"A STUDY TO ASSESS THE EFFECTIVENESS OF BUERGER ALLEN EXERCISE ON WOUND HEALING PROCESS AMONG THE DIABETIC FOOT ULCER PATIENTS ADMITTED IN DIABETOLOGY DEPARTMENT AT RAJIV GANDHI GOVERNMENT GENERAL HOSPITAL, CHENNAI - 03"

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CERTIFICATE

This is to certify that this dissertation titled **"A STUDY TO ASSESS THE EFFECTIVENESS OF BUERGER - ALLEN EXERCISE ON WOUND HEALING PROCESS AMONG THE DIABETIC FOOT ULCER PATIENTS ADMITTED IN DIABETOLOGY DEPARTMENT AT RAJIV GANDHI GOVERNMENT GENERAL HOSPITAL, CHENNAI - 03"** is a bonafide work done by Mrs. M.Vijayabarathi, College of Nursing, Madras Medical College, Chennai – 600003, submitted to THE TAMILNADU DR.M.G.R. MEDICAL UNVERSITY, CHENNAI, in Partial fulfilment of the requirements for the award of Degree of Master of Science in Nursing, Branch I, Medical and Surgical Nursing, under our guidance and supervision during the academic period from 2013 – 2014.

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“From the lord, my soul; all my inmost being, praise HIS holy name, my help comes from the LORD, the maker of heaven and earth”.

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ABSTRACT

An experimental study was conducted by using quasi experimental pre- test post- test control group design to evaluate the effectiveness of Buerger Allen exercise to promote wound healing process among type2 diabetic patients with foot ulcer. The tool used for this study consists of demographic profile, medical related information, Wagner wound assessment scale and wound assessment check list. The population of this study was 60 diabetic patients with foot ulcer of both the sex, 30 for experimental group, and 30 for control group. Sample for the study were selected by using non probability purposive sampling technique. Conceptual framework used for the study was based on Modified Orem's Theory of Self care deficit. Along with the routine treatment, Buerger Allen exercise was performed to experimental group and routine treatment was given to the control group. The diabetic foot ulcer was assessed with wound assessment check list before and after the intervention. The findings of the study revealed that in Experimental group **24.6 %** and in Control group **5.3 %** are showing improvement in wound healing process. It shows the effectiveness of study. Buerger Allen exercise is the form of exercise technique performed with the help of an exercise board in both foot about 10- 15 minutes for three to four times in a day was found to be effective in promoting wound healing process among diabetic patients. Hence in improving lower extremity perfusion to promote wound healing process for diabetic foot ulcer, the practice of Buerger Allen exercise can be intervened to impose comfort and faster wound healing.

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LIST OF ABBREVIATION

S. NO	ABBREVIATION	EXPANSION
1	DM	Diabetes mellitus
2	IDF	International diabetes federation
3	PVD	Peripheral vascular disease
4	CVA	Cerebro vascular accident
5	IGR	Impaired glucose regulation
6	PNP	Peripheral polyneuropathy
7	HRQL	Health related quality of life
8	SD	Standard deviation
9	QOL	Quality of life
10	CLI	Critical limb ischemia
11	TBP	Toe brachial pressure
12	TcPO2	Transcutaneous oxygen tension
13	TcPCO2	Transcutaneous carbon dioxide
14	DPP	Diabetes prevention programme
15	r	Correlation coefficient
16	H	Hypothesis
17	X^2	Chi square test
18	CI	Confidence interval
19	P	Probability level
20	N	Number of subjects

CHAPTER I

INTRODUCTION

"Life is not over because you have diabetes. Make the most of what you have, be grateful".

- Dale Evans

Healthy life is the valuable gift of an individual, if a person is healthy enough according to me he is the richest person in his own world. But there are certain disease condition which affects the normalcy of many a people in our existing world, such as heart problems, neurological problems, orthopedic problems, metabolic disorders especially diabetes mellitus, etc., among which diabetes is the one of the important health issue in today's world which may affect the entire life pattern of an individual.

Diabetes is a global public health problem; it is a chronic disease and is now growing as an epidemic in both developed and developing countries.

World Diabetes foundation in 2010, estimated that 250 million people worldwide have Diabetes mellitus representing roughly 6% of adult population of 20 to 70 years. The number is expected to reach 438 million by 2030 representing 7% of the adult population.

Diabetes is the global epidemic with devastating human, social and economic consequences. The disease claims as many lives each year as HIV / AIDS claims, and places a severe burden on health care system and economics everywhere. Diabetes is the fourth leading cause of death by disease globally and accounts for 60% of total death annually.

The diabetes mellitus (DM) is a group of metabolic disorder of multiple etiologies characterized by hyperglycemia and micro vascular, macro vascular and neuropathic complications, with disturbances of carbohydrate, fat and protein metabolism resulting from resulting from defect in insulin secretion, insulin action or both. Type 2 DM is the commonest form of diabetes constituting 90% the diabetes population. The global prevalence of DM is estimated to increase from 4% in 1995 to 5.4 % by the year of 2025. The world health organization has predicted that the major burden will occur in developing countries (84-228 million).

As per the report of international diabetes federation (IDF) India is looming epidemic of diabetes, and known as the capital for diabetes. According to IDF, India has highest number of, 50.8 million people suffering from DM, followed by China (43.2million) and the US (26.8 million). The report projected 58.7 million DM case in India by the year of 2010- almost 7% of the adult population in the developing countries. More over 3.2 million deaths are due to DM.

The acute and chronic complication of diabetes is the major cause of hospital admission. Studies suggested that, Asian patients had more evidence of micro and macro vascular complication. The prevalence of micro and macro vascular complications more in Asian are 66.4% and it is 44.2% more than European populations. Among these macro vascular complications accounts for 27.8%.

Data from Chennai based MV hospital for diabetes shows that diabetes accounts for 75% of all lower extremities amputations and diabetes have a 15 fold higher risk of requiring amputations as compared to their age, sex matched non- diabetic controls. 10% of all hospital admission is for diabetic foot problem.

As per American Diabetes Association (1999), approximately 15% of all persons with diabetes will develop a foot ulcer during the course of their

diseases. 85% of lower extremity amputations are preceded by foot ulcers of this 14 – 24% will precede to major amputation.

Complications of diabetes mellitus

Acute complications	**Chronic complications**
• Hyperglycemic hyperosmolar state • Diabetic ketoacidisis • Diabetic coma	• Micro vascular complications • Macro vascular complications

Micro vascular complications	**Macro vascular complications**
The common micro vascular complications with its incidence related to diabetes mellitus includes the following, • Coronary artery disease (50%) • Neuropathy (30%) • Nephropathy (10 – 20 %) • Retinopathy (10%)	The common micro vascular complications with its incidence related to diabetes mellitus includes the following, • Stroke (50%) • Peripheral vascular disease (23%) • Diabetic myonecrosis (9%) Diabetes can affect the feet due to, • Neuropathy • Peripheral vascular disease • Infection

Prevalence of diabetes (WHO - 2010)

Country	**In 2000**	**In 2030**
Africa	1,71,000,000	3,66,000,000
America	33,016,000	66,812,000
Europe	33,332,000	47,973,000
India	31,705,000	79,441,000

Institutional statistics of Type 2 DM

Year	Inpatients	Out- patients
2005	288	88,000
2006	606	1,88,000
2007	742	1,98,000
2008	814	2,00,000
2009	808	20,32,000
2011	1564	2,40,000

Currently nearly 18,000 to 20,000 patients coming to the outpatient department with Type 2 DM.

Diabetic foot ulcer

Diabetic foot and foot ulcer are the most serious and costly complications and important cause of morbidity in diabetic people over the years.

Diabetic foot ulcers are the sores that occur on the feet of the people with Type 1 and Type 2 diabetes mellitus. Diabetic foot ulcer is defined as major erosions of the epithelium that extends into the dermis and deeper tissues and are associated with reduced healing capacity (Kinmond – 2003). Diabetic foot ulcer is a miserable experience. The daily activities of the individual and family inevitably revolve around the ulcer; it can affect employment, earning capacity, social life, relationships and quality of life. It is no wonder that people with diabetic foot complications are more at risk of depression.

The two main risk factors that causes diabetic foot ulcer are peripheral neuropathy and micro as well as macro vascular ischemia. Peripheral neuropathy causes loss of pain or feeling into the toes, legs and arms due to the distal nerve damage and low blood flow supply (arthrosclerosis), very less oxygen supply, and eventually death of tissue in feet occurs. Based upon Diabetic foot society of India (2010), about 84% of all lower limb amputations are preceded by foot ulcers in diabetic clients and every single day 110 Indians have a foot or part of their leg got amputated due to diabetic foot ulcer.

HEALING STAGES OF DIABETIC FOOT ULCER

Fig - 1 Healing stages of diabetic foot ulcer

1. More exudating, severely edematous, necrotized wound
2. More exudating, edematous, necrotized wound
3. More exudating, edematous wound
4. Exudating, edematous wound
5. Less exudating, less edematous and less epithelialised wound
6. More epithelialised wound

Diabetic foot ulcer prevalence

Country	Prevalence
Netherland	20.4%
Iran	20%
Nigeria	11.7%
India	6 – 11%
South east Asia	4 – 10%
Kenya	4 – 6%
America	1 – 4 %
South India	3.6%

Managing diabetic foot ulcer

There are many ways to manage diabetic foot ulcer. Depends upon the condition of the wound, patient's age, feasibility, and the medical facilities available the care giver will go for an appropriate type of management for diabetic foot ulcer. It includes,

- Medications (in the form of tablets or insulin injection)
- Dietary modifications
- Walking
- Exercise
- Following complementary and alternative therapy

It can be given singly or as a combination of one or two or all, depending upon the condition and the need of the patient. Among which performing exercise is the one of the easiest and cost effective way of treatment which gives much more advantages for the patients while giving management for the diabetic patients. Especially when the patient is suffering with foot ulcer performing exercise will help the patient to improve the vascularity and blood supply to the affected area thus eases the rich of blood supply and helps for wound healing process.

Exercise and diabetes

The benefits of exercise for the diabetic population especially with type 2 diabetes are very beneficial one. Doing exercise will help the patient to improve the vascularization and at the same time it will help to improve the wound healing process. Performing Buerger Allen exercise for diabetic foot ulcer is the one of the way to improve the vascularity and promotes wound healing process.

Buerger allen exercise

Buerger allen exercise is the one of the type of exercise performed to promote lower extremity perfusion where by promoting wound healing process. To perform this exercise an exercise board can be used.

