

## Impact of Buerger Allen Exercise on Improving Selected Clinical Features of Peripheral Vascular Disease among Diabetic Patients

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### Abstract

**Background:** Diabetes mellitus has increased the risk of peripheral vascular diseases by causing endothelial and smooth muscle cell dysfunction in peripheral arteries. Exercise is the fundamental principle for preventing the peripheral vascular diseases (PVD) among diabetic patients one of these exercises is Buerger Allen exercise. **Aim:** the study aims to evaluate the impact of Buerger Allen exercise on improving clinical features of peripheral vascular disease among diabetic patients. **Design:** Quasi-experimental research design. **Sample:** Purposeful samples include estimated numbers  $n = 100$  diabetic patients were selected. **Setting:** The present study was conducted at the diabetic out-patient clinic, at Minia university hospital. **Tools:** Data were collected using two tools; the first tool included structured interviewed data related to demographic characteristics and medical status. The second tool is assessment check list for selected clinical features of peripheral vascular disease it includes four parameters (Peripheral pulse, Capillary refill, Pain level and Skin color.). **Results:** The main finding of the current study were near to half among study group were had no pain sensation and less than one third among them have normal color of the skin after they were applied Buerger Allen exercise. There is a significant improvement in the level of selected clinical feature of PVD among study group after they were applied Buerger Allen exercise at ( $p < 0.01$ ). **Conclusion:** This study indicates that Buerger Allen Exercise is effective method for the reducing clinical feature of PVD among the patient with type II diabetes mellitus. **Recommendation:** A comparative study conducted to evaluate the effectiveness of Buerger Allen Exercise with other non-pharmacological measures for improving the level of lower extremity perfusion.

**Key words:** Buerger Allen exercise, Peripheral vascular disease, Diabetes mellitus.

Date of Submission: 10-04-2020

Date of Acceptance: 25-04-2020

### I. Introduction

Type 2 diabetes mellitus (T2DM) is a metabolic disorder that is characterized by high blood sugar due to insulin resistance (reduced ability of insulin to stimulate utilization of glucose in the cells of the body system) and also relatively reduced secretion of insulin from the beta cells of pancreas. Obesity, unhealthy dietary habits, sedentary life style and genetic factors are considered as important risk factors in the development of T2DM (Farooq et al., 2017). Peripheral vascular disease is one of the macro-vascular complications of Type 2 DM. Prevalence of PAD is higher among diabetics and has a predilection for lower limbs. It has been hypothesized that the metabolic abnormality in the pre-diabetic phase predisposes to a more distal and aggressive atherosclerosis. Once diabetes has developed, this process is accelerated due to chronic hyper glycaemia, endothelial damage, non-enzymatic glycosylation and poly-neuropathy which in turn could lead to impaired vascular remodeling and collateral formation (Jakovljevic & Milovanovic, 2015). Peripheral arterial disease is a condition characterized by a gradual reduction in blood flow to one or more limbs secondary to atherosclerosis (Edwards et al., 2017). PAD most often affects the arteries that supply the legs and can result in poor perfusion of the muscles and skin of the lower extremity. It may lead to bruises or injuries that do not heal, gangrene, and ultimately, amputation especially in patients with diabetes (Mays, et al., 2018). Peripheral arterial disease, is clinically manifested as intermittent claudication or critical ischemia, or identified by an ankle/brachial index (ABI)  $< 0.9$ , is present in at least one in every four patients with type 2 diabetes mellitus (Goel S, et al., 2018). Claudication is the most severe manifestation of PAD and is caused by severe progressive atherosclerosis. As a result, progression to ulcers, gangrene, and amputation can occur. The pain at rest which can occur is characterized as an ache or a discomfort in the arch of the foot or toes, and it is usually exacerbated with leg elevation. Patients are most uncomfortable when lying flat with their legs elevated (McDermott, 2015). Buerger Allen exercise is one of the most common practice exercise for diabetic patient to drain engorged vessel by

using postural changes and stimulated peripheral circulation by modulating gravity and applying muscle contraction for improving the lower extremity perfusion and relieving the symptoms in patients with lower limbs arterial insufficient (Gerhard-Herman et al., 2017). It has been observed that nurses have an effective role in prevention of foot ulcers and lower limb amputation by educational interventions, screening high-risk people and providing health care (Bethel, 2015). However, the nurse educators can evaluate patient requirements and design a particular educational program for each of patients and their families. Nurses can facilitate active participation of patients and family members in care and they can also teach patients about the importance of regular visits to the clinic, blood tests at specified intervals and the primary principle of diabetes care and prevention of its complication (Ammendola et al., 2017).

