

The effect of Buerger Allen Exercise Versus Reflexology on Lower Extremity Perfusion and Pain among Patients with Type 2 Diabetes Mellitus

Manar Ali Rashwan, clinical Instructor

Medical Surgical Nursing, Faculty of Nursing, Damanshour University.

Nabila Ahmed Bedier, Professor

Medical Surgical Nursing, Faculty of Nursing, Alexandria University.

Safaa Safaa El-Deen El-Kharbotly, Professor

Biological Sciences and Sports Health, Faculty of Physical Education for Boys, Alexandria University

Yousry Nassief Ebrahim, Professor

Internal Medicine, Medical National Institute, Damanshour

Amany Youssef Sharaf, Assistant Professor

Medical Surgical Nursing, Faculty of Nursing, Alexandria University

Abstract

Background: Preventing diabetic foot is a critical issue worldwide. Burger Allen Exercise and reflexology are considered the keystones for improving the lower extremity perfusion, and decreasing pain among diabetic patients. **Objective:** To determine the effect of Buerger Allen exercise versus Reflexology on lower extremity perfusion and pain among patients with type 2 Diabetes Mellitus. **Settings:** The study was carried out at Inpatient Medical Department of the National Medical Institute in Damanshour, El-Beheria governorate, Egypt. **Subjects:** A convenient sample of 60 adult diabetic patients. **Tools:** Four tools were used for data collection. **Tool 1.** Socio-Demographic and Clinical Data Sheet. **Tool II.** Ankle Brachial Index Scale (ABI) to assess the lower extremity perfusion. **Tool III.** Selected Clinical Features of Peripheral Vascular Disease Observational Checklist to assess the level of peripheral vascular disease (PVD). **Tool IV.** Pain Assessment Visual Analog Scale (VAS) to assess pain intensity. **Results:** The majority of the studied patients of the Buerger Allen exercise achieved "normal" level of Ankle Brachial Index (ABI) scale, "normal" level of PVD symptoms, and "mild" level of pain post intervention (73.3%, 90%, 66.7% respectively). 63.3% of the reflexology group patients achieved "normal" Ankle Brachial Index (ABI) scale, 100 % of them achieved "normal" level of PVD symptoms and 76.7 % achieved "no pain" post interventions. Statistical significant difference was found between the overall mean percent improvement of exercise and reflexology groups regarding level of pain ($p < 0.001^*$). **Conclusion:** Both Buerger Allen Exercise, and reflexology are effective in improving lower extremity perfusion among type 2 diabetes mellitus patients. Diabetic patients who performed reflexology intervention experience less pain more than those who performed Buerger Allen exercise. **Recommendations:** Encourage health care providers to integrate Buerger Allen exercise & reflexology in the care protocols of patients with DM in different health care settings

Keywords: Diabetes Mellitus, Buerger Allen exercise, reflexology, lower extremity perfusion, pain level.

Introduction

Diabetes is a complex, fast-growing health problem with a significant short-term and long-term complications which have an impact on patients' morbidity, and mortality (Kohsaka, 2021). The global prevalence of diabetes in 2019 was estimated to be 9.3% (463 million people), rising to 10.2% (578 million) by 2030 and 10.9% (700 million) by 2045 worldwide. In Egypt, the prevalence of type 2 diabetes is around 15.6% of all adults aged 20 to 59 (Hassan, et al 2020).

Diabetic peripheral neuropathy (DPN) is a common complication of diabetes affecting 66% of patients with insulin-dependent diabetes mellitus and 59% of patients with non-insulin-dependent diabetes mellitus. (Egila H,2020)

Peripheral artery disease (PAD) is an atherosclerotic disease that affects a large proportion of the world's population, with an estimated global prevalence of up to 200 million people Exercise and physical activity, as well as regular exercise, are important parts of controlling PAD and enhancing patients' quality of life (Signorelli S,2020)

Buerger Allen Exercises are effective among diabetic patients; which help patients in potential mechanisms like formation of collateral circulation and increase blood flow. Exercises used to empty engorged vessels, stimulate circulation, and relieve swelling in patients with arterial insufficiency of the lower extremity (Parimala. L et al., 2019)

Nowadays, the use of complementary and alternative medicine has been increased. Reflexology is one of an important alternative medicine, which can be considered a part of nursing care (Mirzaie P, et al, 2018). Massaging the soles of the feet can stimulate energy and neural paths as well as improve blood flow and oxygenation. Therefore, reflexology can reduce physical problems as, pain and it also affects the human mental dimension as, anxiety; (Hosein T., et al,2019).

