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A Study to Assess the Effectiveness of Buerger Allen Exercise on Lower Extremity Perfusion Among Diabetes Mellitus Patients Admitted in Selected Hospitals

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Abstract

Introduction: Healthy life is the valuable gift of an individual, if a person is healthy enough he is the richest person in his own world. But there are certain disease condition which affect many people in our world, such as heart problem, neurological problem, orthopedic problem, metabolic disorder especially diabetes mellitus, among which diabetes mellitus is the one of the important health concerns in today's world. Diabetes mellitus is a global public health problem; growing as an epidemic in both developed and developing countries.

Objectives Of The Study:

1. To assess existing lower extremity perfusion among diabetes mellitus patients.
2. To evaluate the effectiveness of Buerger- Allen exercise on lower extremity perfusion among the experimental group.
3. To find out the association between pre-interventional scores of Buerger Allen exercise with selected demographic variables, among diabetes mellitus patients.

Methodology: In the present study Experimental one group pre-test post-test design was used to determine the effectiveness Buerger Allen exercise on lower extremity perfusion among diabetes mellitus admitted in selected hospitals. Samples were selected using consecutive sampling technique.

Result: The subjects enrolled in the studies were 30 participation of diabetes mellitus type 2 patients. In present study 30 patients with diabetes mellitus type 2 were enrolled in hospital setting.

Age group: The majority of the subjects 12 (40%) belonged to the age group of 51-60.

Gender: Majority of subjects were 19 (63.3%) were male and 11(36.7) minimum were female.

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Specific habits: 15 (50%) majority of subjects had specific habits of tobacco chewing subjects while minimum 5 (16.7%) are smoking.

Diet: Majority of the subjects 21(70%) belonged to the mixed diet, while minimum 9(30%) subjects belonged to vegetarian diet.

Conclusion: The above interventional study was a good learning experience for, investigator. The result of this study showed that, Buerger Allen exercise was effective. As per subjects response on lower extremity perfusion among Diabetes Mellitus type 2, thus null hypothesis (H0) is rejected and alternative hypothesis (H1) is accepted. This study proved that the Buerger Allen exercise were effective and will help in the reduction of risk of lower extremity perfusion among Diabetes Mellitus type 2 subjects.

Keywords: Buerger Allen Exercise; Lower extremity perfusion; Diabetes Mellitus Patients; Selected Hospitals.

Introduction

"Beat Diabetes; Action needed to halt rise in Diabetes."(WORLD HEALTH DAY 2016).[1]

Diabetes mellitus is a group of metabolism diseases characterized by increasing level of glucose in the blood (hyperglycemia) resulting from defect in insulin secretion, or both (American Diabetes Association, 2004).[2] In type 2 diabetes mellitus, people have decreased sensitivity to insulin and impaired beta cell functioning resulting in decreased insulin production.[3] Type 2 diabetes mellitus affects approximately 90% to 95% of people with the disease.[4] It occurs more commonly among people who are over 30 years of age and obese, although its incidence is rapidly increasing in younger people because of the growing epidemic of obesity in children, adolescents and young adults.[5] Initially, type 2 diabetes mellitus is treated with diet and exercise and supplemented with oral anti diabetic agents.[6] Diabetes mellitus is a group of metabolic disorder of multiple etiologies characterized by hyperglycemia and micro vascular, macro vascular and neuropathic complications with disturbance of carbohydrate, fat and protein metabolism resulting from defect in insulin secretion, insulin action or both.[7]

Background Of The Study:

Peripheral arterial disease of the lower extremity may affect the aortoiliac, femoral, popliteal arteries, or any combination of these areas.[8] The patient with diabetes mellitus tends to develop disease in the arteries below the knee, especially the anterior tibial, posterior tibial and peroneal arteries.[9] In advanced stages, multiple levels of occlusions are found. Peripheral arterial disease is more frequent in those with diabetes mellitus.[10] Epidemiological evidence confirms the association between diabetes mellitus and the increased prevalence of peripheral arterial disease.[11] The prevalence of micro and macro vascular complications are more in Asian population i.e 66.4% and it is 44.2% in European populations. Among these, macro vascular complications accounts for 27.8%.[12]

Need For The Study:

