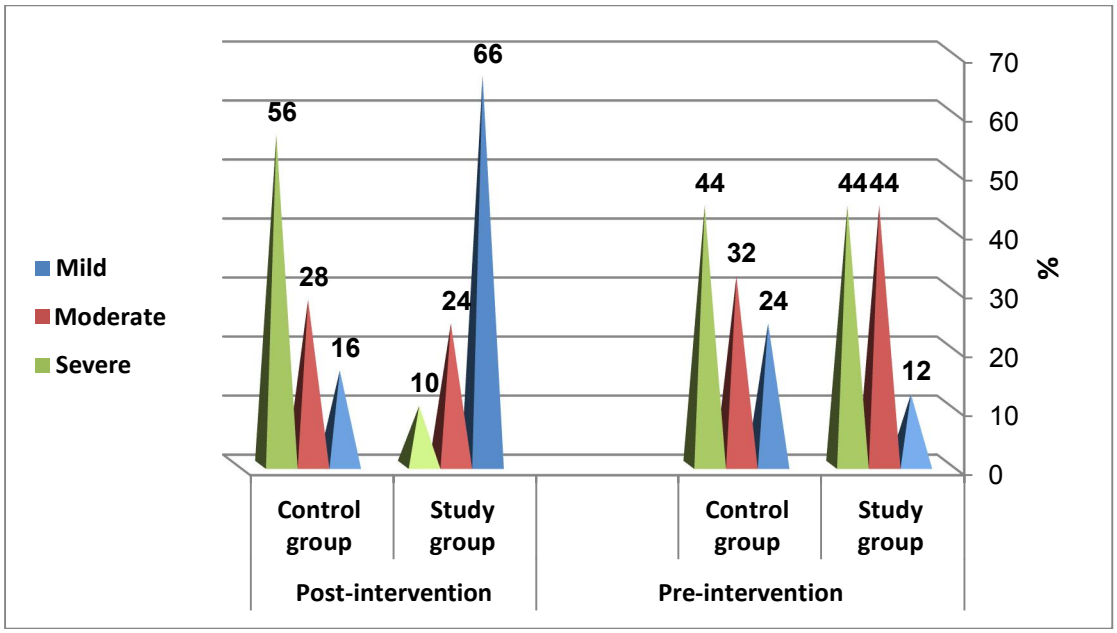

Figure (1) illustrates that near half of both groups had severe pain at pre-intervention. But about two thirds of study group (66%) had mild pain and more than half of the control group (56%) had severe pain at post-intervention.

Table (3): RAND scale of the studied groups pre- and post-intervention:

	Pre-intervention		**Post- intervention**		**Wilcoxon test**	**P value**
	Study group N =50	**Control group N =50**	**Study group N =50**	**Control group N =50**		
	Mean ± SD		**Mean ± SD**			
I- Physical						
Mean ± SD Range	18.60±20.38 0.0-50.0	20.30±18.08 0.0-60.0	62.40±21.95 15.0-100.0	14.40±14.37 0.0-45.0	5.98[a]	<0.001[a]
Mann-Whitney test	U= 1.25		U= 8.18		1.14[b]	0.25[b]
P value	0.20 NS		<0.001 HS			
II- Role limitations due to physical health						
Mean ± SD Range	1.0±4.94 0.0-25.0	15.50±115.86 0.0-100.0	88.50±20.95 25.0-100.0	16.0±120.81 0.0-100.0	6.39[a]	<0.001[a]
Mann-Whitney test	U= 2.99		U= 8.18		0.24[b]	0.80[b]
P value	0.003 S		<0.001 HS			
III- Role limitations due to emotional problems						
Mean ± SD Range	1.50±5.99 0.0-25.0	13.0±24.34 0.0-100.0	82.0±31.95 25.0-100.0	18.0±34.64 0.0-100.0	6.17[a]	<0.001[a]
Mann-Whitney test	U= 2.70		U= 6.79		1.21[b]	0.22[b]
P value	0.007 S		<0.001 HS			
IV- Energy/fatigue						
Mean ± SD Range	30.0±20.0 0.0-70.0	37.5±18.04 20.0-75.0	69.70±18.13 30.0-100.0	28.40±16.33 10.0-75.0	6.17[a]	<0.001[a]
Mann-Whitney test	U= 1.92		U= 7.82		2.59[b]	0.01[b]
P value	0.06 NS		<0.001 HS			
V- Emotional well-being						
Mean ± SD Range	34.48±18.56 0.0-76.0	42.80±22.50 20.0-80.0	73.44±18.28 36.0-100.0	32.32±15.79 20.0-68.0	6.16[a]	<0.001[a]
Mann-Whitney test	U= 2.03		U= 7.50		2.69[b]	0.007[b]
P value	0.04 S		<0.001 HS			
VI- Social functioning						