### **Significant of the study**

Diabetes mellitus is the one of the important health issue in today's world which may affect the entire life pattern of an individual. It is a global and chronic public health problem and is now growing as an epidemic in both developed and developing countries. Individuals with diabetes, peripheral arterial disease (PAD) typically presents at an earlier age among diabetes mellitus patients and is associated with a more rapid progression than in non-diabetic. Moreover, the incidence of PAD increases significantly with the longer an individual has been diabetic (Park et al., 2013 & Ahmad, J. 2016). In Egypt, diabetes mellitus is a fast growing public health problem with a significant impact on morbidity, mortality, and health care resources. Currently, the prevalence of type II diabetes (T2D) is around 15.6% of diabetic Egyptian adults aged twenty (20) to seventy nine (79) years of age (International Diabetes Federation, 2013 & Hegazi et al 2015)

Peripheral arterial disease (PAD) is one of the macro-vascular complications of type 2 diabetes mellitus. It has received little detection especially among the community setting. Hence, we carried out the present study to explore impact of buerger Allen exercise on improving Lower peripheral arterial perfusion among type II diabetic patients.

### **Aim of The study:**

The current study aimed to evaluate the impact of Buerger Allen exercise on improving clinical features of peripheral vascular disease among diabetic patients.

## **II. Materials And Methods**

### **Research Design:**

The quasi-experimental research design (study & control) was utilized in the current study.

### **Setting:**

The study was conducted at the diabetic out-patient clinic, Minia university hospital. Selected hospital located on the western bank of the Nile River and in the face the upper bridge on the Nile south of Minia City.

### **Sample size:**

Purposeful sample technique was utilized in this study. Selected number of with type II Diabetes Mellitus who attend the outpatient clinics and whose who met the inclusion criteria will be divided into two equal groups, control and study (n.= 50 for each one). The total numbers of patients attending the diabetes clinic during the year are one thousand (1000) patients and the sample was calculated using the following equation:-

The determination of the sample size based upon the following sample calculation formula:

$$N = \frac{t^2 \times p(1-p)}{m^2}$$
$$N = \frac{(1.96)^2 \times 0.07(1-0.07)}{(0.05)^2} \quad N = 100 \text{ patient}$$

### **Description:**

N = required sample size.

t = confidence level at 95 % (standard value of 1.960).

p = estimated prevalence of type 2 diabetes mellitus at Minia University Hospital 2016 (0.07).

m = margin of error at 5 % (standard value of 0.05).

### **Inclusion Criteria:**

- Patients who are medically diagnosed as Type II Diabetes Mellitus and with regular treatment.
- Diabetic patients for more than 4 years.

**Exclusion criteria:**

- Patients who have severe foot ulcer or amputated.

**Study Tools:**

The current study data was collected by two tools. Study tool was revised by five experts in the field of nursing at the faculty of nursing; Assiut and Minia University, to test its content validity and feasibility, the necessary modifications were done. **This includes two tools:-**

**Tool 1: Structured interviewed data**

**Part 1: Socio demographics characteristics assessment:**

It consists of five (5) items including socio demographic data such as age, sex, occupation, level of education, residence.

**Part 2: Medical status assessment:**

This part include six (6) items as duration of diabetes mellitus, health problem, body mass index, a accompanied medical illness with diabetes II, diabetes treatment, family history of peripheral arterial disease and receive medical treatment for PAD.