BUERGER ALLEN EXERCISE BOARD

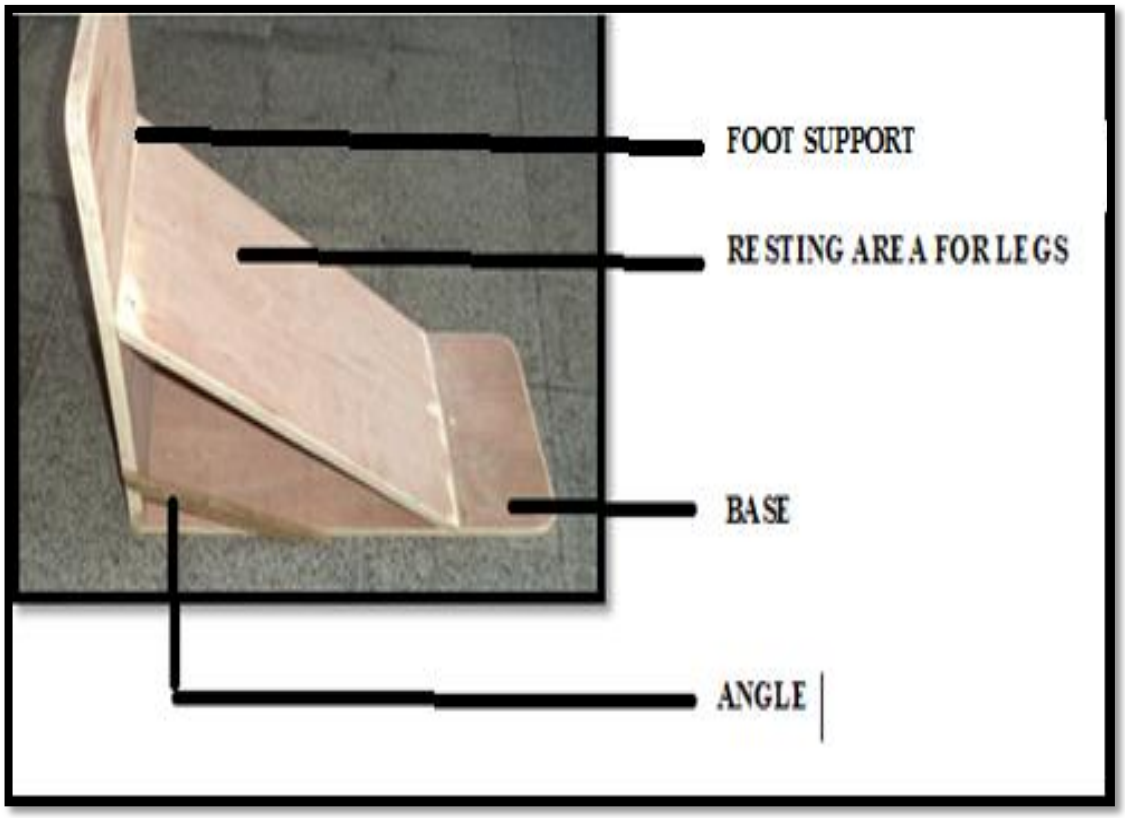


Fig - 2 Buerger allen exercise board

1. 1 NEED FOR STUDY

Diabetes is an important risk for Lower extremity arterial disease (LEAD). LEAD in DM compound by the presence of peripheral vascular disease neuropathy and suspects for infections. Mortality rate is increases patient with LEAD, particular of foot ulceration, or gangrene .Three year survival rate of amputation is < 50%.

Statistic shows that 12% individual are (8-12 million) having PVD in the US. PVD is an independent factor for cerebral vascular death. Approximately 4-8% patient with PVD require amputation. PVD have at least 30% of risk of death from myocardial infarction (MI) or cerebro vascular accident (CVA) within 5 years and risk of approximately 50% in 10 years. Statistics shows that 83% of hospital consultant episode for PVD required hospital admission in England in 2002-2003(59% men & 41% women). Among these 18% needed emergency admissions.

A study was carried out in south Indian patients to find out diabetes and its complication. The study was carry out in young subjects between different parts of Asian countries showed that 42%-72% of all amputations are related to diabetic complications. Recurrence rates for foot ulcer in neuropathic subjects were estimated at 52% in 374 patients in India. The study was concluded that patient should be educated regarding life style modifications like body weight control; increased physical exercise and smoking cessation are potentially beneficial for the patients for preventing diabetes complications.

Exercise training for prevention of peripheral vascular disease among diabetic patient helps in potential mechanisms like formation of collateral circulation and increased blood flow, changes micro circulation and endothelial functions, changes in muscle metabolism and oxygen extraction, prevention inflammation and muscle injury, cost effective, preventing atherosclerosis and prothrombotic risk factors.

Considering the above factors and review of literature investigator felt that nurses has a important role in educating the patients regarding supervised exercise like Buerger Allen exercise for improving the lower extremity perfusion among diabetic patients. So there is a need to assess the effectiveness of Buerger Allen exercise on improving the lower extremity perfusion among diabetic patients .

For most people who have lost a leg life will never return to normal. Amputations may involve lifelong dependence, inabilities to work and much misery even after amputations takes place.

1.2 STATEMENT OF THE PROBLEM

A study to assess the effectiveness of Buerger Allen exercise on wound healing process among the diabetic foot ulcer patients admitted in Diabetology department at Rajiv Gandhi Government General Hospital,Chennai-03.

1. 3 OBJECTIVES OF THE STUDY

- To assess the lower extremity perfusion among diabetes mellitus subject in Experimental and Control group.
- To evaluate the effectiveness of Buerger Allen exercise on wound healing process among the Experimental group.
- To compare the wound healing process between the Experimental and Control group.
- To find out the association between wound healing process and Buerger Allen exercise with selected demographic variables among Experimental group.

1.4 OPERATIONAL DEFINITION

- **Effectiveness:** In this study it refers to show the significant difference on, improvement in the lower extremity perfusion among the experimental group and control group after performing Buerger Allen exercise.
- **Improve:** In this study it refers to the act of making something better i.e. to promote the wound healing process.
- **Lower extremity perfusion:** In this study it refers to the increased blood circulation of the lower extremity as evidenced by skin colour changes, decreased pain and edema after administering the Buerger Allen exercise among type2 diabetes mellitus patients.
- **Diabetes mellitus patients** : it refers to, patient who are diagnosed as type2 diabetes mellitus and blood sugar level is more than the normal value and is controlled by administration of insulin injections as well as rehabilitative measure.
- **Buerger Allen exercise**: Buerger Allen exercise is an active postural exercise, which helps in fills and empties the lower extremity blood vessels according to gravity alternatives. In this study it refers a three steps (elevation, dependency, horizontal) active postural exercise to improve the collateral circulations of the lower extremities among diabetic patients.

1.5 HYPOTHESIS

H 1 : There will be a significant difference between the pre and post assessment interventional score regarding the lower extremity perfusion among diabetes mellitus subjects in both Experimental and Control group.

H 2 : There will be a significant difference between the pre test and post test interventional scores regarding the lower extremity perfusion among diabetic patient of Experimental group on administering Buerger Allen exercise.

H 3: There will be a significant difference between pre and post interventional score on Buerger Allen exercise on improving lower extremity perfusion among Experimental and Control group.

H 4: There will be significant association between interventional scores with selected demographic variables.

1.6 ASSUMPTION

1) It is assumed that diabetic patients may inadequate knowledge regarding Buerger Allen exercise.

2) It is assumed that the effectiveness of the Buerger Allen exercise may varies with selected demographic variables among Experimental andControl group.

3) Exercise will promote circulation in lower extremities to fasten wound healing process.

CHAPTER II

REVIEW OF LITERATURE

"The decline of literature indicates the decline of a nation"

- **Johann Wolfgang von Goethe**

Review of literature is a key step in research process. The typical purpose of analyzing a review existing literature is to generate research question to identify what is known and what is unknown about the topic. The major goal of review of literature is to develop a strong knowledge base to carry out research and non research scholarly activity.

The purpose of the review of literature is to obtain comprehensive knowledge bare and in depth information about effectiveness of exercise on diabetic foot ulcer and about wound healing process.

This chapter deals with the selected studies, which are related to objectives of the proposed study.

2.1 Review of related literature

2.2 Conceptual frame work

2.1 REVIEW OF RELATED LITERATURE

The research has reviewed the relevant literature in support of problem statement of the present study. Literatures from 1990 to 2013 were reviewed. The extensive review of literature has been done and it is organized according to the following four aspects,

Part I : Studies related to diabetes mellitus.

Part II : Studies related to lower extremity perfusion and diabetes mellitus.

Part III : Studies related to Buerger Allen exercise - supervised exercise programme to improve of lower extremity perfusion among diabetic patients.

Part IV : Studies related to effectiveness of other interventional program on diabetes patients.

Part I : LITERATURE RELATED TO DIABETES MELLITUS

Groot M. Anderson, et.al(2001) was conducted a study and showed that depression is twice as much as diabetes in the general population and major depression present in at least 15% of patient with diabetes mellitus these depression is associated with poor glycemic control with health complications, increased health cost, and decreased health quality of life .A study is revealed that the diabetic men have erectile dysfunctions and the prevalence is 34 - 45%.risk factors include poor glycemic control, diabetes duration. The micro and macro vascular complication, psychological and situational factors are also affecting the erectile dysfunctions.

Oott A. Stolk RP, et.al (2003), conducted a study to determine the influence of type2 diabetes mellitus on the risk of dementia and Alzheimer's disease: The aim of the study was to find out both dementia and diabetes are frequent disorders in elderly people. Prospective population-based cohort study among 6,370 elderly subjects. At baseline study participants were examined for presence of diabetes mellitus. Non demented participants were followed up, on average of 2.1 years. Incident dementia was diagnosed using a three-step screening and comprehensive diagnostic workup.. The study was estimated relative risks with proportional hazard regression, adjusting for age, sex, and

possible confounders. . The study showed that the follow-up, 126 patients became demented, of whom 89 had Alzheimer's disease. Diabetes mellitus almost doubled the risk of dementia (relative risk [RR] 1.9 [1.3 to 2.8]) Alzheimer's disease and (RR 1.9 [1.2 to 3.1]). Patients treated with insulin were at highest risk of dementia (RR 4.3 [1.7 to 10.5]). The study revealed that the diabetes is a risk for developing dementia (8.8%).The study suggested that diabetes may have contributed to the clinical syndrome in a substantial proportion of all dementia patients.

Saurbh J. Sharma, et.al (2005), conducted a study to assess the association of diabetes retinopathy and other micro vascular complications in case of diabetes mellitus. The study included 129 diabetic patients and cases were divided into 3 groups according to their duration, type of diabetes mellitus and non-compliance to management. The result of the study shown that, prevalence of retinopathy in group 1 was 34.45in group 2 was 12.4% in type diabetes mellitus as compared with group1 and group 3 which was 25.5%. The difference was statistically significant showed that diabetic retinopathy associated with all type of diabetes mellitus. As duration increase prevalence of the diabetes retinopathy also increase. It was 8.9% in<5 years duration and 89.0% in 11-15 years and 100% in cases with >15 years of diabetes. The incidence of nephropathy and neuropathy are also more in all type of diabetes mellitus.