Mean ± SD Range	35.0±19.23 0.0-50.0	44.75±20.53 12.50-75.0	70.50±18.16 25.0-100.0	37.0±21.86 12.50-75.0	6.12[a]	<0.001[a]
Mann-Whitney test	U= 1.93		U= 6.37		2.29[b]	0.02[b]
P value	0.05 S		<0.001 HS			
VII- Pain						
Mean ± SD Range	33.30±15.65 10.0-55.0	38.75±16.62 10.0-67.50	67.05±17.95 22.5-100.0	34.25±14.79 10.0-67.5	5.93[a]	<0.001[a]
Mann-Whitney test	U= 1.75		U= 7.05		1.72[b]	0.08[b]
P value	0.07 NS		<0.001 HS			
VIII- General Health						
Mean ± SD Range	30.0±16.31 0.0-60.0	28.40±15.30 0.0-60.0	68.60±15.97 30.0-95.0	32.80±23.86 0.0-70.0	6.16[a]	<0.001[a]
Mann-Whitney test	U= 0.52		U= 7.07		0.99[b]	0.31[b]
P value	0.60 NS		<0.001 HS			
Mean Total score						
Mean ± SD Range	22.98±12.88 1.25-46.06	31.90±19.36 10.31-75.31	72.77±16.70 29.19-93.75	26.64±19.51 8.13-75.06	6.15[a]	<0.001[a]
Mann-Whitney test	U= 1.81		U= 7.78		0.83[b]	0.40[b]
P value	0.07 NS		<0.001 HS			

a: comparison between pre and post intervention among study group
b: comparison between pre and post intervention among control group

Table (3) presents that, the mean score of role limitation relating to physical impairment was 88.50±20.95for study group compared to 16.0±120.81 for control group at post-intervention. Also, the mean score of role limitations due to emotional problems was82.0±31.95 95for study group compared to 18.0±34.64 for control group at post-intervention. There were statistically significant improvements in study group than control group related to mean emotional well-being, social functioning and general health at post-intervention as p- value <0.001.