**Tool 2:- Assessment check list for selected clinical features of peripheral vascular disease.**

This checklist was applied to assess the symptoms level of peripheral vascular disease (PVD). Developed by **Priya, N (2016)**. It includes six (6) parameters (Peripheral pulse, Capillary refill, Edema, Temperature, Pain, Skin color.) and was modified by the researcher who excluded edema and temperature parameters because they were not appear on the diabetic patients while conducting the pilot study. Scoring of parameters was done by **Priya, N (2016)** according standard revised venous clinical severity score.

Peripheral pulse rank from zero (0) (normal pulse) to three (3) (absent of peripheral pulse), capillary refill rank from zero (0) (1-2 second) to three (3) (>4 second), pain or other discomfort ( i.e., aching, heaviness, fatigue, soreness, burning) rank from zero (0) (no pain) to three (3) ( severe in which daily pain or discomfort i.e., limits most regular daily activities) and color of the skin rank from zero (0) (normal color) to three (3) (reddish). Scoring system for this checklist was estimated as the following: total scoring system for this checklist for four parameters (0-3) scores this mean the patient has normal or absence of clinical features of PVD, (4-6) this mean the patient has mild clinical features of PVD, (7-9) this mean the patient has moderate clinical features of PVD and (10-12) this mean the patient has severe clinical features of PVD.

**Content validity:** The tools content validity was done to identify the degree to which the used tools measure what was supposed to be measured. Developed tools were examined by a panel of five experts' opinion in the field of community health nursing specialty and the tool (2) was suggested adding to assess the symptoms level of peripheral vascular disease.

**Reliability:** Internal consistency of interview questionnaire was assessed with the Cronbach's alpha coefficient. Cronbach's alpha coefficient of 0.00 indicates no reliability and a coefficient of 1.00 indicates perfect reliability. However, a reliability coefficient of  $\geq 0.70$  is acceptable. Cronbach's alpha for reliability testing was performed for selected clinical features of PVD tool and the results was 0.897.

**Procedure**

- An official permission taken from the dean of the faculty for conducting the study. An official letter from the faculty of nursing was delivered to the director (s) of the intended study setting (director of Minia University Hospital and director of diabetes mellitus outpatient clinics)
- **The study duration** lasted for six months; the study started at the beginning of November 2018, and was completed by the end of April 2019.
- Selected sample who attend the diabetic outpatient clinic was chosen and informed by the researcher individually about purpose and nature of the study, then researcher obtained oral consent from those who accepted to participate in this study.
- The current study collection tools was done by the researcher through two days per week from the studied sample who scheduling in diabetes mellitus outpatient clinic
- The researcher has started a collection of data from control group firstly in three months by using the study tools which consisted of two tools (socio-demographic characteristics, medical status and selected clinical feature of PVD). While data collection from study group was started for another three monthsthen the selected study group were ranged from 3-5 diabetic clients in each visit.
- The researcher was informed selected both group that collection of (tool II) was collect again after applying buergerallen exercise for the study group after six (6) weeks to assess clinical feature of peripheral vascular disease.

- **Educational training practice regarding Buerger Allen exercise:**
- Educational and training practices about Buerger Allen Exercise was performed by the researcher for the study group in two session duration 20-30 minutes individually. Researcher must ensure that exercise was demonstrated by the studygroup under until their performance become competent. Also, the researcher was gave the study group a simplephoto brochure regarding this exercises.
- Buerger-Allen exercise is Specific exercises intended to improve circulation to the feet and legs. This exercise consists of three positions; **position 1 (elevation)**, the lower extremities are elevated to a 45 to 90 degree angle and supported in this position until the skin blanches (appears dead white for 2-3 minutes). **Position 2 (dependency)**, the feet and legs are then lowered below the level of the rest of the body until redness appears for 3-5 minutes (considering there is no pressure against the back of the knee); **position 3 (horizontal)**, the legs are placed flat on the bed for 3-5 minutes . The length of time for each position may vary with the patient's tolerance and the speed with which color change occurs. (Buerger L1926; Allen AW, 1930).It was performed two times per day with 12 hours interval for the period of 6 weeks at diabetic patients home. After 6 weeks of doing Buerger Allen exercise assessment ofselected clinical feature of PVD was done.