Mundet X. Pou, et.al (2008) conducted a study to find out the prevalence and incidence of chronic complications and mortality in a cohort of type 2 diabetic patients .The aim of the study was to evaluate the prevalence, incidence of micro- and macrovascular complications, final events, and mortality in type 2 diabetic patients, followed over a period of 10 years in Spain. The study was done in 317 type 2 diabetic patients treated at a Primary Care Centre, followed for 10 years. Variables were described by means of ratios, mean values and standard deviation. The chi square test was used to compare ratios and the Student's't' test to compare mean values. The result of

the study showed that the prevalence of an increase in nephropathy (12%), in retinopathy (6.2%) and in neuropathy (2.1%), a decrease in ischemic cardiomyopathy (6.2%), an increase in peripheral vascular disease (5.6%). Cerebrovascular, events and diabetic foot remaining unchanged. The highest incidence rates (1000 subjects/year) were nephropathy 43, neuropathy 39 and ischemic cardiomyopathy 32. The prevalence of cardiovascular risk factors increased over the follow-up; being high blood pressure the most noticeable (30%). Overall mortality was 28/1000 subjects/year, being cardiovascular disease the main cause (31.2%). The study concluded that the prevalence and incidence of chronic complications and risk factors are in Spain.

PART II : LITERATURE RELATED TO LOWER EXTREMITY

PERFUSION IN DIABETES PATIENTS

Osmundson (1990) in the second national health and nutritional examination survey, reported that the prevalence of the diminished or absents of the dorsalis pedis artery pulse found in 16.2% of adult with the age of 35-54 years and 23.5% of those of 55-74 years .This rates are considerably higher than non diabetes patient. According to national hospital discharge survey (NHDS) 16.2% of diabetes patient is having peripheral vascular disease which is 3.2% higher than non-diabetes patients. The study concluded that the prevalence of vascular disease is frequently more in diabetes patients as comparing with non-diabetes patients.

Jamie d. Santilli, (1999), found Chronic critical limb ischemia is manifested by pain at rest, nonhealing wounds and gangrene. Ischemic rest pain is typically described as a burning pain in the arch or distal foot that occurs while the patient is recumbent but is relieved when the patient returns to a position in which the feet are dependent. Objective hemodynamic parameters that support the diagnosis of critical limb ischemia include an ankle-brachial

index of 0.4 or less, an ankle systolic pressure of 50 mm Hg or less, or a toe systolic pressure of 30 mm Hg or less. Intervention may include conservative therapy, revascularization or amputation. Progressive gangrene, rapidly enlarging wounds or continuous ischemic rest pain can signify a threat to the limb and suggest the need for revascularization in patients without prohibitive operative risks. Bypass grafts are usually required because of the multilevel and distal nature of the arterial narrowing in critical limb ischemia. Patients with diabetes are more likely than other patients to have distal disease that is less amenable to bypass grafting. Compared with amputation, revascularization is more cost-effective and is associated with better perioperative morbidity and mortality. Limb preservation should be the goal in most patients with critical limb ischemia.

Edward. B Jude Samson, et.al (2001) conducted a study to quantify the distribution of the peripheral vascular disease in diabetics and non - diabetic patients attending angiography and to compare, severity and the outcome between both groups of patients. The study was conducted in 136 patients and 58(43%) patients were diabetic. This study was confirmed that diabetic patients have more worsened peripheral vascular disease and are at high risk lower extremity amputation than non-diabetes patients. Diabetes patients with peripheral vascular disease also had high mortality and died at a younger age than non-diabetes patient.

Shen. Q. Jia,et.al (2006) conducted a community based study and showed the prevalence of peripheral vascular diseases in diabetes and impaired glucose regulation subjects. The aim of the study was to investigate the prevalence of the PVD in the patients with DM and impaired glucose regulation (IGR) This study was conducted in 717 patients in with DM or IGR. The study revealed that overall prevalence of PVD was 12.2% in the hyperglycemic population. The prevalence of PVD in diabetes patients were 15.1% significantly higher than of the IGR subjects (7.7%). The study was concluded that the age, sex, diabetic duration, and total cholesterol level were

independent risk of diabetic peripheral vascular disease and the prevalence of PVD is common in DM as well as IGR subjects.

Neburrs. Franssem MH, et.al. (2008), conducted a study to determine the effect of Polyneuropathy on the foot microcirculation in type2 diabetes. The aim of the study was to investigate the influence of peripheral polyneuropathy (PNP) on skin microcirculation and foot swelling rate in the feet of the patients of type 2 diabetes mellitus. The study was conducted in 38 type 2 DM patients, 24 with PNP and 14without PNP and 16 healthypatients, first supine and subsequently sitting with the foot dependent for 50 minutes. The result shows patient with PNP was low capillary blood velocity. Compared with control group the percentage reduction in skin blood flux, after 10 minutes was higher in the patient with PNP and without PNP (3%, 18%, 26% respectively, p<002). The study was concluded that type 2 diabetes patients had polyneuropathy associated multiple abnormalities in the skin microcirculation on the foot, characterized by reduction in capillary blood flow and impaired fluid filtration.

G. Premletha, et.al. (2009) conducted a study in Chennai for the prevalence of PVD among DM patients. The purpose of the study was to find out the prevalence of the PVD among south Indian patients, this study was carry out in two colonies in Chennai. The study was done in three groups. (Normal, impaired and diabetes patients). The overall prevalence of the PVD is 3.2%, among these prevalence 6.3% is alone consisted by diabetes patients. The study concluded that the prevalence of PVD was higher in (7.8%)in diabetic patient than with newly diagnosed DM patients.

Vijay A Doraiswamy, et.al, (2010), conducted a study on Premature peripheral arterial disease – difficult diagnosis in very early presentation. Peripheral arterial disease (PAD) is defined as an ankle-brachial index of less than 0.9. It is mostly prevalent in patients older than 50 years of age; its occurrence in younger patients is rare. Nevertheless, the diagnosis must be

considered in any patient with exertional lower extremity symptoms. Patients with early-onset disease, also called premature PAD, have a particularly difficult course with early involvement of other major arterial beds such as the carotid and coronary arteries. Their diagnosis and treatment have to be comprehensive to prevent early morbidity and mortality. Reports of very early occurrence and management are rare, especially of onset before 25 years of age. Management of this early presentation of PAD is unclear because most of the available information concerns treatment of patients 40 years of age or older. The cases of two patients who developed symptomatic PAD before 25 years of age are described, and the various causes and management options available for the treatment of early onset PAD patients are discussed.

Gunnel Ragnarson Tennvall, et.al, (2011), studied on Health-related quality of life in patients with diabetes mellitus and foot ulcers, **t**o investigate health-related quality of life (HRQL) in diabetes patients separately for those with current foot ulcers, those with primary healed ulcers, and those who have undergone minor or major amputations. A response rate of 70% was obtained. Patients with current foot ulcers rated their significantly lower than patients who had healed primarily without amputation. Major amputation reduced the index value, while the experimental value which was reduced by other diabetic complications and increased by living with a healthy partner. Both values were reduced by a current foot ulcer.

Robert L Greenman, et.al, (2011),studied, Early changes in the skin microcirculation and muscle metabolism of the diabetic foot to study Changes in the large vessels and microcirculation of the diabetic foot are important in the development of foot ulceration and subsequent failure to heal existing ulcers. The forearm during resting was different in all groups, with the highest value in controls (mean 42 [SD 17]), followed by the non-neuropathic (32 [8]) and neuropathic (28 [8]) groups ($p<0{\cdot}0001$). In the foot at resting, S_IO_2 was higher in the control (38 [22]) and non-neuropathic groups (37 [12]) than in the neuropathic group (30 [12]; $p=0{\cdot}027$). The Pi/PCr ratio was higher in the non-

neuropathic (0·41 [0·10]) and neuropathic groups (0·58 [0·26]) than in controls (0·20 [0·06]; p<0·0001). It shows that tissue S_1O_2 is reduced in the skin of patients with diabetes, and that this impairment is accentuated in the presence of neuropathy in the diabetic foot. Additionally, energy reserves of the foot muscles are reduced in the presence of diabetes, suggesting that microcirculation could be a major reason for this difference.

PART III : LITERATURE RELATED TO BUERGERGER'S ALLEN EXERCISE - SUPERVISED EXERCISE PROGRAMME ON IMPROVING LOWER EXTREMITY PERFUSION

Treesak. C, et.al (1993) conducted a study to determine high –intensity training for intermittent claudication in vascular rehabilitation. The aim of the observational study was investigating the safety and effectiveness of the high intensity interval programme for the patient with peripheral vascular disease. This study was conducted among 47 patients the result shows that the rehabilitation score with participation in the program and more exercise sessions led to greater improvement. More over no adverse event occurred in the study patients. The study suggested patient with PVD can safely tolerate high intensity exercise programme.

R. Vincent Dynamic (1995), conducted a study to determine the cost effective of exercise training to improve claudication symptoms in peripheral arterial disease. The aim of the study was to prove effectiveness of the exercise rehabilitation for the treatment of intermittent claudication, the primary symptom of PVD. The study was conducted comparing percutaneous transluminal angioplasty (PTA) and exercise rehabilitation. The effectiveness was assessed three and six months exercise programme. Initially first three months PTA was more effective than exercise rehabilitation but after six months the researcher found that the exercise was more effective than PTA and cost effective also. The study concluded that exercise rehabilitation for

claudification treatment has national implication for future PVD care.

John J. Castronuovo, et.al (1999), conducted a study on Skin perfusion pressure measurement is valuable in the diagnosis of critical limb ischemia, to study the Critical limb ischemia (CLI) is equated with a need for limb salvage. Arterial reconstruction and major amputation are the therapies ultimately available to such patients. The findings include, there was no difference in the size or location of foot ulcers between the study. SPP measurements identified 31 of 32 limbs diagnosed as having CLI by clinical evaluation (i.e., group I, those limbs that required vascular reconstruction or major amputation). SPP measurements diagnosed 12 of the 14 limbs that did not heal as having CLI (PPV, 75%) and 11 of 15 limbs that did heal as not having CLI (NPV, 85%). The sensitivity of SPP less than 30 mm Hg as a diagnostic test of CLI was 85%, and the specificity was 73%. The overall diagnostic accuracy of SPP less than 30 mm Hg as a diagnostic test of critical limb ischemia was 79.3% ($p <$ 0.002, Fisher's exact test). The final c*onclusions was* that SPP measurement is an objective, noninvasive method that can be used to diagnose critical limb ischemia with approximately 80% accuracy.

Felix W. Tsai, et.al (1999), conducted a study on skin perfusion pressure of the foot is a good substitute for toe pressure in the assessment of limb ischemia the main purpose of the study was to find out Noninvasive measurements of limb systolic pressures are used routinely in the assessment of the severity of peripheral arterial disease, including the evaluation for critical limb ischemia. There was a strong linear correlation between SPP and toe pressure (r = 0.87; $P <.01$). Also, significant correlation was found in both the patients with diabetes and the patients without diabetes (r = 0.85 and 0.93, respectively; $P <.01$ in both cases). The findings included that SPP measured in the foot correlates well with toe pressure and can be substituted for toe pressure measurement in patients in whom toe pressures cannot be measured.