Figure (2): RAND scale total score of studied groups' pre and post intervention

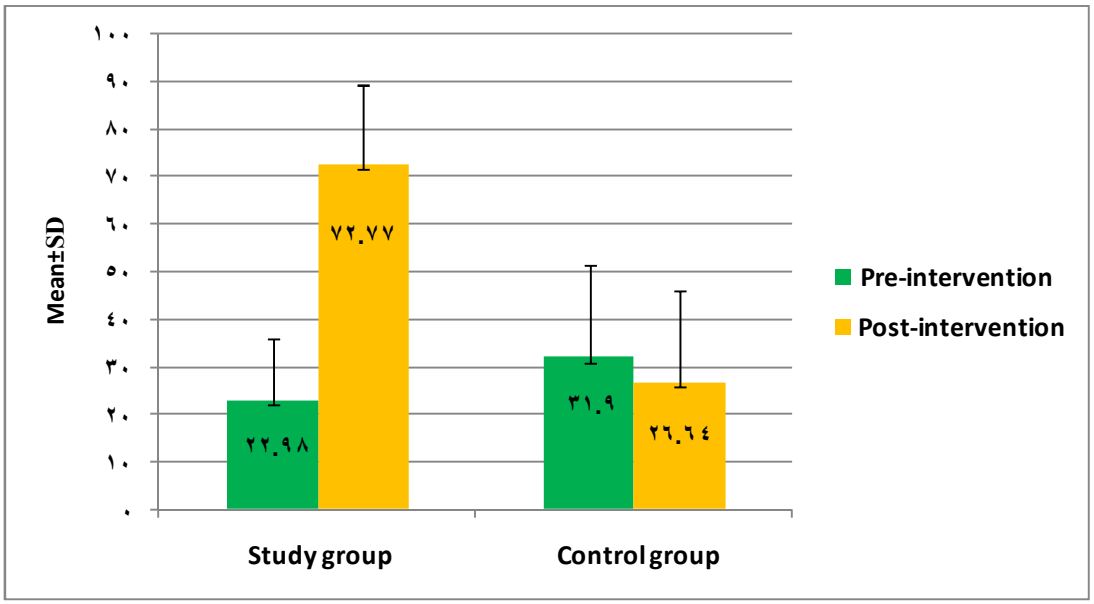

Figure (2) shows that the mean total score of RAND was 72.77±16.70 for study group compared to 26.64±19.51 for control group at post-intervention.

Table (4): Barthel Index Scale of the studied groups pre- and post-intervention:

	Pre-intervention		Post- intervention		Wilcoxon test	P value
	Study group N =50	Control group N =50	Study group N =50	Control group N =50		
	Mean ± SD		Mean ± SD			
I- Feeding						
Mean ± SD Range	3.20±2.42 0.0-5.0	2.80±2.50 0.0-5.0	8.40±2.35 5.0-10.0	2.40±2.89 0.0-10.0	6.32[a]	<0.001[a]
Mann-Whitney test - P value	0.81--- 0.41 NS		7.50---<0.001 HS		0.78[b]	0.43[b]
II- Bathing						
Mean ± SD Range	0.50±1.51 0.0-5.0	0.10±0.70 0.0-5.0	4.0±2.02 0.0-5.0	0.20±0.98 0.0-5.0	5.91[a]	<0.001[a]
Mann-Whitney test - P value	1.67--- 0.09 NS		7.66---<0.001 HS		0.57[b]	0.56[b]
III- Grooming						
Mean ± SD Range	0.50±1.51 0.0-5.0	0.10±0.70 0.0-5.0	4.20±1.85 0.0-5.0	0.60±1.64 0.0-5.0	6.08[a]	<0.001[a]
Mann-Whitney test - P value	1.67--- 0.09 NS		7.17---<0.001 HS		1.89[b]	0.06[b]
IV- Dressing						
Mean ± SD Range	3.50±2.90 0.0-10.0	4.40±1.64 0.0-5.0	8.20±2.81 0.0-10.0	3.50±2.71 0.0-10.0	5.93[a]	<0.001[a]
Mann-Whitney test - P value	2.08--- 0.03 S		7.61---<0.001 HS		1.64[b]	0.10[b]
V- Bowels						
Mean ± SD Range	6.80±3.15 0.0-10.0	7.30±2.51 5.0-10.0	8.80±2.58 0.0-10.0	7.30±2.51 5.0-10.0	7.47[a]	<0.001[a]
Mann-Whitney test - P value	0.61--- 0.53 NS		3.26---0.001 HS		0.0[b]	1.0[b]
VI- Bladder						
Mean ± SD Range	5.20±3.90 0.0-10.0	6.30±2.21 5.0-10.0	8.80±2.15 5.0-10.0	6.40±2.26 5.0-10.0	5.68[a]	<0.001[a]
Mann-Whitney test - P value	1.42--- 0.15 NS		4.78---<0.001 HS		1.0[b]	0.31[b]
VII- Toilet use						
Mean ± SD Range	3.80±3.28 0.0-10.0	2.80±2.50 0.0-5.0	8.60±2.26 5.0-10.0	1.50±2.71 0.0-10.0	6.01[a]	<0.001[a]
Mann-Whitney test - P value	1.43--- 0.15 NS		8.15---<0.001 HS		2.55[b]	0.01[b]
VIII- Transfers (bed to chair and back)						
Mean ± SD Range	4.60±3.61 0.0-10.0	5.50±3.07 0.0-10.0	9.90±2.14 5.0-15.0	4.60±3.16 0.0-10.0	5.90[a]	<0.001[a]
Mann-Whitney test - P value	1.32--- 0.18 NS		7.31---<0.001 HS		1.52[b]	0.12[b]
IX- Mobility (on level surfaces)						
Mean ± SD Range	4.40±2.79 0.0-10.0	5.0±2.67 0.0-10.0	9.40±2.60 5.0-15.0	5.80±1.85 5.0-10.0	6.28[a]	<0.001[a]
Mann-Whitney test - P value	1.10--- 0.27 NS		6.39---<0.001 HS		2.12[b]	0.03[b]
X- Stairs						
Mean ± SD Range	2.30±2.51 0.0-5.0	2.80±2.50 0.0-5.0	7.0±2.85 0.0-10.0	1.70±2.39 0.0-5.0	5.93[a]	<0.001[a]