**Pilot study**

To assess the clarity, reliability and applicability of the study tools which was used in the study for data collection; a pilot study was conducted on 10% (n.10diabetic) of the sample. Based on results of the pilot study there is not modification was done. Those cases of the pilot study were included in the study sample.

**Statistical Analysis**

Data were summarized, tabulated, and presented using descriptive statistics in the form of frequency distribution, percentages, means and the standard deviations as a measure of dispersion. A statistical package for the social science (SPSS), version (25) was used for statistical analysis of the data, as it contains the test of significance given in standard statistical books. Numerical data were expressed as mean and SD. Qualitative data were expressed as frequency and percentage. Nonparametric chi-test was used. Probability (P-value) is the degree of significance, less than 0.05 was considered significant. The smaller the P-value obtained, the more significant is the result (\*), less than 0.001 was considered highly significant (\*\*).

**Ethical consideration**

Oral consent was obtained from each diabetic patient to be included in the study. It was included full explanation of the tool, rights for privacy, confidentiality and rights to withdraw from the study at any time.

**III.Results**

**Table (1):** Distribution of the studied sample according their Socio demographic characteristics assessment (n= 100).

Sociodemographic data	Groups				X <sup>2</sup> / fisher	P – value
	study (n=50)		control (n= 50)			
	No.	%	No.	%		
<b>Age/ year</b>						
20-	1	2.0	0	.0	8.366	.137 NS
30-	5	10.0	12	24.0		
40-	16	32.0	9	18.0		
50-	20	40.0	15	30.0		
60-	5	10.0	10	20.0		
70-	3	6.0	4	8.0		
Mean ± SD	50.9 ± 10.5 years		51.5 ± 12.53 years			
<b>Sex</b>					.041	.839 NS
Male	20	40.0	21	42.0		
Female	30	60.0	29	58.0		
<b>Educational level</b>					3.391	.335 NS
Illiterate	26	52.0	26	52.0		
Read and write	10	20.0	13	26.0		
Secondary	11	22.0	11	22.0		
University	3	6.0	0	.0		
<b>Occupation</b>					1.365	.505 NS
Not working	38	76.0	34	68.0		
working	12	14.0	16	32.0		
<b>Residence</b>					.437	.509
Rural	34	68.0	37	74.0		

Urban	16	32.0	13	26.0		NS
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**Table (1)** showed that, 60% and 58% of the studied groups were females respectively and the mean average age among them were similar constituted  $50.9 \pm 10.5$  and  $51.5 \pm 12.53$  years respectively. As regard to educational level the highest percentage (52%) was illiterate among both groups while the lowest percentage (22%) was in secondary degree for the same groups and most of them (76% & 68%) respectively were not occupied. On the other hand result show that most (68% & 74%) of studied groups were lived in rural area respectively. Lastly, there were no significant differences between study and control groups regarding socio demographic characteristics.

**Table (2):** Distribution of the studied sample according their medical status assessment (n= 100).

Medical status	Groups				X <sup>2</sup> / fisher	P – value
	Study (N=50)		Control (N=50)			
	No.	%	No.	%		
<b>Duration of type 2 diabetes</b>						
5 – <10 years	33	66.0	32	64.0	.046	.977 NS
>10 years	16	32.0	17	34.0		
Don't known	1	2.0	1	2.0		
<b>Body mass index (BMI)</b>						
Normal weight	8	16.0	14	28.0	2.125	.346 NS
Overweight	32	64.0	28	56.0		
Obese	10	20.0	8	16.0		
<b>Accompanied medical illness with diabetes II</b>						
Heart disease	1	2.0	3	6.0	5.191	.158 NS
Hypertension	19	38.0	18	36.0		
Heart and hypertension	4	8.0	0	.0		
Not present	26	52.0	29	58.0		
<b>Diabetes treatment</b>						
Oral hypoglycemic agents	33	66.0	32	64.0	1.306	.521 NS
Insulin	14	28.0	17	34.0		
Insulin and oral hypoglycemic agents	3	6.0	1	2.0		
<b>Family history of peripheral arterial disease(PAD)</b>						
Yes	14	28.0	17	34.0	.421	.517 NS
No	36	72.0	33	66.0		
<b>Receive medical treatment for PAD</b>						
Yes	4	8.0	3	6.0	.154	.695 NS
No	46	92.0	47	94.0		