Preventing diabetic foot is a critical issue worldwide, Buerger's exercises and reflexology are seen as a conservative treatment of the peripheral vascular disease (Chang, Chang and Chen, 2015).

Therefore, nursing interventions are essential in this area and the nurse should take active role in assisting the patients to learn measures that may decrease their pain and improve their abilities to perform activities of daily living. So this study was conducted to determine the effect of Buerger Allen exercise versus Reflexology on lower extremity perfusion and pain among patients with type 2 Diabetes Mellitus.

Aims of the Study

This study aims to determine the effect of Buerger Allen exercise versus Reflexology on lower extremity perfusion and pain among patients with type 2 Diabetes Mellitus

Research Hypotheses

1. Diabetic patients who perform Buerger Allen exercise experience less pain and improved lower extremity perfusion
2. Diabetic patients who perform reflexology experience less pain and improved lower extremity perfusion
3. Diabetic patients who perform Buerger Allen exercise experience less pain and improved lower extremity perfusion than those who perform reflexology
4. Diabetic patients who perform reflexology experience less pain and improved lower extremity perfusion than those who perform Buerger Allen exercise.

Materials and Method

Materials

Design: Quasi-experimental research design was used for the purpose of this study

Settings: The study was carried out at the Inpatient Medical Department of the

National Medical Institute in Damanhur, El-Beheria governorate, Egypt.

Subjects: The sample size was estimate using Epi info 7 statistical program using the following parameters; total population (diabetic patients attending the previously mentioned settings) 200, confidence level 95% and with 10% margin of error. The minimum sample size estimated to be 48 diabetic patients. The final sample size was 60 adult patients. Those patients were divided into two equal groups 30 patients for each; Bureger Allen exercise group and reflexology group.

Inclusion criteria:

- Age 40-60 years with type II diabetes
- Willing to participate in the study
- Patients with pain in lower extremity
- Patients with peripheral artery disease assessed by Ankle Brachial Index <1
- Free from disability (lower limb amputation) and other peripheral vascular disease as deep vein thrombosis (DVT)

Tools: Four tools were used to collect data of the study:

Tool (I): Socio-Demographic and Clinical Data Sheet: It was developed by the researchers to collect the necessary data from patients. It included two parts:

First part: Socio-demographic data: including age, gender, marital status, level of education, occupation and residence.

Second part: Clinical data: including family history, medical health history, duration of the disease, and causes of previous hospitalization.

Tool (II): Ankle Brachial Index Scale (ABI). This scale was adopted from Selmar (2016), to assess the lower extremity perfusion. The ABI was done using standard manual sphygmomanometer and standard hand held Doppler. Formula for Calculating Ankle Brachial Index (ABI): Ankle brachial Index = Highest ankle pressure / Highest brachial arm pressure. The score was interpreted as following: >1=normal, 0.8-

1.0= mild level of peripheral arterial disease,0.5-0.8=moderate level of peripheral arterial disease, < 0.5 =severe level of peripheral arterial disease

Tool (III): Selected Clinical Features of Peripheral Vascular Disease Observational Checklist. This sheet was adopted from Priya et al (2016), to assess the level of peripheral vascular disease (PVD). It included six parameters (peripheral pulse, capillary refill, edema, temperature, pain, and skin color.) scoring of items was done with standard revised venous clinical severity score. 0-4-normal, 5-9-mild, 10-14- moderate, and 15-18-severe level symptoms of peripheral vascular diseases

Tool (IV): Pain Assessment Visual Analog Scale (VAS) This scale was adopted from Domenica (2018), to assess pain intensity. Scores are based on self-reported measures of symptoms that are recorded with a single handwritten mark placed at one point along the length of a 10-cm line that represents a continuum between the two ends of the scale— “no pain” on the left end (0 cm) of the scale and the “worst pain” on the right end of the scale (10 cm). scoring system zero =no pain, from1-3 cm mild pain, from 4-6 cm moderate, 7-9 cm sever, 10cm unboreable pain.