	Pre-intervention		Post- intervention		Wilcoxon test	P value
	Study group N =50	Control group N =50	Study group N =50	Control group N =50		
	Mean ± SD		Mean ± SD			
Mann-Whitney test - P value	0.99--- 0.32 NS		7.12---<0.001 HS		2.29[b]	0.02[b]
Total score						
Mean ± SD Range	35.10±20.68 0.0-75.0	37.30±14.99 15.0-70.0	77.0±17.26 30.0-100.0	33.80±17.88 15.0-80.0	6.17[a]	<0.001[a]
Mann-Whitney test - P value	0.73--- 0.46 NS		7.71---<0.001 HS		0.69[b]	0.48[b]
Score categories N (%): Severely disable, can`t perform daily activity Severely disable Moderate disable Mild disable Not need help	18 (36.0) 15 (30.0) 14 (28.0) 3 (6.0) 0 (0.0)	11 (22.0) 22 (44.0) 17 (34.0) 0 (0.0) 0 (0.0)	0 (0.0) 5 (10.0) 11 (22.0) 32 (64.0) 2 (4.0)	12 (24.0) 25 (50.0) 11 (22.0) 2 (4.0) 0 (0.0)		
χ2- P value	6.30 ---- 0.09 NS		53.80---<0.001 HS			

a: comparison between pre and post intervention among study group
b: comparison between pre and post intervention among control group

Table (4) demonstrates that 36% of study group was severely disable and can't perform daily activity at pre-intervention but 64% of them were mildly disable at post-intervention. 34%of control group was moderately disabled at pre-intervention but 50% of them became severely disable at post-intervention. The means total scores of Barthel Index scale were 77.0±17.26 and 33.80±17.88 for study and control groups respectively.

Figure (3): Barthel Index Scale total score of the studied groups pre- and post-intervention