L.Ted Frigrurd Dynamic (2005), submitted an article regarding

conservative approach to the management of lower extremity associated signs and symptoms (pain, edema, tenderness, cyanosis, coldness and stiffness) show the effectiveness of Buerger Allen exercise. The treatment involve encouragement of blood flow during the actively vasospastic phase by elevation of an active exercise part. The researcher recommended that Buerger Allen Exercise for the improvement of lower extremity blood supply. Another article regarding intermittent claudication also highly recommended the importance of Buerger Allen exercise (three 3 series of exercise repeat 6- 7 times in a day) among peripheral vascular disease.

D.T.Williams, et.al. (2007) conducted a study to find out the effectiveness of the Buerger Allen Exercise among PVD patients; The study was conducted among 13 patients. The study showed that increased subcutaneous blood flow during the patients doing the exercise, the study also revealed that the increased angle pressure and toe pressure during the exercise. The overall benefits are seen in 7 patients after 24 hours. The study concluded that the Buerger Allen exercise is effective for improving the lower extremity circulation.

Adam .J, et.al (2010) conducted a study to find out the influence of foot perfusion in diabetes exercise. The aim of the study was to measure changes in foot perfusion following a brief period of lower limb exercise in individuals with and without type 2 DM and non critical PVD. The study was conducted among 61 patients. The result shows that post exercise, toe pressure and toe brachial pressure (TBI) increased in non -diabetic patient. But there was elevated transcutaneous oxygen tension (TcPO2) value in diabetic patient and decreased transcutaneous carbon dioxide (TcPCO2) decreased in all arterial disease. The study was concluded that the improvement in the TcPO2and decreased TcPCO2 level in foot site in diabetes shows changes in cutaneous blood supply. The result suggested that brief exercise results in an improvement as cutaneous perfusion in non critical PVD particularly patient with type 2 DM.

PART IV : LITERATURE RELATED TO EFFECTIVENESS OF OTHER INTERVENTIONAL PROGRAMME ON DIABETES PATIENTS

Matvieko, et.al (1998), conducted a study to determine the effectiveness of physiotherapeutic exercise programme for chronic heart failure patients. The aim of the study was to evaluate the design and effects of a physiotherapeutic exercise programme on exercise capacity, muscle strength and quality of life in patients with chronic heart failure. The total of 18 samples randomly selected, assigned to either a training group (n=9) participating in a physiotherapeutic exercise programme or a regular control group (n=9). The result shows that compared with the control group, a positive trend in the result of the training group was found.(p=.004).The study was concluded that there was a positive trend in effectiveness physical exercise programme among chronic heart patients regarding exercise.

John Wiley, (2001), said that foot ulcers are a serious complication of diabetes mellitus that are associated with adverse sequelae and high costs. In addition, such foot ulcers have a significant impact on quality of life (QoL). For example, the loss of mobility associated with foot ulcers affects patients' ability to perform simple, everyday tasks and to participate in leisure activities. Notably, several studies have shown that patients with diabetes mellitus and foot ulcers were more depressed and had poorer QoL than those who had no diabetic complications. Given the detrimental effect foot ulcers have on patients, it is essential that these foot ulcers are prevented or treated more effectively than at present. Evidence suggests that many foot ulcers can be prevented by using intensive interventions and adopting a multidisciplinary approach to treatment. In addition, preventative strategies may become more effective if new research into how patients with diabetes experience and interpret their health threats (e.g. diagnosis ‘loss of sensation’ or a foot ulcer episode) is taken into account. With regard to treatment, new options should enable ulcers to heal more quickly than with standard therapies. One area of interest is the use of growth factors. For example, recombinant platelet-derived

growth factor, in addition to good ulcer care, has been shown to improve the number of ulcers that heal and healing times significantly compared with good ulcer care alone. Other potential new treatments include the use of skin substitutes. In summary, improved preventative measures and wound treatment should reduce the potential for patients with diabetes mellitus to experience impaired QoL caused by foot ulcers.

I. J. M. Scheffers, et.al (2004), conducted a study to determine the effectiveness of patient education and exercise and diet interventions on blood glucose control for patients with type2 diabetes. Of a total of 100 participants' , 33 were instructed to follow the standard diet for the type2 DM patients, 28 were preformed exercise in addition to the slandered diet and 39 did not participate in either exercise or follow the diabetic diet . The result shows if this 8 weeks intervention programme indicate that diabetic education and intervention program involving the combination of exercise and diet enhanced the effectiveness in blood glucose control in patient with type 2 DM.

Gianna M. Rodrighuer, et.al (2008) conducted a study to determine the life style intervention study in patient with diabetes or impaired glucose tolerance to validate lifestyle modification curriculum of diabetes prevention programme (DPP) into community based program delivered by trained graduate students on a university campus. The aim of the study was done to determine whether the delivery approach is effective in lowering risk factors of type 2 DM . The study was in 29 DM patients regarding life style modifications, mainly on weight reduction. The study result showed that there was a mean weight loss at 12 months was 6%. The study concluded that life style modification interventional study in non clinical settings can help some adults at risk for or in early stages of diabetes.

2.2 CONCEPTUAL FRAME WORK

MODIFIED OREM'S THEORY OF SELFCARE DEFICIT

A conceptual framework is the precursor of a theory. It has preceded broad perspectives for nursing proactive research and education. Their overall purpose is to make scientific findings meaningful and genera liable. **Polit and Hungler (1989)** describes, conceptual frame work is "a group of mental images or concepts that are related but the relationship is not explicit".

The conceptual frame work of the present study as depicted in the diagram was developed on the basis of Orem's theory of self-care. Self care deficit theory or nursing is composed of six basic concepts and one related or peripheral concept. The basic or core, concepts are self – care, self care agency, therapeutic self care demand, self care deficit, nursing agency and nursing system.

Self care, self care agency, therapeutic self care demand and self care deficit are related to the patient, or the person in need of nursing.

Whereas nursing agency and nursing system are related to the nurses and their actions,

- **Self care (dependent care)**

  The practice of activities that individuals, initiate and perform on their own behalf in maintaining life, health and well being (1991).

  In this study the type2 diabetic patients with foot ulcer will acquire demand or requirements to sustain and maintain life called as health deviated self care requirement i.e., ignorance of care of foot ulcer.

- **Self care agency** (Dependent care agency)

  Self care agency is the power of individuals to engage in self care and the capability for self care. The person who uses the power or self care ability is the self care agent.

  In this study the self care agency is the patients with type 2 diabetic foot ulcer.

- **Therapeutic self care demand**

  It can be thought of as a collection of action to be performed or "a programme of action". This totality of care actions is performed to meet the self care requisites.

  In this study, the therapeutic self care demand is the need for information, education, communication and demonstration regarding Buerger Allen exercise to promote wound healing process.

- **Self care deficit**

  A self care deficit is the relationship between self care demands of the individuals in which capabilities for self care are not equal to meeting some or all of the components of their therapeutic self carte demands.

  In this study the self care deficit is the inadequate care to promote wound healing process.

- **Nursing agency**

  Complex property or attribute of persons and trained as nurses that is enabling when exercise for knowing and helping others. Know their self-care demand and in meeting their self care demand.

  In this study the investigator is the nursing agency carries out the information on wound healing of the diabetic foot ulcer in the Diabetology wards, Rajiv Gandhi Government General Hospital, Chennai - 03. Where the pre assessment of the wound was done and the frequent regular interval the post assessment also was carried out on wound healing.

- **Nursing system**

All the actions and the interactions of the nurses and patients in nursing practice situation. There are three types of nursing systems, i.e., wholly compensatory, practically compensatory and supportive educative system.

In this study the investigator has chosen the supportive educative system as nursing system in which demonstration of performing Buerger Allen exercise was explained in an structured manner with the help of flash cards and administered to the patients of those who are having diabetic foot ulcer.

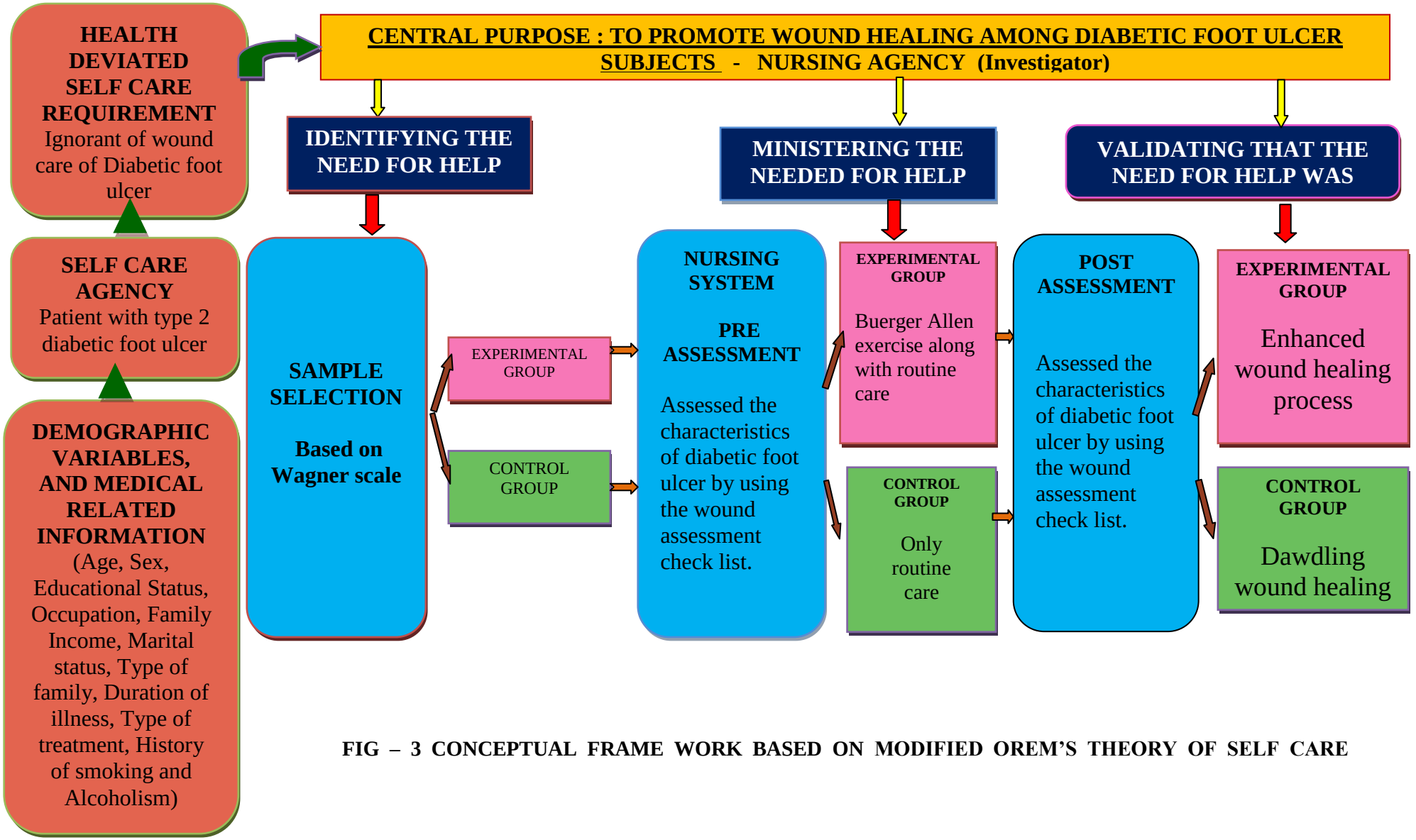


FIG – 3 CONCEPTUAL FRAME WORK BASED ON MODIFIED OREM'S THEORY OF SELF CARE

STEP-I: IDENTIFICATION OF A NEED FOR HELP

Identification involves individualization of the diabetic subjects, his experiences and recognition of the subject's perception of his condition. In this study the investigator identifies the demographic variables, medical related information and assessment of wound using Wagner wound assessment scale. The central purpose is to promote wound healing process effectively.