Arterial (ischemic) ulcers most commonly occurs over bony prominences on the toes, feet and lower leg.[13] Nonhealing arterial ulcers and gangrene are most serious complication of end stage of peripheral arterial disease and may result in lower extremity amputation if blood flow is not restored adequately or if severe infection occurs.[14] If atherosclerosis has been present for an extended period, collateral circulation may prevent gangrene of the extremity.[15] Nearly 90% of diabetes related lower limb amputations were preceded by foot ulcers.[16] Some medical genius at that time developed postural treatment to improve circulation in the lower extremities. Buerger-Allen exercises were proposed by Leo Buerger and modified by Arthur Allen. The value of these exercises had frequently been emphasized by Allen, and many medical experts considered them as important adjuvant treatment and postoperative care for circulatory disturbances in the extremities.[17]

Review of Literature

A cross-sectional descriptive study was conducted in south-west Nigeria to assess the prevalence of peripheral arterial disease in diabetic subject in south-west Nigeria. Peripheral arterial disease (PAD) is rarely sought for and generally under-diagnosed

even in diabetics in developing countries like Nigeria. PAD is easily detected and diagnosed by the ankle-brachial index, a simple and reliable test. A total of 219 diabetic subjects aged 50–89 years was carried out. The participants were administered a pre-tested questionnaire and measurement of ankle-brachial index (ABI) was done. The ankle-brachial index < 0.90 was considered equivalent to peripheral arterial disease. The overall prevalence of PAD was 52.5%. The prevalence of symptomatic PAD was 28.7% whilst that of asymptomatic PAD was 71.3%. There were a number of associations with PAD which included, age ($p < 0.05$), sex ($p < 0.05$). The use of the ankle-brachial index in the detection of PAD was clearly more reliable than the clinical methods like history of intermittent claudication and absence or presence of pedal pulses. The prevalence of PAD is relatively high in diabetic subjects in the south-western region of Nigeria. Also the use of ABI is of great value in the detection of PAD as evidenced by a clearly more objective assessment of PAD compared to both intermittent claudication and absent pedal pulses.[18]

A study was conducted in Central Africa to assess the epidemiology of lower extremities peripheral artery disease. In the western countries, a high prevalence of lower-extremities peripheral artery disease (LE-PAD) is reported in the elderly. They sought to determine the prevalence and risk factors for LE-PAD in the general elder population in 2 Sub-Saharan African countries. They performed 2 cross-sectional studies in the populations aged >65 years in two representative districts of Brazzaville, Congo and Bangui, Central African Republic. The ankle-brachial index (ABI) was used to define LE-PAD, when ABI <0.90. An ABI >1.40 was considered to define medial calcinosis (MC). They study are concluded the first population study in Central Africa, we found a very high prevalence of LE-PAD in the elderly, and highlight particularities regarding the associated risk factors, different from data published in western countries.[19]

Title Of The Study

A study to assess the effectiveness of Buerger Allen exercise on lower extremity perfusion among Diabetes Mellitus patients admitted in selected hospitals.

Objectives Of The Study

- To assess existing lower extremity perfusion among diabetes mellitus patients.
- To evaluate the effectiveness of Buerger-Allen exercise on lower extremity perfusion among the experimental group.
- To find out the association between pre-interventional scores of Buerger Allen exercise with selected demographic variables, among Diabetes Mellitus patients.

Hypothesis:

H_0: There will be no significant effect of Buerger Allen exercise on lower extremities perfusion among diabetes mellitus patients.

H_1: There will be a significant effect of Buerger Allen exercise on lower extremities perfusion among diabetes mellitus patients.

H_2: There will be significant association between pre-interventional scores on Buerger Allen exercise with selected demographic variables.

Operational Definition

1. **Effectiveness:** In this study it refers to significant difference in interventional scores on Buerger Allen exercise on lower extremity perfusion among the Diabetes Mellitus patients.
2. **Lower extremity perfusion:** In this study it refers to assessing the blood circulation of brachial and dorsal pedis arteries before and after intervention as measured by Ankle brachial Index scale among diabetes mellitus patients.
3. **Buerger Allen exercise:** In this study it refers to active postural exercise, in which three steps (elevation, dependency, horizontal) active postural exercise to improve the collateral circulations of the lower extremities among diabetes mellitus patients.

Step 1 – Elevation:

The lower extremities are elevated to a 45 to 90 degree angle and supported in this position until the skin blanches for about 2 to 3 minutes.

Step 2 – Dependency:

The feet and legs are then lowered below the level of the rest of the body until redness appears (care should be taken that there is no pressure against the back of the knees) for about 3-5 minutes.

Step 3 – Horizontal:

The legs are placed flat on the bed in a horizontal position for 3-5 minutes.