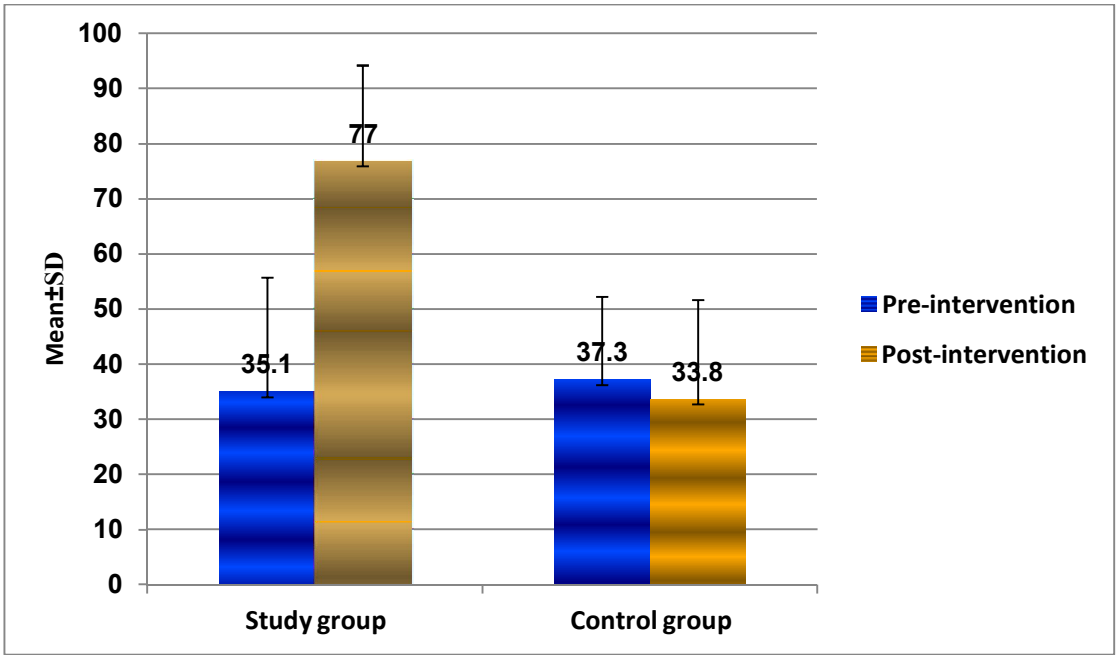

Figure (3) presents that the means total scores of Barthel Index scale were 77.0±17.26 and 33.80±17.88 for study and control groups respectively

Table (5): Correlation between pain scale scores and RAND and Barthel Index scale scores among the studied group:

	Pre-intervention pain scale scores of study group (n=50)	Pre-intervention pain scale scores of control group (n=50)	Post-intervention pain scale scores of study group (n=50)	Post-intervention pain scale scores of control group (n=50)
Pre-intervention RAND scale score	r= 0.72	r= 0.94		
Test of sig.	Spearman's rho	Spearman's rho		
P value	<0.001HS	<0.001HS		
Post-intervention RAND scale score			r=0.78	r=0.89
Test of sig.			Spearman's rho	Spearman's rho
P value			<0.001HS	<0.001HS
Pre-intervention Barthel Index scale score	r= 0.76	r=0.92		
Test of sig.	Spearman's rho	Spearman's rho		
P value	<0.001HS	<0.001HS		
Post-intervention Barthel Index scale score			r=0.72	r=0.86
Test of sig.			Spearman's rho	Spearman's rho
P value			<0.001HS	<0.001HS

Table (5) reveals that there were significant positive correlations between pain scale scores and RAND. also, between pain Brthel Index scale scores among study and control groups at post-intervention.

Discussion:

Concerning demographic characteristics: the mean age of both groups was 55.92 ± 9.18 and 55.12 ±9.50 Years respectively. Majority of study group and about two thirds of control group were male. In agreement with this result; **Agrawal et al;** [33]; reported that majority of studied sample were males but with a mean age 37.72±13.22Also; **(Pedras, (7)** showed that individuals with LLA aged from 22 to 89 years, with an average of 63 years and the most of them were male [7]. And **Faltas & Ameen;** [34] revealed that the highest percentage of studied sample were in the age group (45<60) years old and male. Furthermore; (**Nesbitt et al.,** [35] revealed that the mean age of patients with lower limb amputations was 59.5 years. And **Mohammed & Shebl;** [36]**;** presented" more than half of the females of the study had lower limb amputation with age ranged from fifty to sixty years". Also; **Mostafa et al;** [37] formed more than half of the subjects was female their age was fifty to less than sixty. The differentiation is easily explainable by the fact that males have a greater tendency of getting involved in outdoor activities in different community.

Regarding marital status, almost of both groups were married. Around half of study group and two thirds of control group were illiterate, more than half of both groups were unoccupied while two thirds of them reported their income was not satisfied. According to **Mohammed & Shebl**[36], majority of studied sample was illiterate, most of the males and most of the females were having jobs that require physical efforts. According to **(Pedras, (7)** individuals with LLA, 17.5% individuals had no education. Majority of the sample were married or living with a partner [7]. In **Mostafa et al;** [37] study; it was reported that the most percentages in both groups was illiterate. **Faltas & Ameen;** [34] revealed that the highest percentage of patients had private working.