STEP-II: MINISTRATION OF HELP

Ministration is providing the needed help. It requires the identification of the need for help, the selection of a helping measure appropriate to that need, and the acceptability by the patient. Buerger Allen exercise was provided to subjects with diabetic foot ulcer to promote wound healing process.

STEP-III: VALIDATION THAT NEED FOR HELP WAS MET

Validation is evidenced that the diabetic foot ulcer subjects with functional ability will be restored as a result of the help given. It is validating that the needed help was delivered in achieving the central purpose. The step involves the post assessment after ministering the help and analysis to make suitable decision and recommended action either to continue or modify the nursing action.

CHAPTER III

METHODOLOGY

There is nothing like looking, if you want to find something. You certainly usually find something, if you look, but it is not always quite the something you were after."

- J.R.R. Tolkien

This chapter deals with methodology which was adopted for the study and includes the description of research approach, research design, setting population, sample size, sampling technique, criteria for sample selection, method of data collection and plan for statistical data analysis.

3.1 RESEARCH APPROACH

In this study the quantitative research approach was used, the investigation aims at evaluating the effectiveness of practicing Buerger Allen exercise among diabetic foot ulcer patients to study the effectiveness of wound healing process. It also helps the researcher with the suggestions of possible conclusions to be drawn from the data.

3.2 RESEARCH DESIGN

The research design used for this study is quasi experimental pre test post test control design.

Group	Pre- assessment	Intervention	Post- assessment
Experimental group	**O 1**	**X**	**O 2**
Control group	**O 3**	**---**	**O 4**

01 – Pre wound assessment score in Eexperimental group

02- Post wound assessment score in Experimental group

X - Buerger allen exercise.

-- Routine medical management

03- Pre wound assessment score in control group

04- Post wound assessment score in Control Group

3.3 VARIABLES

The categories of variables discussed in this study were

- **Independent variable :** Buerger Allen exercise.
- **Dependent variable :** Wound healing process
- **Demographic Variable :** Age, sex, religion, marital status, educational status, occupation, income, dietary pattern.

3.4 SETTING OF THE STUDY

The study was conducted in Institute of Diabetology, Rajiv Gandhi Government General Hospital, Chennai - 03.

3.5 POPULATION

Population is the subjects and events potentially available for the research study. In this study, the population includes the inpatients with type2 Diabetes Mellitus with foot ulcer admitted at Rajiv Gandhi Government General Hospital, Chennai- 03.

3.6 SAMPLE

Subjects of type 2 diabetes Mellitus with foot ulcer admitted in diabetic wards at Rajiv Gandhi Government General Hospital and who fulfills the inclusion criteria.

3.7 SAMPLE SIZE

The sample size for this study was 60, 30 per each group of experimental and control group.

3.8 SAMPLING TECHNIQUE

Non probability purposive sampling technique was adopted in this study. Subjects were randomly assigned to Experimental and control group.

3.9 CRITERIA FOR SAMPLE SELECTION

INCLUSION CRITERIA

- Subjects who diagnosed to have type2 DM of both sexes.
- Age above 35 years.
- Subjects with diabetic foot ulcer within the grade of 0 - 1 according to Wagner wound assessment scale.
- Subjects who are available during the period of study.
- Subjects who are able to understand Tamil and English.

EXCLUSION CRITERIA:

• The patients those who diagnosed as type1 DM of both sexes.

• The patients, who are not willing to participate in the study.

• Patients who are having Neurological and cardiological diseases.

3.10 DEVELOPMENT AND DESCRIPTION OF TOOL

After an extensive review of literature and discussion with the experts the following tools are prepared to collect data.

Section A: Demographic variable (Age, Sex, Occupation, Income, Educational status, Marital status, Type of family)

Section B : Medical related information (Diagnosis, Duration of illness, Type of treatment, Type of medication used and Type of diet).

Section C : Wagner wound assessment scale.

Section D : Wound assessment checklist.

SCORING KEY

♣ **Wagner wound assessment scale**

1. Open lesions: may have deformity or cellulitis - 0
2. Superficial ulcer - 1
3. Deep ulcer to tendon or joint capsule - 2
4. Deep ulcer with abscess, osteomyelitis, or joint sepsis - 3
5. Local gangrene – forefoot or heel - 4
6. Extensive gangrene, needs major amputation - 5

♣ **Wound assessment checklist score**

1. 50 to 60 - Very good
2. 40 to 49 - Good
3. 30 to 39 - Moderate
4. 20 to 29 - Mild
5. < 19 - Poor

3. 11 ETHICAL CONSIDERATION

This study was conducted after the approval obtained from the ethical committee, Madras Medical college, Chennai-3. Permission was obtained from the professor and HOD of the Institute of Diabetology, Rajiv Gandhi Government General Hospital, Chennai - 03. All subjects were carefully informed about the purpose of the study. Ensured confidentiality of the study result. The freedom was given to the client to leave the study at his / her will without assigning any reason. No routine care was altered or withheld. The investigator followed the ethical guidelines which were issued by the research committee. Written consent was obtained from all subjects.

3.12 CONTENT VALIDITY

The tool developed by the investigator was sent along with the request for validity of experts including, Medical and Nursing. The experts validated the relevance, sequence, adequacy of language of the tool.

3.13 PILOT STUDY

Formal permission was obtained from the concern higher authorities at Rajiv Gandhi Government General Hospital, Chennai – 03. 6 Samples were selected with the help of Wagner Wound Assessment Scale within the range of 0 – 1. Among 6 samples, 3 samples were in experimental group and 3 samples were in control group. Informed consent was obtained from the subjects. Buerger Allen exercise was performed for experimental group and routine care was provided for the control group. Pre and post - assessment of the wound was done to study the wound healing process by using wound assessment check list for both the group. The data was analyzed and the result of the study revealed that, it was highly effective of performing Buerger Allen exercise. Study was

practically feasible. The instrument was found reliable for proceeding with the main study.

3.14 RELIABILITY

Reliability denotes degree of consistency. After pilot study reliability of the tool was checked by using inter rater method and its correlation coefficient r –value is 0.82. This correlation coefficient is high and it is a good tool for assessing effectiveness of Buerger - Allen exercise on wound healing process among the diabetic foot ulcer subjects admitted in Diabetology wards at Rajiv Gandhi Government General Hospital.

3.15 DATA COLLECTION PROCEDURE

A formal permission was obtained from the Professor and Head of the Institute of Diabetology, Rajiv Gandhi Government General Hospital, Chennai- 03. By using non probability purposive sampling technique three or four subjects were selected on every day. Subjects selected for pilot study were excluded.

The subjects for the study were selected based on the Wagner Wound Assessment Scale within the grade of 0 -1. The study purpose and method were explained to all subjects and informed written consent were obtained. Confidentiality was assured to all the subjects. The information regarding demographic profile and medical related information were collected from 60 Type2 diabetic subjects by interviewing them and observing health records. Thirty subjects were included for experimental and 30 subjects were included for control group. The pre- assessment of the wound was done with the help of wound assessment check list for all the subjects and it was recorded on the first day of the study. Then the Buerger Allen exercise was explained to the subjects with the help of flash cards and the subjects were helped to do Buerger Allen exercise with the help of specially designed exercise board.

The same procedure was followed for all the subjects for a period of 2 weeks and the periodic wound assessment was done on the 5^{th}, 10^{th} and 15^{th} day respectively. The control group subjects were treated with routine medical management. At the end, the effectiveness of wound healing process was assessed with the help of wound assessment checklist between Control and Experimental group.

3.16 PLAN FOR DATA ANALYSIS

The data were planned to be analyzed in terms of the objectives of the study using descriptive and inferential statistics.

Descriptive statistics include

1) Frequency and percentage distribution of demographic profile and medical related information.

2) Mean and standard deviations of pre-assessment and post-assessment of wound healing scores.

Inferential statistics include

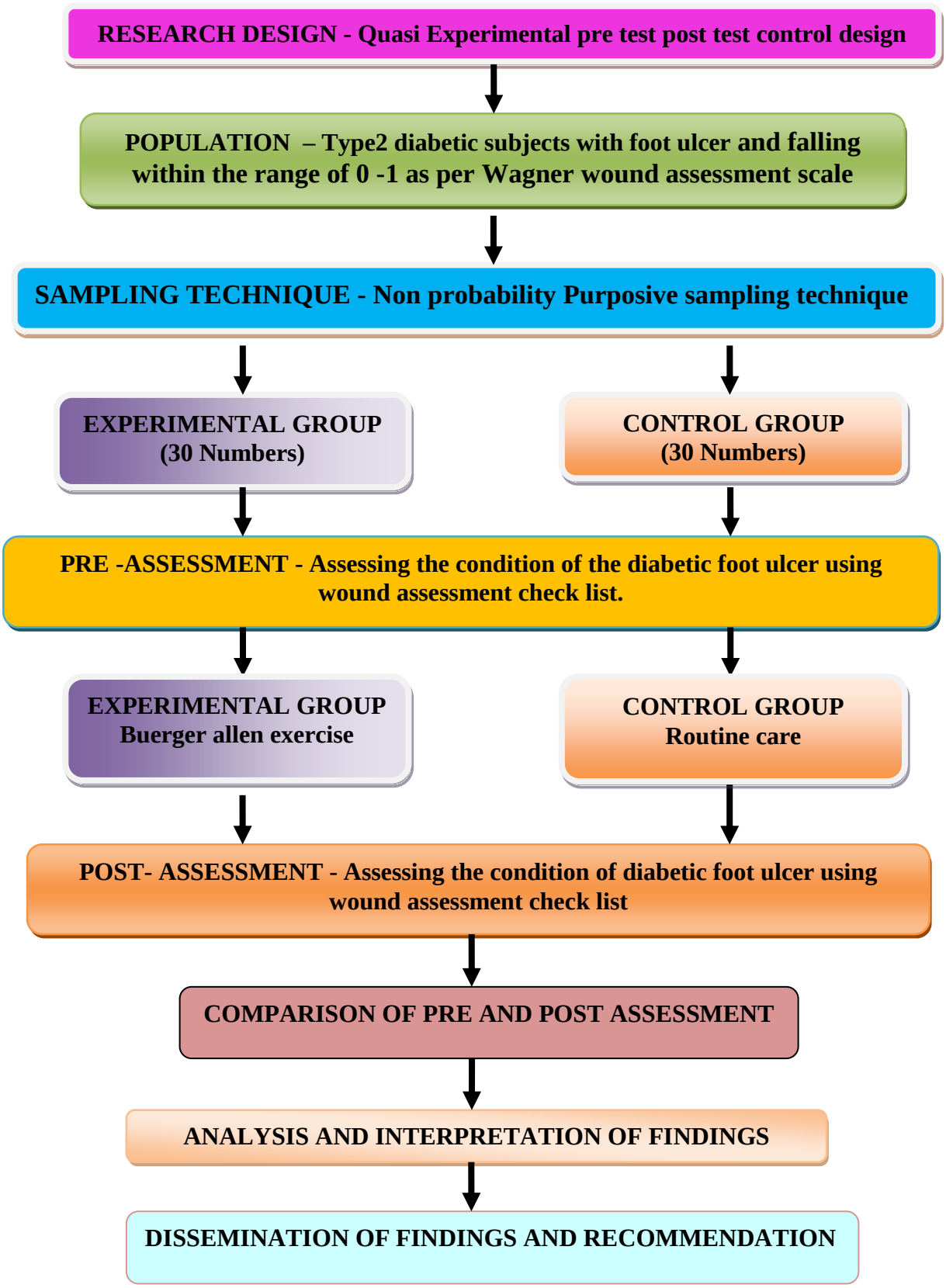
1**).** Independent 't' test to assess the effectiveness of Bueger Allen exercise on wound healing process in experimental groups.