The length of time for each position varies with the patient's tolerance and the speed with which colour change occurs. Usually the exercises are prescribed for about 12-13 minutes. Three series of steps can be repeated for a frequency of 2 times a day.

1. **Diabetes Mellitus patients:** In this study it refers to patients who are diagnosed as type 2 diabetes mellitus, since 5 years or more.
2. **Selected demographic variables:** In this study it refers to demographic variables gender, diet.

Assumption:

The assumptions of the study were that Buerger Allen exercise may improve lower extremity perfusion in diabetes mellitus patients.

Research Methodology:

Research Approach: A Quantitative experimental approach was found appropriate.

Research Design: One group, pre-test & post-test experimental design.

Setting of the study: The study was conducted in the Medical wards of selected hospitals.

Population: Diagnosed and with type 2 diabetes mellitus admitted at selected hospitals. Population distinguished as target and accessible population.

Target Population: In this study, the target population were subjects diagnosed with type 2 diabetes mellitus for more than 5 years with ABI (Ankle brachial index) score between 0.6–0.9.

Accessible Population: Subjects diagnosed and admitted with type 2 diabetes mellitus admitted in Medical wards of selected hospitals.

Sample: In this present study the sample were subjects diagnosed with type 2 diabetes mellitus for more than 5 years with ABI (Ankle brachial index) score between 0.6–0.9 with reduced lower extremity perfusion in selected hospitals.

Sample size: 30 subjects diagnosed and admitted with type 2 diabetes mellitus admitted in Medical wards of selected hospitals.

Sampling Technique: Consecutive sampling is a non-probability sampling technique.

Variables:

Independent Variables: In this study, independent variable was Buerger Allen Exercise.

Attribute Variables:

It includes

- Age.
- Gender.
- Specific habits.
- Diet.
- Duration of Diabetes Mellitus in years.

Dependent Variables: In this study, dependent variable was on lower extremity perfusion.

Criteria for Selection of the Sample:

Inclusion Criteria

- The subjects those who are diagnosed with type 2 Diabetes Mellitus, more than 5 years and admitted in selected medical ward.
- The subjects those who are diagnosed with type 2 Diabetes Mellitus and have ABI score between 0.6 -0.9.
- The subjects with the age group of above 30 years.
- The subjects who are available during the study.
- The subjects who can follow the instructions.

Exclusion Criteria

- The subjects who have chronic diabetes mellitus with foot ulcer, gangrene & amputation.
- The subjects who are critically ill and having secondary illness.
- The subjects who have the ABI score less than 0.5.

Description Of Data Collection Tool:

The tool for data collection consisted the following sections:-

Part I: Socio demographic variables.

Information on socio demographic variable of the subjects containing five items, which included age, gender, specific habits, diet and duration of diabetes mellitus in years.

Part II: Ankle Brachial Index Scale.

Assessment of lower extremity perfusion by using Ankle Brachial Index Scale.

>1.4	Indicates non compressible vessels.
≥1.0	Normal.
≤0.9	Lower Extremity Arterial Disease.
≤0.6 to 0.8	Borderline.
≤0.5	Sever Ischemia.

Pilot Study:

The pilot study was conducted in the in patients units of different hospital from 2nd December 2016 to 8th December 2016, to assess the practicability of the study and to decide a plan for statistical analysis. It was conducted on six subjects to assess the feasibility of the study. The investigator obtained formal permission from the concerned authority prior to the pilot study. Subjects were selected by consecutive sampling technique. Pre-test was conducted by the investigator assessment of lower extremity perfusion by using Ankle Brachial Index Scale. Buerger Allen exercise for 12-13 minutes was given to subjects and post test was conducted using same tool. This procedure was carried twice a day for 5 days. The participants were approached and were given an explanation of the objectives of the study and consent was obtained after assuring complete confidentiality of data. Ethical compliance was ensured. Pilot study revealed that there was significant difference in lower extremity perfusion after giving Buerger Allen exercise. So the investigator decided to follow pre and post-test design for the main study.

Method Of Data Collection:

Data collection tool are the procedures or instruments used by the investigator to observe or measure the key variables in the research problem. Data was collected by the investigator himself. The main study was conducted in the medical ward of the selected hospital from 24/12/2016 to 24/01/2017. The subjects were selected by the consecutive sampling technique. Each subject was given instructions regarding the purpose of the study. The study was conducted on 30 subjects admitted in Medical wards of selected hospitals to assess the effectiveness of Buerger Allen exercise on lower extremity perfusion among diabetes mellitus patients.