NS= not significant

**Table (2)** founded that more than two-thirds among both groups were had diabetes mellitus from five years to less than ten years and they were had overweight constituted (64% & 56%) respectively. The results revealed that the highest percentage (52% & 58%) among both groups were hadn't any accompanied medical illness. As regard diabetes treatment more than two third (66% & 64 %) among both groups were had taken oral hypoglycemic agents, but (72% & 66%) respectively were hadn't family history of peripheral arterial disease. finally the majority (92% & 94%) of both groups weren't received previously any medical treatment for PAD. There were no significant differences between study and control groups regarding medical data assessment.

**Table (3):** comparison between the studied sample according their selected clinical feature of peripheral vascular disease pre and post application of Buerger Allen exercise for six weeks (n= 100).

Items	Pre				Post			
	Groups				Groups			
	Study		Control		Study		Control	
	No.	%	No.	%	No.	%	No.	%
<b>Clinical Feature of Peripheral vascular Disease</b>								
Normal	10	20.0	16	32.0	29	58.0	16	32.0
Mild	36	72.0	30	60.0	21	42.0	31	62.0
Moderate	4	8.0	4	8.0	0	0.0	3	6.0
X <sup>2</sup> / fisher (P – value)	1.930 (.381)				8.679 (.01*)			

NS= not significant \*  $p \leq .05$  (statistical significance) \*\*  $p \leq .01$  (highly statistical significance)

**Table (3)** showed that, there were highly statistically significant relations among both groups after they applied Buerger Allen exercise on selected clinical feature of PVD ( $p \leq 0.01$ ).

**Table (4):** comparison between the studied sample according their selected clinical feature of peripheral vascular disease after application of buergerallen exercise for six weeks (n= 100).

Items	Post selected clinical feature of PVD				$\chi^2$ / fisher (P – value)
	study		control		
	No.	%	No.	%	
<b>Peripheral pulse</b>					3.795 (.150) NS
Normal	14	28.0	7	14.0	
Weak pulse	36	72.0	42	84.0	
Non palpable	0	.0	1	2.0	
<b>Capillary refill</b>					3.037 (.219) NS
1- 2 second	20	40.0	13	26.0	
3 second	28	56.0	32	64.0	
4 second	2	4.0	5	10.0	
<b>Painlevel</b>					8.494 (.01*)
No pain	23	46.0	10	20.0	
Mild	25	50.0	34	68.0	
Moderate	2	4.0	6	12.0	
<b>Color of the skin</b>					12.220 (.007**)
Normal	14	28.0	2	4.0	
Pale	36	72.0	46	92.0	
Black	0	.0	1	2.0	
Reddish	0	.0	1	2.0	

**Table (4)** revealed that, there were highly significant differences among both groups regarding pain level and color of the skin according their selected clinical feature of peripheral vascular disease after six weeks application of buergerallen exercise ( $P \leq 0.01$  &  $0.007$ ) respectively.

**Table (5):** relations between frequency and duration of application Buerger Allen exercise for six weeks among the study group and their post selected clinical feature of peripheral vascular disease levels (n= 50).

Items	Post selected clinical feature of PVD levels				Fisher	P- value
	Normal (n=29)		Mild (n=21)			
	No.	%	No.	%		
<b>Frequency of application per day</b>						
One/ day (n= 36)	19	52.8	17	47.2	1.439	.230
Twice or more (n= 14)	10	71.4	4	28.6		NS
<b>Duration of exercise</b>						
First two weeks (n= 16)	7	43.8	9	56.2	3.893	.143
Four weeks (n= 17)	9	52.9	8	47.1		NS
Six weeks (n= 17)	13	76.5	4	23.5		

**Table (5):** presented that there were no statistical significance relations between frequency of application and duration of exercise among the study group and their post selected clinical feature of peripheral vascular disease levels after applied Buerger Allen exercise for six weeks.