2). Chi-square to associate between the selected demographic variables.

3.17 PROJECTED OUTCOME:

Projected outcome of the study is that the type2 diabetes mellitus subjects, will have,

- ❖ Improved wound healing status
- ❖ Reduced wound exudates
- ❖ Improved blood circulation.



3.18 Fig - 4 Schematic representation of the research methodology

CHAPTER IV

DATA ANALYSIS AND INTERPRETATION

"All things are subject to interpretation. Whichever interpretation prevails at a given time is a function of power and not the truth."

- Friedrich Nietzsche

This chapter deals with analysis and interpretation of data collected from 60 subjects to assess the effectiveness Buerger Allen exercise on wound healing process among diabetic foot ulcer patients admitted in Diabetology wards at Rajiv Gandhi Government General Hospital, Chennai – 03.

Analysis and interpretation of the data was based on collection of the data through non probability purposive sampling technique. Descriptive and inferential statistics were used for the analysis of the data.

Data collected was edited, tabulated, interpreted and findings obtained were presented in the form of tables and diagrams represent the following headings.

SECTION I : Data on demographic variables of diabetes mellitus with foot ulcer.

SECTION II : Data on medical related information related to diabetes mellitus.

SECTION III : Data on lower extremity perfusion among diabetes mellitus patients in Experimental and Control group.

SECTION IV : Data on effectiveness of Buerger Allen exercise on wound healing process among Experimental group.

SECTION V : Data on comparison of wound healing process between Experimental and Control group.

SECTION VI : Data on post-assessment of the lower extremity perfusion among diabetes mellitus patients in Experimental and Control group

SECTION VII : Data on association between wound healing process and Buerger Allen exercise with selected demographic variables and medical related information among Experimental group.

SECTION – I: DATA ON DEMOGRAPHIC VARIABLES OF DIABETES MELLITUS WITH FOOT ULCER

Table 1 : DEMOGRAPHIC PROFILE

Frequency and percentage distribution of subjects in the Experimental and Control group regarding their background factors.

DEMOGRAPHIC VARIABLES		GROUP			
		EXPERIMENTAL		CONTROL	
		N	%	N	%
Age	30 -40 yrs	6	20.0%	4	13.3%
	40 -50 yrs	7	23.3%	7	23.3%
	50 -60 yrs	11	36.7%	9	30.0%
	>60 yrs	6	20.0%	10	33.3%
Sex	Male	10	33.3%	13	43.3%
	Female	20	66.7%	17	56.7%
Marital status	Married	26	86.7%	24	80.0%
	Widowed	4	13.3%	6	20.0%
Religion	Hindu	23	76.7%	26	86.7%
	Muslim	1	3.3%	1	3.3%
	Christian	6	20.0%	3	10.0%
Type of family	Nuclear family	18	60.0%	16	53.3%
	Joint family	12	40.0%	14	46.7%
Educational status	Illiterate	7	23.3%	2	6.7%
	Primary	15	50.0%	19	63.3%
	Higher secondary	6	20.0%	7	23.3%
	Graduate and above	2	6.7%	2	6.7%
Occupation	Government	2	6.7%	1	3.3%
	Private	11	36.7%	17	56.7%
	Pensioner	3	10.0%	4	13.3%
	Unemployed	14	46.7%	8	26.7%
Income	< Rs.1000	20	66.7%	14	46.7%
	Rs.1000 -2000	4	13.3%	10	33.3%
	Rs.2000 -5000	4	13.3%	3	10.0%
	>Rs.5000	2	6.7%	3	10.0%
Area of residence	Rural	16	53.3%	15	50.0%
	Urban	14	46.7%	15	50.0%
Dietary pattern	Vegetarian	8	26.7%	5	16.7%
	Non-vegetarian	2	6.7%	2	6.7%
	Mixed	20	66.7%	23	76.7%

Table 1, shows the demographical information of subjects those who are participated for the study. It reveals the frequency and percentage distribution of subjects in the Experimental and Control group regarding their demographic information.

In considering the age wise distribution, 36.7 % (11) of subjects were in 50 to 60 years of age, in the Experimental group. In the Control group 33.3 % (10) of subjects were more than 60 years of age.

Majority of subjects were female in both Experimental 66.7 % (20) and Control group 56.7 % (17). Married people were 86.7 % (26) in Experimental group and 80.0 % (24) in Control group.

Subjects constituting 76.7% (23) were mainly Hindus in the Experimental, as well as in Control group 86.7% (26).

Regarding Type of family, majority of the subjects in Experimental group 60.0 % (18) and Control group 53.3 % (16) belongs to Nuclear family.

Regarding Education, in Experimental group majority was educated up to primary education 50.0 % (15) and in Control group 63.3% (19) equally educated up to primary education and High School.

Majority of the subjects was unemployed in Experimental group 46.7 % (14) and in Control group mostly they belongs to private, it is 56.7% (17).

Regarding Monthly income, both Experimental group 66.7% (20), and Control Group 46.7 % (14) were less than Rs 1000. Majority of subjects were consuming mixed diet in Experimental group 66.7 % (20) and in Control group 76.7 % (23).

Regarding Area of residence, nearly half of the subjects were residing in the rural area, in Experimental group 53.3% (16) and in Control group it is 50.0 % (15).

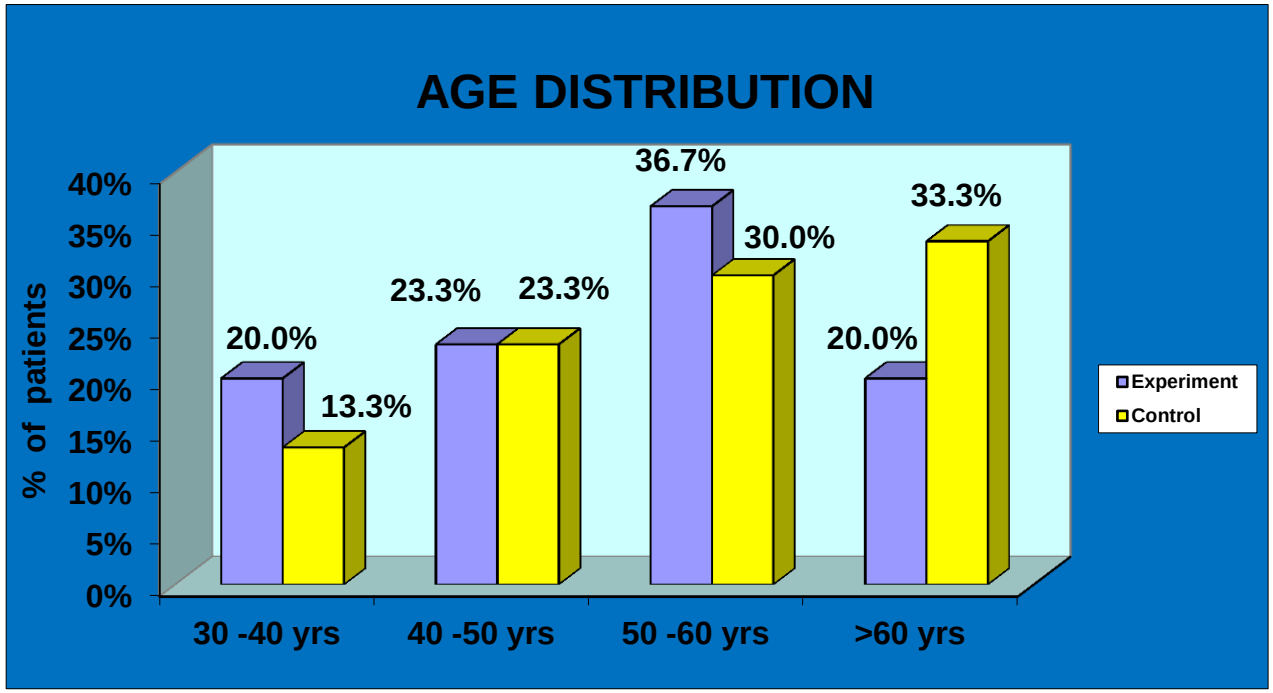


Fig - 5 Age distribution of type 2 Diabetic patients in Experimental and Control group