Data Analysis And Interpretation:

Table 1: Frequency and percentage distribution of lower extremity perfusion among diabetes mellitus type 2 subjects according to demographic variables.

n=30.

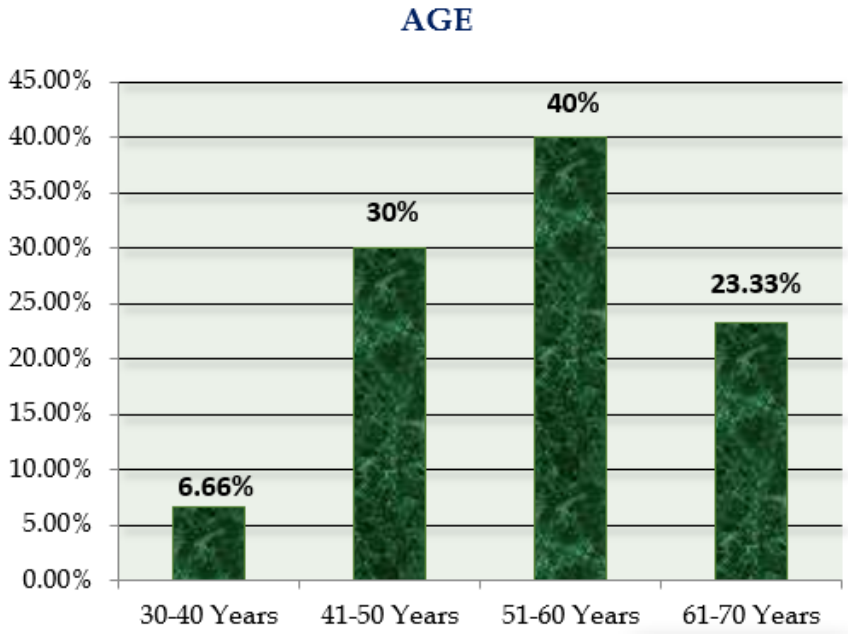

Table 2: Analysis and interpretation to the effectiveness of Buerger Allen exercise on lower extremity perfusion among the experimental group.

	Mean ± SD	(Wilcoxon signed ranks test).	
		z	p value
Pre-test ABI RL 1 Post-test ABI RL 2	0.9143 ± 0.04313 0.9853 ± 0.03608	-4.737	0.000
Pre-test ABI LL 1 Post-test ABI LL2	0.9137 ± 0.04351 0.9867 ± 0.03898	-4.629	0.000

Table 3: Analysis of data related to association between pre-interventional score and selected demographic variables, among diabetes mellitus patients.

n = 30

Demographic Variables			Ankle Brachial Index Scale.			Calculated Value	Tabulated Value	df	Remark
			LEA-D	Borderline	Normal				
Ge Gender	Male	RL	13	6	0	0.279	1.172	14	Not Significant
	Female		8	3	0				
	Male	LL	14	5	0	1.856	0.42	12	Not Significant
	Female		7	3	1				
diet	Vege-terian	RL	6	3	0	0.106	0.745	14	Significant
	Mixed		15	6	0				
	V e g e - terian.	LL	7	2	0	3.059	0.212	12	Not Significant
	Mixed		14	6	1				

The above finding showed that there was no significant association between pre-interventional score and selected demographic variables. Like gender, diet.

Conclusion

The above interventional study was a good learning experience for, investigator. The result of this study showed that Buerger Allen exercise effective on lower extremity perfusion among diabetes mellitus type 2, thus null hypothesis (**Ho**) is rejected and alternative hypothesis (**H1**) is accepted. Buerger Allen exercise used in clinical settings for subjects with Medical wards in selected hospitals.

Summary

Research analysis gives abroad view of the whole research and helps to know the result of study. This chapter dealt with the analysis of the data collected by the investigator to get better understanding about research problem and the objective of the study. Buerger Allen exercise was found to be effective on lower extremity perfusion among diabetes mellitus type 2 subjects.

Recommendations

On the basis of findings and the experiences while conducting the study the following recommendations are offered for future research.

- The study can be replicated for a larger number of subjects to validate and generalize the findings.
- A study may be conducted to find the effectiveness of Buerger Allen exercise on lower extremity perfusion among diabetes mellitus.

Conflict of Interest: I declare no conflict of interest.

Source of Funding: This study was self-funded.

Ethical Clearance: A written ethical approval permission was obtained from the institution authority prior to the study. Written consent from the subjects confidentially of the subjects was maintained.

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