Method

1. Written approval of the Ethical Committee of Nursing Research at Alexandria faculty of nursing was obtained before conducting the study. Official approval to carry out the study was obtained from the hospital responsible authorities at the previously mentioned research setting to collect necessary data after explaining the aim of the study.
2. Content validity of tools was submitted to a panel of 5 experts specialized in the field of medical surgical nursing department, faculty of nursing, Alexandria University to test their comprehensiveness, clarity and

objectivity. Comments and suggestions were reviewed and necessary changes were done accordingly.

3. A pilot study was conducted on 10% of the subjects to assess clarity, applicability and feasibility of the developed and adopted tools. Modifications were introduced accordingly. Pilot study patients were excluded from the study sample.
4. The researcher received training related to the performance of reflexology under supervision of the Physical Education Faculty specialist and under the observation of one of the supervisors' committee during data collection.
5. To fulfill the study aim, the study was carried out in four phases: assessment, planning, implementation, and evaluation. Start with exercise group first then reflexology group.

I. Assessment phase:

- The researcher introduced herself to the selected patients, and explained the purpose of the study
- Initial assessment was conducted on individual base of all patients in both exercise and reflexology groups to assess the lower extremity perfusion level using tools II, III, to assess pain level using tool IV.

1. **For the exercise group**

- A. The researcher provided information for each patient individually regarding Bureger allen exercises (benefits, how to perform these exercise, duration of performance, frequency, time of demonstration)
- B. The researcher demonstrated the Bureger allen exercises using illustrated pictures
- C. The patient performed the exercise with the assistance of the researcher for 30-45 minutes two times per day with 6 hours interval for the period of 5 days (10 sessions) in the presence of

the researcher in the morning (9 Am) and evening shift (3Pm) in the medical department in patients' room.

- Each session will consist of three steps:
 - *Step 1 Elevation*; the lower extremities were elevated to 45-degree angle and supported in this position until the skin blanches (2-3 minutes)
 - *Step 2 Dependency*; the feet and legs were lowered below the level of the rest of the body until redness appears (3-5 minutes).
 - *Step 3 Horizontal*; the legs were placed flat on the bed for (3-5 minutes).
- Reassessment was conducted on the sixth day using tool II, tool III and tool IV.

II. **For the reflexology group** the

researcher provided information for each patient individually regarding Reflexology (benefits, performance, duration of performance, frequency, time of demonstration)

- Foot massage was carried out by the researcher for 30-45 minute, for three sessions/week for four weeks (12 sessions).
- During each session; the researcher demonstrated reflexology foot massage session as follows: Relaxing reflexology technique phase and reflexology massage phase ended by (foot relaxation massage)
- Every patient received complete reflexology foot massage session for 40 min (20 min for each foot) to specific reflex points in the foot guided by reflexology foot massage map.
- Initial assessment was done before demonstrating reflexology foot massage,

second assessment, after the sixth session, and third assessment, after the twelve session using tool II, tool III and tool IV were done.

- Post interventions evaluation:

a) The Exercise group patients were evaluated once using (tool II), (tool III) to assess lower extremity perfusion and (tool IV) to assess pain intensity on the six day after tenth session. b) The reflexology group patients were evaluated twice, after sixth session and twelve sessions.

c) The effect of Buerger Allen Exercise Versus Reflexology on lower extremity perfusion and pain among Patients with Type 2 Diabetes Mellitus was determined by comparing the results of both groups before & after interventions.

Ethical considerations:

- Patient's written consent was obtained after explanation of the aim of study.
- The privacy and confidentiality of patient's responses was assured.
- The patients were informed that their participation is voluntary and they can refuse participation in the study.

Statistical Analysis

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

Results

Table (1) Frequency distribution of the studied patients of both Bureger Allen exercise and reflexology groups according to their sociodemographic and clinical characteristics . More than half of the studied patients were between 50 to 60 years in both exercise, and reflexology groups (60%, 56.7% respectively), 56.7% of the exercise group patients were females, and 56.7% of the reflexology group patients were male.

Concerning the educational level, two fifth of both exercise and reflexology groups (40 %) were illiterate. Regarding health history, nearly half of studied patients (50%, 60% respectively) had hypertension in both exercise and reflexology groups. In relation to duration of the disease, 60%, 63.3% respectively of patients had diabetes between 5-10 years in both exercise and reflexology groups.