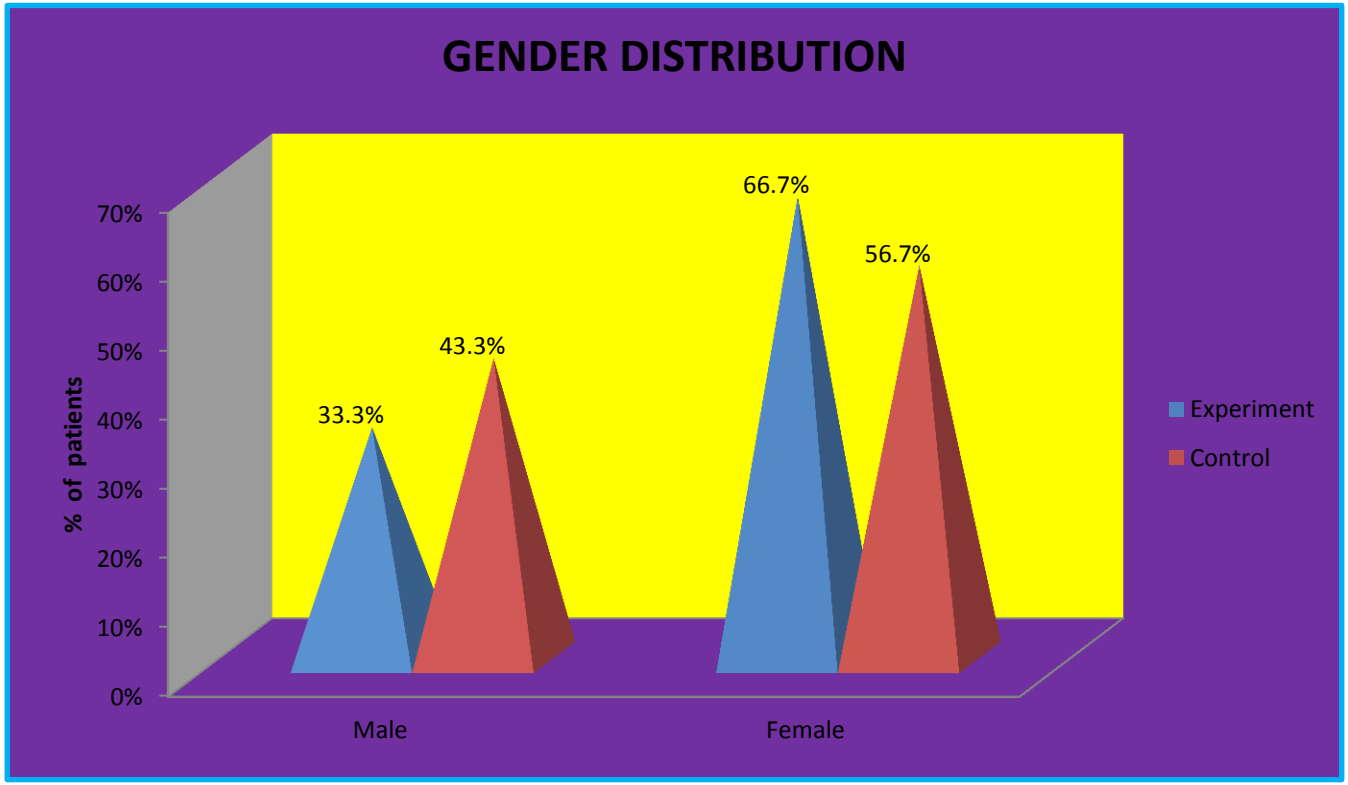


Fig - 6 Gender distribution of type 2 Diabetic patients in Experimental and Control group

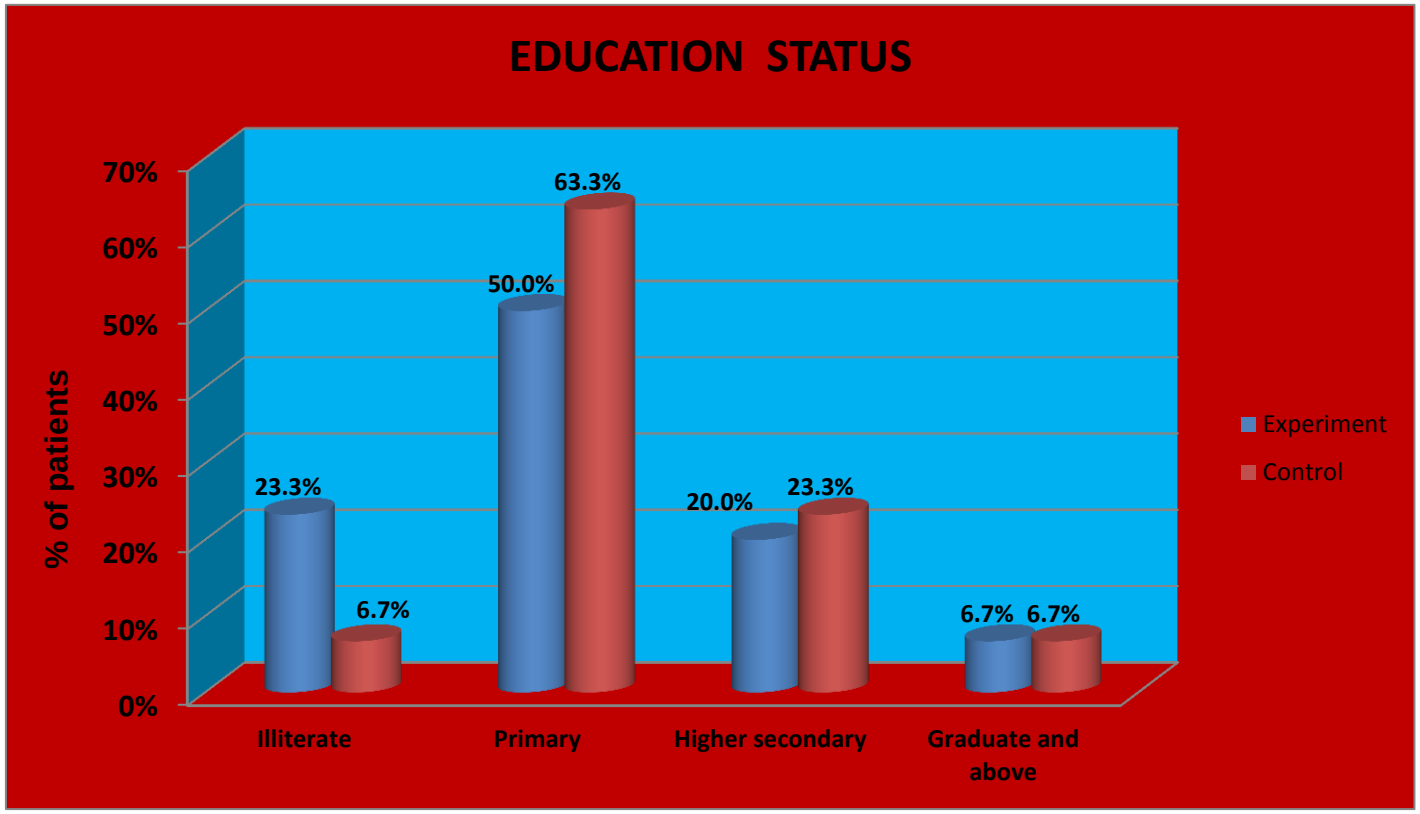


Fig - 7 Education Status Distribution of type 2 Diabetic patients in Experimental and Control group

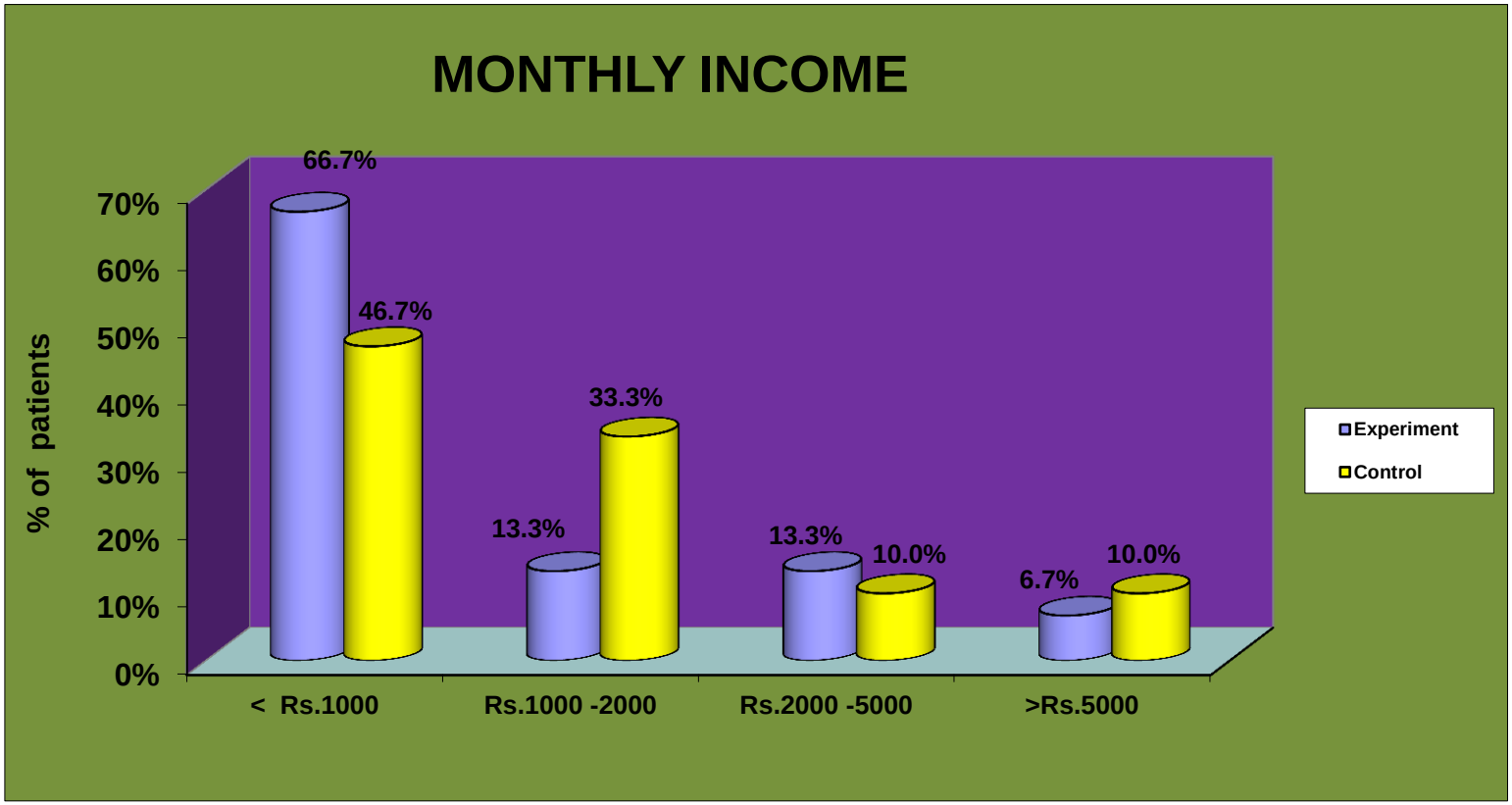


Fig - 8 Monthly Income Distribution of type 2 Diabetic patients in Experimental and Control group

SECTION - II : DATA ON MEDICAL RELATED INFORMATION RELATED TO DIABETES MELLITUS

Table 2: MEDICAL RELATED INFORMATION

MEDICAL RELATED INFORMATION		GROUP			
		EXPERIMENTAL		CONTROL	
		N	%	N	%
Type of diet	Carbohydrate rich diet	10	33.3%	8	26.7%
	Cholesterol rich diet	3	10.0%	2	6.7%
	Protein rich diet	3	10.0%	3	10.0%
	Mixed diet	14	46.7%	17	56.7%
History of chronic illness	Yes	6	20.0%	9	30.0%
	No	24	80.0%	21	70.0%
If yes specify	Hypertension	5	83.3%	7	87.5%
	Cardiovascular problems	1	16.7%	1	12.5%
History of consuming medication for chronic illness	Yes	1	3.3%	2	6.7%
	No	29	96.7%	28	93.3%
Duration of illness	1- 2 year	3	10.0%	4	13.3%
	2- 5 year	9	30.0%	9	30.0%
	5- 10 year	9	30.0%	5	16.7%
	> 10 year	9	30.0%	12	40.0%
Duration of consuming diabetic medications	1- 2 year	7	23.3%	11	36.7%
	2- 5 year	14	46.7%	7	23.3%
	5- 10 year	3	10.0%	4	13.3%
	> 10 year	6	20.0%	8	26.7%
Type of diabetic medication	oral hypoglycemic agent	19	63.3%	21	70.0%
	Insulin and oral hypoglycemic agent	11	36.7%	9	30.0%
History of smoking	Yes	8	26.7%	10	33.3%
	No	22	73.3%	20	66.7%

No. of years of smoking	5-10 years	1	12.5%	2	20.0%
	10-20 years	5	62.5%	3	30.0%
	>20 years	2	25.0%	5	50.0%
No. of cigarettes per day	1 -2	1	12.5%	2	20.0%
	3 -5	5	62.5%	3	30.0%
	6 -8	1	12.5%	3	30.0%
	>8	1	12.5%	2	20.0%
History of consuming alcohol	Yes	4	13.3%	7	23.3%
	No	26	86.7%	23	76.7%
No. of years of consuming alcohol	5-10 years	2	50.0%	3	42.9%
	10-20 years	1	25.0%	2	28.6%
	>20 years	1	25.0%	2	28.6%
Duration of consuming alcohol per week	Once	1	25.0%	2	28.6%
	2 -3 times	1	25.0%	4	57.1%
	4 -5 times	2	50.0%	1	14.3%
Amount of consuming alcohol per day	90 ml	1	25.0%	1	14.3%
	180 ml	3	75.0%	6	85.7%

Table 2, shows the medical related information of diabetic patients those who are participated in this study. It reveals the frequency and percentage distribution of subjects in the Experimental and Control group regarding their Medical related information.