**Table (6):** relations between medical data assessment of the studied sample and their post selected clinical feature of peripheral vascular disease levels after applied Buerger Allen exercise for six weeks (n=100)

Medical data	Post selected clinical feature levels of PVD					
	study			control		
	Normal (n= 29)	Mild (n= 21)	Moderate (n= 0)	Normal (n= 16)	Mild (n= 31)	Moderate (n=3)
	No ( %)	No ( %)	No ( %)	No ( %)	No ( %)	No ( %)
<b>Duration of type 2 diabetes</b>						
5 -<10 years	21 (72.4)	11 (52.4)	0 (0.0)	11(68.8)	18 (58.1)	3 (100.0)
More than 10	7 (24.1)	10 (47.6)	0 (0.0)	4(25.0)	13(41.9)	0 (0.0)
Don't known	1 (3.4)	0 (0.0)	0 (0.0)	1(6.2)	0 (0.0)	0 (0.0)
Fisher (P – value)	28.80 (.000**)			9.173 (.057) NS		
<b>BMI</b>						
Normal weight	6 (20.7)	2 (9.5)	0 (0.0)	4(25.0)	4 (12.9)	0 (0.0.)
Overweight	20 (68.9)	12 (57.2)	0 (0.0)	9(56.2)	18 (58.1)	2 (66.6)

Obese	3 (10.4)	7 (33.3)	0 (0.0)	3 (18.8)	9 (29.0)	1 (33.4)
Fisher (P – value)	36.240 (.001**)			7.175 (.127) NS		
<b>Accompanied medical illness with diabetes II</b>						
Heart disease	0 (0.0)	1 (4.8)	0 (0.0)	0 (0.0)	1 (3.2)	0 (0.0)
Hypertension	9 (31.1)	10 (47.6)	0 (0.0)	10 (62.5)	8 (25.8)	1(33.3)
Heart and hypertension	2 (6.9)	2 (9.5)	0 (0.0)	0 (0.0)	4 (12.9)	0 (0.0)
Not present	18(62.0)	8(38.1)	0 (0.0)	6 (38.5)	18 (58.1)	2 (66.7)
Fisher (P – value)	13.214 (.004**)			13.482 (.009**)		
<b>Diabetes treatment</b>						
Oral hypoglycemic agents	23 (79.3)	10 (47.6)	0 (0.0)	12 (75)	20 (64.5)	1 (33.3)
Insulin	5 (17.3)	9 (42.9)	0 (0.0)	4 (25)	9 (29.0)	1 (33.3)
Insulin and oral hypoglycemic agents	1 (3.4)	2 (9.5)	0 (0.0)	0 (0.0)	2 (6.5)	1 (33.3)
Fisher (P – value)	4.487 (.000**)			11.961 (.02*)		
<b>Family history of peripheral arterial disease</b>						
Yes	6 (20.7)	8 (38.1)	0 (0.0)	4 (25.0)	7 (22.6)	3 (100.0)
No	23 (79.3)	13 (61.9)	0 (0.0)	12 (75.0)	24 (77.4)	0 (0.0)
Fisher (P – value)	3.247 (.001*)			3.368 (.186) NS		
<b>Receive medical treatment for PAD</b>						
Yes	2 (6.9)	2 (9.5)	0 (0.0)	1 (6.2)	3 (9.7)	0 (0.0)
No	27 (93.1)	19 (90.5)	0 (0.0)	15 (93.8)	28 (90.3)	3 (100.0)
Fisher (P – value)	.35.280 (.000**)			2.859 (.239) NS		

**Table (6):** showed that there were statistical significance relations between all medical data of the study group and their post selected clinical feature of peripheral vascular disease levelswhile there were no statistical significance relations among control groups except in Accompanied medical illness with diabetes II and diabetes treatment with statistically significance relations ( $p \leq .009$  &  $0.02$ ) respectively.