Table (2): Shows frequency distribution of both Buerger Allen exercise and reflexology groups according to ankle brachial index (ABI) of peripheral vascular diseases (PVD) level at pre and post interventions. The majority of the exercise group patients (73.3%) achieved "normal" level of peripheral vascular disease after application of interventions, while 63.3% of the reflexology group patients achieved "normal" level of PVD four weeks post application of interventions. Statistical significant differences were detected between pre and post interventions' levels of PVD in both groups ($p < 0.001^*$). No significant differences were detected between the overall mean percent improvement of exercise and reflexology groups regarding level of lower extremity perfusion measured by ABI scale.

Table (3): Displays frequency distribution of both Buerger Allen Exercise and reflexology groups according to their levels of peripheral vascular disease (PVD) symptoms at pre and post interventions. The majority of the studied patients (90%) achieved "normal" level of PVD symptoms after application of the exercise interventions. Moreover, all of the studied patients (100 %) achieved "normal" level of PVD symptoms four weeks post application of the reflexology interventions. Statistical significant differences are detected between pre & post interventions levels of PVD symptoms in both groups ($p < 0.001^*$). No significant differences were detected between the overall mean percent improvement of exercise and reflexology groups regarding level of lower extremity perfusion measured by level of PVD symptoms.

Table (4): Illustrates frequency distribution of both Buerger Allen Exercise and reflexology groups patients according to their levels of pain at pre and post exercises and reflexology. The findings revealed that 66.7 % of the exercise group patients achieved a “mild” level of pain post interventions. The finding also revealed that 76.7 % of the reflexology group patients achieved “no pain” level four weeks post interventions. Statistical significant differences between pre and post-test levels of pain were detected in both exercise, and reflexology groups ($P < 0.001^*$). A statistical significant differences were found between the overall mean percent improvement of exercise and reflexology groups regarding level of pain ($p < 0.001^*$)

Table (5): Illustrates Relationship between selected socio-demographic & clinical data and overall mean percent improvement of level of lower extremity perfusion and pain level in both exercise, and reflexology groups. A statistical significant difference was found between medical health history and overall mean percent improvement of level of lower extremity perfusion ($p = 0.017^*$) as the patients who had health history had improvement of level of lower extremity perfusion than those had no health history in reflexology groups.

Discussion

Burger Allen Exercise and reflexology are considered the keystones for improving the lower extremity perfusion, and decreasing pain among diabetic patients. This raises the urge for investigating the effects of Burger Allen exercise versus reflexology on perfusion of lower extremity and pain among diabetic patients. Therefore, this study was conducted to determine the effects of Burger Allen Exercise versus reflexology on perfusion of lower extremity and pain among diabetic patients.

Concerning socio-demographic and clinical data of the studied patients, the present study revealed that the mean age among the studied patients was $(50.07 \pm$

$5.92)$ years, and (50.33 ± 6.51) respectively in both exercise, and reflexology groups. These findings are in agreement with (Sasi et al., 2020) who revealed that the mean age of the experimental group in their study was (55.30 ± 4.58) . Also, the present study revealed that more than half of the studied patients in the exercise group were female, while they were male in the reflexology group. This finding is in line with (Leelavathi, 2015) who mentioned that most of studied patients with diabetes mellitus were males. Moreover, the findings of the current study showed that two-fifth of the studied patients in both exercises, and reflexology groups were illiterate. This may be attributed that more than two-third of the studied patients in both exercise, and reflexology groups were living in rural areas with low economic status whereas, they were interested in working their children's to increase income more than their education. These findings were supported by (Bhuvaneshwari & Tamilselvi, 2018) who illustrated that more than one-third of their patients were illiterate.

Regarding medical health history, the current study revealed that about half of the studied patients in both exercises, and reflexology groups were hypertensive. This may be related to that the majority of the studied patients had DM from 5 to 10 years, these patient had long- term complications of diabetes mellitus as peripheral vascular diseases and had atherosclerosis that increase resistance of vascular wall and hyperglycemia, both mechanisms elevate systemic blood pressure. These results were in agreement with (Kumari et al., 2019) who found that more than half of diabetic patients were suffering from hypertension. Also, the current study showed that the majority of the studied patients in both exercises, and reflexology groups were suffering from DM for 5 to less than 10 years. This finding was in line with (Patidar, 2018) who stated that the majority of their studied subjects had diabetes for five to ten years.