Regarding the cause of amputation more than half of the study group and about two thirds of the control group had diabetic foot and lower percentage suffering ischemia; the site of amputation was mostly of right lower leg of studied group. In accordance with present study; **Agrawal et al;** [33] found that more than half of sample denoted cause of amputation to trauma, infection followed by low percentage had vascular injury and tumor. Furthermore **Mohammed and Shebl;** [36] showed that cause of amputations in more

than half of the both groups were diabetes while one-third were related to vascular disease. Concerning amputation site, majority of the studied sample have lower limb amputation. On the same line; **(Pedras,** [7]reported that three thirds of LLA were due to a chronic disease, only little suffered above-knee amputation. Furthermore; (**Nesbitt et al.,** [35] revealed that two thirds of amputation was diabetic patients, and one-third on dialysis. **Richardson** [38]stated that more than half of the amputation were related to diabetes, minority related to hypertension, and musculoskeletal/neurological.

Regarding pain pre and post-intervention: The current result revealed that near half of both groups had severe pain at pre-intervention. But about two thirds of study group had mild pain compared to half of the control group that had severe pain at post-intervention with statistical significance decreases. Supporting this result; **Yin et al.,** [39] revelaed that PLP was found in nearly one third of the amputees. The average of phantom limb pain intensity was 5.1 ± 2.2, third of them having severe intensity. Lower-limb amputation has significant functional, and psychological [40]**.**

Lower limb amputate are liable to multi physical, emotional and socialization problems. In the present study; There were statistically significant improvements in study group than control group at post-intervention as p- value <0.001. Concerning the present study; **Yin et al.,** [39] revealed that "the effects of phantom limb pain on the quality of the patients were as follows:" 7.8% of the patients had to limit their daily life and 29.0% of the patients had to limit their social activities. 17.3 And 25.7% of patients experienced depression and sleeping disorder respectively". According to**(Prawitri & Haryadi,** [11] Emotional disturbance had a negative consequence on the quality of life of patients. As patients who experienced phantom pain had worse quality of life than patients who did not. As quality of life aspects include impaired physical function, social function, and involvement because of physical problems, involvement due to inadaptation emotionally and general health awareness. Also**; Akarsu et al** [41] found that patients with lower limb amputations were liable to problems; physically, psychologically and socially when these problems' scores were pointedly higher in the unilateral group. Furthermore; **Knezevic et al;** [42] results have shown a positive statistically significant difference in the quality of life of the patients with amputations. The psychosocial wellness measured through socialization, emotional role, mentality after amputation. These findings signpost the necessity of continuity of care [43].

The amputated patients accomplish significantly lower scores in the portion of the SF-36 questionnaire relating to the pain scale. [42]**.** The present study demonstrated that the mean and standard deviation among study group were obviously improved at post-intervention than pre-intervention with statistically significant difference. Concerning this results **Riis Madsen** [43].; reported that patients functional status reduced obviously in daily living activities as measured by the Barthel Index.

In the present study; there were positive significant correlations between pain scale scores and RAND & Barthel Index scale scores among study and control groups post-intervention. **Guest, Marshall & Stansby** [44]**;** recommend that Effective amputation surgery, with respectable outcomes for the patient, required care to details and alert coordination with physiotherapy and rehabilitation departments. On the same line; **(Mostafa et al.,** [37]**;** suggested therapy programs for range of motion, conditioning exercises, correct placing of the residual limb, ambulation with gait aids, relaxation techniques, and activities of daily living (ADLs) should be started as soon as medically appropriate.

The improvement of an individual post amputation is impacted by the individual's motivation, level of amputation, presence of other medical conditions, and the availability of rehabilitation programs [27].

Implications for practice:

This article highlights that patients following LLA are suffering from phantom pain, risk of falling and poor functional independence. These patients required integration of healthcare practitioners in an interdisciplinary team especially considering of the physical/functional challenges as well as psychological challenges.

Conclusion:

Based on the consequences of current study, it was decided that nursing rehabilitation protocol after lower limb amputation was effective in reducing phantom pain, improving performance of activities of daily living and enhancing better lifestyle.

Recommendation:

– Offer a continuous a planned standard rehabilitation programs regularly to improve patients with amputation lifestyle at outpatient clinic of the vascular surgery**.**

– A written updated rehabilitation protocol of lower limb amputation supplemented by an illustrative booklet should be available and applied for all patient undergoing lower limp amputation.

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