#### IV. Discussion

Diabetes mellitus is a strong risk factor for the development atherosclerotic coronary and peripheral arterial disease which includes disease of the carotid, aorta, and lower extremity arterial beds. Peripheral vascular disease and diabetes are both increasingly prevalent conditions, affecting an estimated 200 and 360 million people worldwide, respectively (**Berger JS&Ladapo JA 2017**).The present study revealed that, the mean average age among the studied groups were similar constituted ( $50.9 \pm 10.5$ ) years and ( $51.5 \pm 12.53$ ) years, this related to increase the risk of peripheral arterial disease among type II diabetes mellitus with aging process. This result was in agreement with **John, J and Rathiga,A(2015)**whoconducted that effectiveness of Buerger Allen Exercise to improve the lower extremity perfusion among patients with type 2 diabetes mellitus were admitted in India and mentioned that, more than half of both groups between age 51 to 60 years were having lower extremity perfusion with Type 2 Diabetes Mellitus.This result was also in contradicted with**Bhuvaneshwari S &Tamilselvi S (2018)** who studythe effectiveness ofBuerger Allen exercise on lower extremity perfusion among patients with type 2 diabetes mellitus in Chennai and revealed that more than one third of the diabetic patients were between the age group above 60 years among both groups.

The result of this present study illustrated that more than half of the studied sample were females ,this can be discussed as decline level of estrogen at menopause cause increased risk for diabetes mellitus because estrogen produce several anti-aging effects including anti oxidative properties as oxidative stress is considered the most important cause in micro vascular diseases. This result agreed with **Kumari1.A et al., (2019)** who study the effectiveness of Buerger Allen exercise on foot perfusion among patients with diabetes mellitus in Haryanaand illustrated that half of the patients in experimental group were females and in control group.In contrary to the current study findings **Leelavathi, M (2015)** who study effectiveness of burger's Allen exercise on improving lower extremity perfusion among patients with diabetes mellitus in Chennai and mentioned that most of the patients with diabetes mellitus were males.

Our findings showed that more than half of the studied samples were illiterate. This may be rationalized as in the past there was no interest in education so, illiteracy was common among diabetic patients that lead to lack of health awareness about complication of diabetes and follow up.As well this finding is supported by **Bhuvaneshwari, S &Tamilselvi, S (2018)** who study the effectiveness of Buerger Allen exercise on lower extremity perfusion among patients with type 2 diabetes mellitus in Chennai andillustrated that more than one third of the patients were illiterate.

As regard, current study sample's occupation showed that the majority of both groups were not occupied. This may be related tothe lack of work makes diabetics patients less mobile, which lead to a slowing of lower peripheral blood circulation, thus being prone to peripheral vascular disease.This result supported by **baby, B (2015)**who study effectiveness of Buerger Allen exercise on lower extremity perfusion among diabetes

mellitus patients in Coimbatore and revealed that that one third of experimental and control group were unemployment.

The current study revealed that the majority of both groups were from the rural area because the lack of health awareness about care of diabetes mellitus which can be converted into complication leads to peripheral vascular disease as well as lack of health care services in rural area. This result supported by **Vijayarathi. M (2014)** who study the effectiveness of buergerallen exercise on wound healing process among the diabetic patients at Rajiv Gandhi Government general hospital in Chennai and regarding area of residence, nearly half of the diabetic patients were residing in the rural area.

Results of the current study showed that more than two-thirds of the studied sample's duration of diabetes from five years to less than 10 years. This can be discussed as the longer the duration of diabetes, the more susceptible to peripheral arterial disease

This result in agreement with **Patidar, V. (2018)** who study the effectiveness of burger allen exercise on improving peripheral circulation among type 2 Diabetes Mellitus patients in selected hospitals of Nadiad city and stated that less than two thirds of the study sample were having duration of diabetes from five years to ten years. This finding is in contradiction with **Kumari A et.al, (2019)** who study the effectiveness of Buerger Allen exercise on foot perfusion among patients with diabetes mellitus in Haryana and mentioned that, more than half of the studied samples were having duration of diabetes mellitus between zero to five years.