Various interventions are attempted to prevent complications, two types of therapy that are recently developing are Buerger's exercise and reflexology (Hidayat, A, 2021). Ankle Brachial Index Scale, and an observational checklist for selected clinical features of PVD were used to assess the lower extremity perfusion. Also, a visual analog scale (VAS) is used to assess pain levels among both Berger's Allen exercise and reflexology groups.

Regarding the effects of Buerger Allen exercise and reflexology on the levels of lower extremity perfusion measured by ABI, the current study illustrated that there was a significant improvement in Ankle-Brachial index scale post-application of Buerger's exercise and reflexology interventions. These findings were in the same line with (Radhika et al., 2020) who found that there was a significant improvement in ABI score among diabetics post-Buerger Allen exercise intervention. Similar result was reported by (Cicek, 2021) post reflexology intervention.

Regarding the effect of Buerger Allen exercise and reflexology on the level of lower extremity perfusion measured by level of PAD symptoms. There was a significant improvement of lower extremity perfusion levels post-application of Buerger Allen exercise and reflexology ($P < 0.001$). This finding may be related to Buerger Allen Exercise can increase the glucose uptake by active muscles exercise which lower the blood glucose level, prevents peripheral artery disease, increases blood flow to arteries, which produced positive effect on preventing PAD among diabetic patients. These findings are in the same line with (Digal, 2019) who reported that there was significant improvement in lower extremity perfusion post-Buerger Allen exercise interventions among diabetic patients. Regarding reflexology these findings may be related to that reflexology increase blood flow to lower limbs by direct pressure on the reflex points, which releases vasodilators, stimulated circulation of blood to the feet These study findings were agreed with

(Sakdanuparp, 2013) who found that foot reflexology was an effective way to improve foot blood flow and peripheral neuropathy.

Regarding the effects of Buerger Allen exercise and reflexology on pain of lower limb, the present study illustrated that there was a significant decreasing of level of pain post-application of Buerger's exercise and reflexology interventions. These findings may attribute that Buerger Allen exercise improved circulation of lower limb and improved lower extremity perfusion, so decrease pain sensation. These findings were relevant by (Awaluddin et al., 2019) who found that exercise improved peripheral pain among people with diabetes post application Buerger Allen exercise intervention. Regarding reflexology these findings could be related to the fact that reflexology works based on balancing electrical and chemical stimuli in the body's distant organs and tissues, improves vascular blood flow, stimulates neurotransmitters between nerve endings so, decreasing pain levels. This finding was in the same line with (Chatchawan, 2020) who mentioned that reflexology was one of the recent non-pharmacological treatments for diabetic patients for mediated vasodilation which decreases the sensation of pain.

Also, the current study revealed that a statistically significant difference was found between the overall mean percent improvement of exercise and reflexology groups regarding level of pain ($p < 0.001^*$). This finding may be interpreted that reflexology procedure induces focused pressure on the specific reflex point of (solar plexus) in the foot sole as, which decreases pain levels of feet and increases blood supply to the legs resulting in improving lower extremity perfusion.

In addition, the current study showed a significant relationship between medical health history and overall mean percent improvement of the level of lower extremity perfusion in the reflexology group. This finding may be attributed that reflexology has positive effects on different systems as

endocrine not only circulatory, and digestive systems through pressure on reflex points of these systems in the foot, many problems of these systems can be improved after performing reflexology sessions, so patients with hypertension or liver disease may experience improvement than others.

Conclusion

Based upon the findings of the current study, it could be concluded that the majority of both the Buerger Allen Exercise and reflexology group patients achieved improvement in level of peripheral vascular disease, and level of pain post intervention. Diabetic patients who perform reflexology intervention experience less pain more than those who perform Buerger Allen exercise.

Recommendations

In line with the findings of the study, the following recommendations are made:

1. Encourage health care providers to integrate Buerger Allen exercise & reflexology in the protocols of nursing care for patients with DM in different health care settings.
2. Provide each diabetic clinic with qualified and trained nurses to apply reflexology intervention

Table (1): Frequency distribution of the studied patients of both exercise and reflexology groups according to their sociodemographic and clinical characteristics (n=60).

Socio-demographic characteristic and clinical characteristics	Exercise group (n = 30)		Reflexology group (n = 30)		χ^2	p
	No.	%	No.	%		
Age					0.069	0.793
40<50 years	12	40.0	13	43.3		
50-60 years	18	60.0	17	56.7		
Min. – Max.	41.0 – 60.0	41.0 – 60.0	40.0 – 59.0	40.0 – 59.0		
Mean \pm SD.	50.07 \pm 5.92	50.07 \pm 5.92	50.33 \pm 6.51	50.33 \pm 6.51		
Gender					1.067	0.302
Male	13	43.3	17	56.7		
Female	17	56.7	13	43.3		
Marital status					0.995	MCp=1.000
Single	1	3.3	0	0.0		
Married	22	73.3	23	76.7		
Widow	7	23.4	7	23.3		
Divorced	0	0.0	0	0.0		
Educational level					0.111	0.946
Illiterate	12	40.0	12	40.0		
Read & Write	8	26.7	9	30.0		
Diploma degree	10	33.3	9	30.0		
Bachelor degree	0	0.0	0	0.0		
Occupation					1.288	MCp=0.815
Clerical work	9	30.0	6	20.0		
Manual work	9	30.0	12	40.0		
House wife	11	36.7	11	36.7		
Retired	1	3.3	1	3.3		
Residence					0.000	1.000
Urban	15	50.0	15	50.0		
Rural	15	50.0	15	50.0		
Health history					0.496	FEp=0.593
Hypertension	15	50	18	60		
Liver disease	2	6.7	1	3.3		
None	13	43.3	11	36.7		
Duration of the disease					0.451	0.798
1>5 years	7	23.3	5	16.7		
5>10 years	18	60.0	19	63.3		
10>15 years	5	16.7	6	20.0		

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

Table (2): Frequency distribution of both Buerger Allen exercise and reflexology groups patients according to ankle brachial index (ABI) of peripheral vascular diseases (PVD) level at pre and post exercise and reflexology interventions. (n = 60).

Ankle brachial index scale (ABI)	Exercise groups (n = 30)				Reflexology groups(n = 30)					
	Pre interventions		Post interventions		Pre interventions		Post 1		Post 2	
	No.	%	No.	%	No.	%	No.	%	No.	%
Normal	0	0.0	22	73.3	0	0.0	3	10.0	19	63.3
Mild level of peripheral arterial disease.	24	80.0	8	26.7	19	63.3	27	90.0	11	36.7
Moderate level of peripheral arterial disease	6	20.0	0	0.0	11	36.7	0	0.0	0	0.0
Severe level of peripheral arterial disease	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
% improvement	43.33±13.56				40.56±23.03					
p₀	MH p<0.001*				Fr p<0.001*					

Post 1 = Two weeks after reflexology
 Post 2 = Four weeks after reflexology Fr: Friedman test MH: Marginal Homogeneity Test
 p₀: p value for comparing between studied periods *: Statistically significant at p ≤ 0.05

Table (3): Frequency distribution of both Buerger Allen Exercise and reflexology groups patients according to their levels of peripheral vascular disease (PVD) symptoms at pre and post exercises and reflexology. (n=60).

Level of PAD Symptoms	Exercise groups (n = 30)				Reflexology groups(n = 30)					
	Pre interventions		Post interventions		Pre interventions		Post 1		Post 2	
	No.	%	No.	%	No.	%	No.	%	No.	%
Normal-Absence of clinical features of PVD	9	30.0	27	90.0	7	23.3	29	96.7	30	100.0
Mild clinical features of PVD	21	70.0	3	10.0	23	76.7	1	3.3	0	0.0
Moderate clinical features of PVD	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Sever clinical features of PVD	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
% improvement	30.0 ± 24.91				38.33±21.51					
p₀	MCN p<0.001*				Fr p<0.001*					

Post 1 = Two weeks after reflexology Post 2 = Four weeks after reflexology
 Fr: Friedman test McN: McNemar test
 p₀: p value for comparing between studied periods *: Statistically significant at p ≤ 0.05

Table (4): Frequency distribution of both Buerger Allen Exercise and reflexology groups patients according to their levels of pain at pre and post exercises and reflexology. (n=60).