The present study revealed also that more than half of the studied samples were overweight, this due to lack of compliance with healthy diet for diabetic patients and exercise. In contrast to the current study results **Kumar, AVN (2018)** who study the effectiveness of Buerger Allen exercise in improving peripheral vascular tissue perfusion among clients with type II diabetes mellitus in selected hospital at Maharashtra and reported that, nearly half of the subjects were in the normal range of body mass index.

The present study revealed also that more than two-thirds of both groups were haven't family history of peripheral arterial disease. Because the diabetes mellitus will be caused either by getting old, obese, not exercising regularly and not eating healthy food. This result was further supported by **Hemalatha, K (2018)** who study effectiveness of buergerallen exercise on lower extremity perfusion among patients with type 2 diabetes mellitus in selected hospitals at Kanniyakumari district and found that the majority of both groups weren't have family history of peripheral atrial disease

Results of the current study showed that a highly statistically significant improvement in pain level among the study groups. The researcher's point of view, buergerallen exercise intended to improve feet and legs circulation this will increase blood flow, so that the feeling of pain will decrease. These results are congruent with **Selmar, ME (2016)** who study effectiveness of Buerger Allen exercise on lower extremity perfusion and pain among patients with type 2 diabetes mellitus Chennai and demonstrated that comparison of pre and posttest findings showed that in the experimental group, the mean score of level of lower extremity pain was reduced from 4.33 to 1.30. The reduction of pain was statistically significant difference at 1% level of significance ( $p=0.001$ ).

The current study illustrated that there were highly statistically significant relations among both groups after they applied Buerger Allen exercise for six weeks in which more than half became normal in clinical feature of PVD levels. Because buergerallen exercise led to the enhancement of peripheral arterial vessels and helped to improve it. This finding is congruent with **Priya. N (2016)** who study effectiveness of Buerger Allen exercise on levels of lower extremity perfusion among patients with selected non- communicable diseases (NCDs) in Vellore and mentioned that after practicing buergerallen exercise the posttest mean value for selected clinical features of PVD was greater than pretest mean value this shows that Buerger Allen Exercise is effective in improving lower extremity perfusion among patients with selected NCD.

Results of the current study showed that there were statistical significance relations among the study group and their post assessment of the selected clinical feature of peripheral vascular disease PVD levels regarding body mass index (BMI) after applied Buerger Allen exercise for six weeks. Because the exercise steps were simple and the participants did not need to make a great effort to do it, therefore those who have overweight were easy to exercise. This result had been agreed with study by **priya, N (2016)** who study effectiveness of Buerger Allen exercise on levels of lower extremity perfusion among patients with selected non- communicable diseases (NCDs) in Vellore and show that, the association between post test scores based on checklist for selected clinical features of PVD was significant difference in body mass index (BMI). In contrast with the current study finding the study done by **Pranitha (2010)** who revealed that the effectiveness of Buerger Allen Exercise on lower extremity perfusion and showed that, there was no association between post-test peripheral perfusion with selected variables such as BMI.

The result of the current study revealed there were statistical significance relations among the study group and their post assessment of the selected clinical feature of peripheral vascular disease PVD levels regarding family history of peripheral arterial disease after applied Buerger Allen exercise for six weeks. May be the genetic factor in some diseases can increase or decrease the harm, in the case of diabetes and the absence of



a genetic factor for peripheral arterial diseases that help in improving the result of the exercise. Another interpretation because most of the studied sample weren't has family history of peripheral arterial disease. As well this finding also is in agreement with **Edward, AS (2013)** who reported that effect of limb exercise on foot perfusion among patients with PVD in selected hospitals at China and the study also found that 80.2% of the participants experienced reduced peripheral perfusion which was significantly associated with family history of PAD.

## V. Conclusion

This study indicates that Buerger Allen Exercise is effective method for reducing clinical feature of PVD among the patient with type II diabetes mellitus.

## VI. Recommendation

A comparative study conducted to evaluate the effectiveness of Buerger Allen Exercise with other non-pharmacological measures for improving the level of lower extremity perfusion.

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