Visual Analog Scale	Exercise groups (n = 30)				Reflexology groups(n = 30)					
	Pre interventions		Post interventions		Pre interventions		Post 1		Post 2	
	No.	%	No.	%	No.	%	No.	%	No.	%
No pain	0	00.0	4	13.3	0	0.0	6	20.0	23	76.7
Mild pain	4	13.3	20	66.7	5	16.7	18	60.0	7	23.3
Moderate pain	20	66.7	6	20.0	19	63.3	6	20.0	0	0.0
Severe pain	6	20.0	0	00.0	6	20.0	0	0.0	0	0.0
Unbearable	0	00.0	0	00.0	0	0.0	0	0.0	0	0.0
% improvement	33.89 ± 7.24				58.89±11.97					
p₀	MH p<0.001*				Fr p<0.001*					

Post 1 = Two weeks after reflexology Post 2 = Four weeks after reflexology
 Fr: Friedman test MH: Marginal Homogeneity Test
 p₀: p value for comparing between studied periods *: Statistically significant at p ≤ 0.05

Table (5): Relationship between selected socio-demographic & clinical data and overall mean percent improvement of level of lower extremity perfusion and pain level in both exercise, and reflexology groups (n = 60)

	Exercise group (n = 30)			Reflexology group (n = 30)		
	Ankle brachial index scale (ABI)	Symptoms of PAD	Visual Analog Scale	Ankle brachial index scale (ABI)	Symptoms of PAD	Visual Analog Scale
	Mean ± SD.	Mean ± SD.	Mean ± SD.	Mean ± SD.	Mean ± SD.	Mean ± SD.
Age						
40–50 years	36.11 ± 18.58	33.33 ± 24.62	33.33 ± 6.15	35.90 ± 22.41	42.31 ± 18.78	56.41 ± 12.80
50–60 years	48.15 ± 5.39	27.78 ± 25.57	34.26 ± 8.03	44.12 ± 23.53	35.29 ± 23.48	60.78 ± 11.32
U (p)	64.0 (0.065)	96.0 (0.632)	106.0 (0.950)	82.0 (0.245)	95.0 (0.536)	88.50 (0.363)
Gender						
Male	42.31 ± 14.62	34.62 ± 24.02	35.90 ± 8.60	44.12 ± 19.49	38.24 ± 21.86	61.27 ± 10.60
Female	44.12 ± 13.10	26.47 ± 25.72	32.35 ± 5.81	35.90 ± 27.09	38.46 ± 21.93	55.77 ± 13.34
U (p)	102.50 (0.742)	92.50 (0.457)	87.50 (0.341)	95.50 (0.536)	110.0 (1.000)	85.0 (0.300)
Educational level						
Illiterate	47.22 ± 6.49	25.0 ± 26.11	35.42 ± 9.48	41.67 ± 21.90	29.17 ± 25.75	59.72 ± 11.14
Read & Write	36.58 ± 17.68	31.25 ± 25.88	35.42 ± 5.89	33.33 ± 27.64	44.44 ± 16.67	55.56 ± 16.14
Diploma degree	41.67 ± 16.20	35.0 ± 24.15	30.83 ± 4.03	46.30 ± 20.03	44.44 ± 16.67	61.11 ± 8.33
H (p)	1.326 (0.515)	0.906 (0.636)	2.618 (0.270)	1.159 (0.560)	3.633 (0.163)	0.350 (0.839)
Health history						
None	43.59 ± 14.50	23.08 ± 25.94	35.90 ± 8.60	24.24 ± 23.99	36.36 ± 23.35	56.82 ± 14.35
Hypertension	42.22 ± 13.90	36.67 ± 22.89	31.67 ± 3.45	50.0 ± 17.15	38.89 ± 21.39	59.72 ± 10.79
Liver disease	50.0 ± 0.0	25.0 ± 35.36	37.50 ± 17.68	50.0	50.0	66.67
H (p)	1.032 (0.597)	2.158 (0.340)	1.480 (0.477)	8.187*(0.017*)	0.398 (0.819)	0.577 (0.749)
Duration of the disease						
1>5 years	42.86 ± 18.90	14.29 ± 24.40	38.10 ± 8.13	23.33 ± 22.36	40.0 ± 22.36	50.0 ± 11.79
5>10 years	46.30 ± 7.13	33.33 ± 24.25	32.87 ± 7.27	43.86 ± 21.67	36.84 ± 22.62	60.96 ± 10.41
10>15 years	33.33 ± 20.41	40.0 ± 22.36	31.67 ± 3.73	44.44 ± 25.09	41.67 ± 20.41	59.72 ± 15.29
H (p)	3.532 (0.171)	3.913 (0.141)	3.336 (0.189)	4.116 (0.128)	0.265 (0.876)	3.626 (0.163)

U: Mann Whitney test

H: H for Kruskal Wallis test

*: Statistically significant at p ≤ 0.05

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