In considering the history of chronic illness majority of subjects were not having any history of chronic illness, in the Experimental group 80.0 % (24) and in the Control group 70.0 % (21). Majority of subjects with chronic illness was suffering with Hypertension in Experimental 83.3 % (5) and Control group 87.5 % (7).

Subjects constituting history of consuming medications for chronic illness is very less, in Experimental group 96.7% (29) in Control group 93.3 % (28).

Regarding duration of illness, mostly subjects are having the duration of more than 10 years, in Experimental group 30.0 % (9) and in Control group 40.0 % (12).

Regarding duration of consuming diabetic medications in Experimental group 46.7 % (14) were consuming medications for 2 – 5 years and in Control group, 36.7 % (11) were consuming medications for 1 – 2 years. Regarding type of diabetic medication, majority of the subjects in Experimental group 63.3% (19) and Control group 70.0% (21) were consuming Oral Hypoglycemic agent. Regarding history of smoking majority of the subjects was not having history of smoking in Experimental group 73.3 % (22) and in Control group 66.7 % (20).

Regarding number of years of smoking, majority of the subjects in Experimental group 62.5 % (5) were smoking for 12 - 20 years and in Control group, 50.0 % (5) were smoking for >20 years.

Considering number of cigarettes smoked per day, majority of subjects were smoking 3 – 5 cigarettes per day, in Experimental group it is 62.5 % (5) and in Control group 30.0 % (3). Regarding history of consuming alcohol majority of the subjects having no history of consuming alcohol, in Experimental group 86.7 % (26) and in Control group 76.7 % (23).

Regarding number of years of consuming alcohol, majority of the subjects consuming alcohol for 5 – 10 years, in Experimental group 50.0 % (2) and in Control group, 42.9 % (3). Considering duration of consuming alcohol per week in Experimental group 50.0 % (2) were consuming alcohol for 4 – 5 times and in Control group, 57.1 % (4) were consuming alcohol for 2 – 3 times.

Regarding amount of consuming alcohol per day, majority of the subjects were consuming 180 ml, in Experimental group 75.0 % (3) and in Control group it is 85.7 % (6).

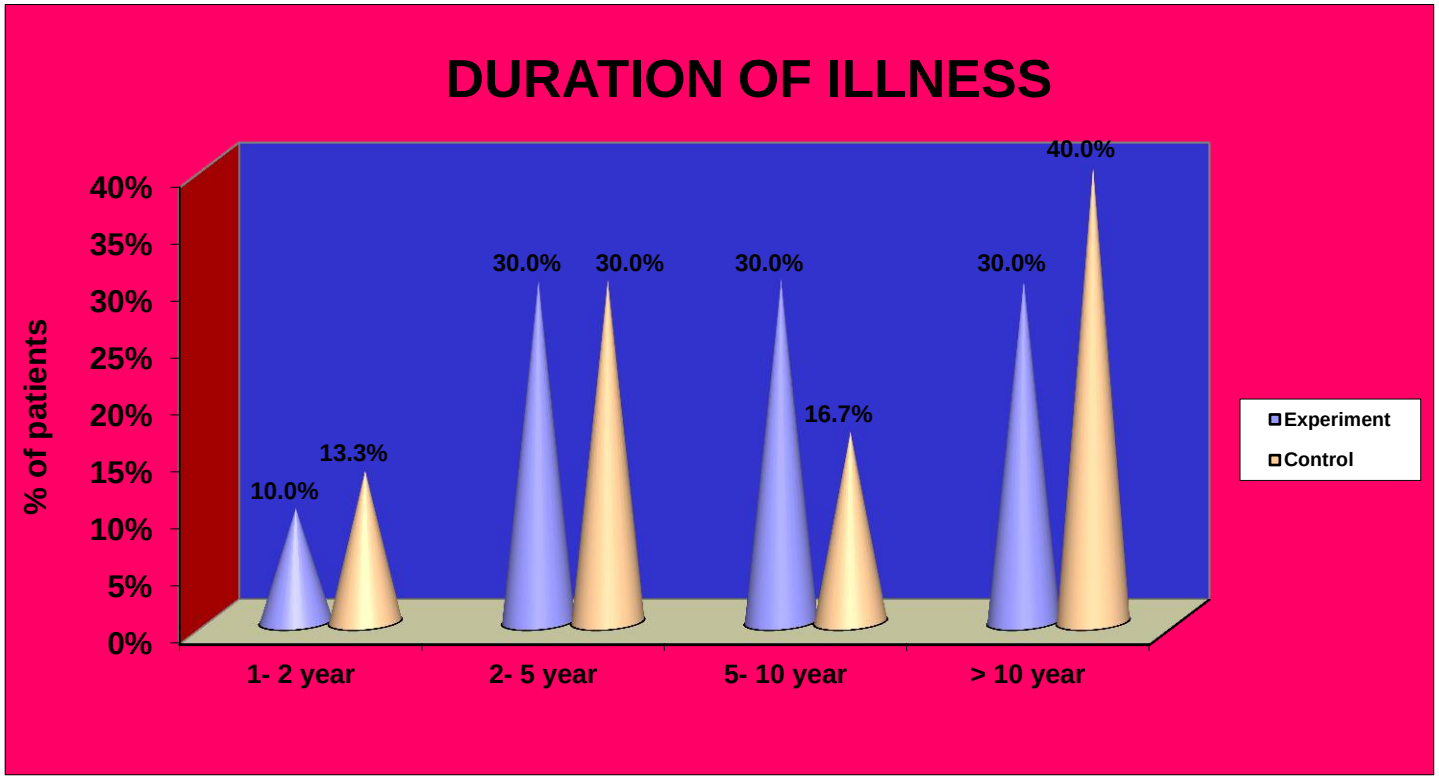


Fig – 9 Duration of illness in Experimental and Control group

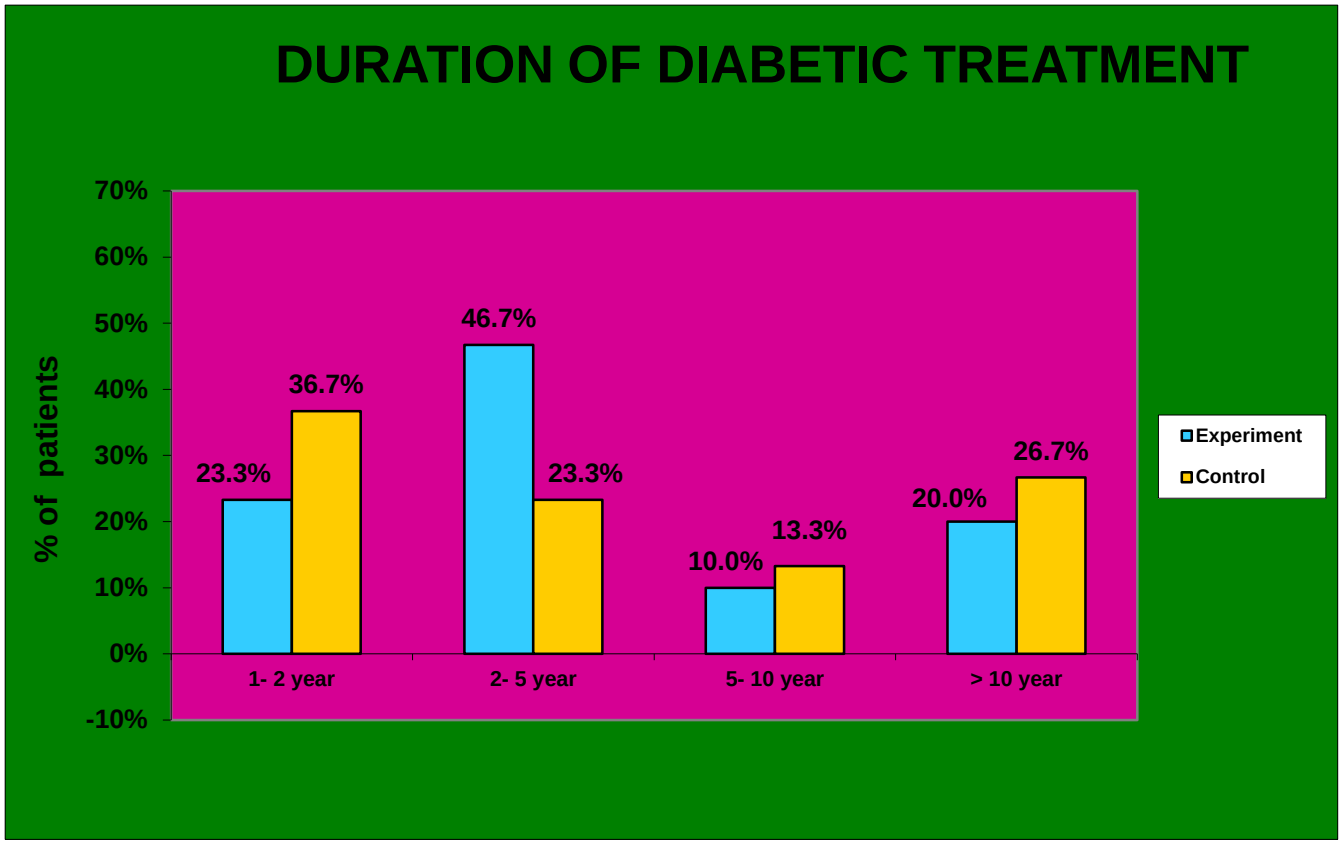


Fig - 10 Duration of Diabetic treatment in Experimental and Control group

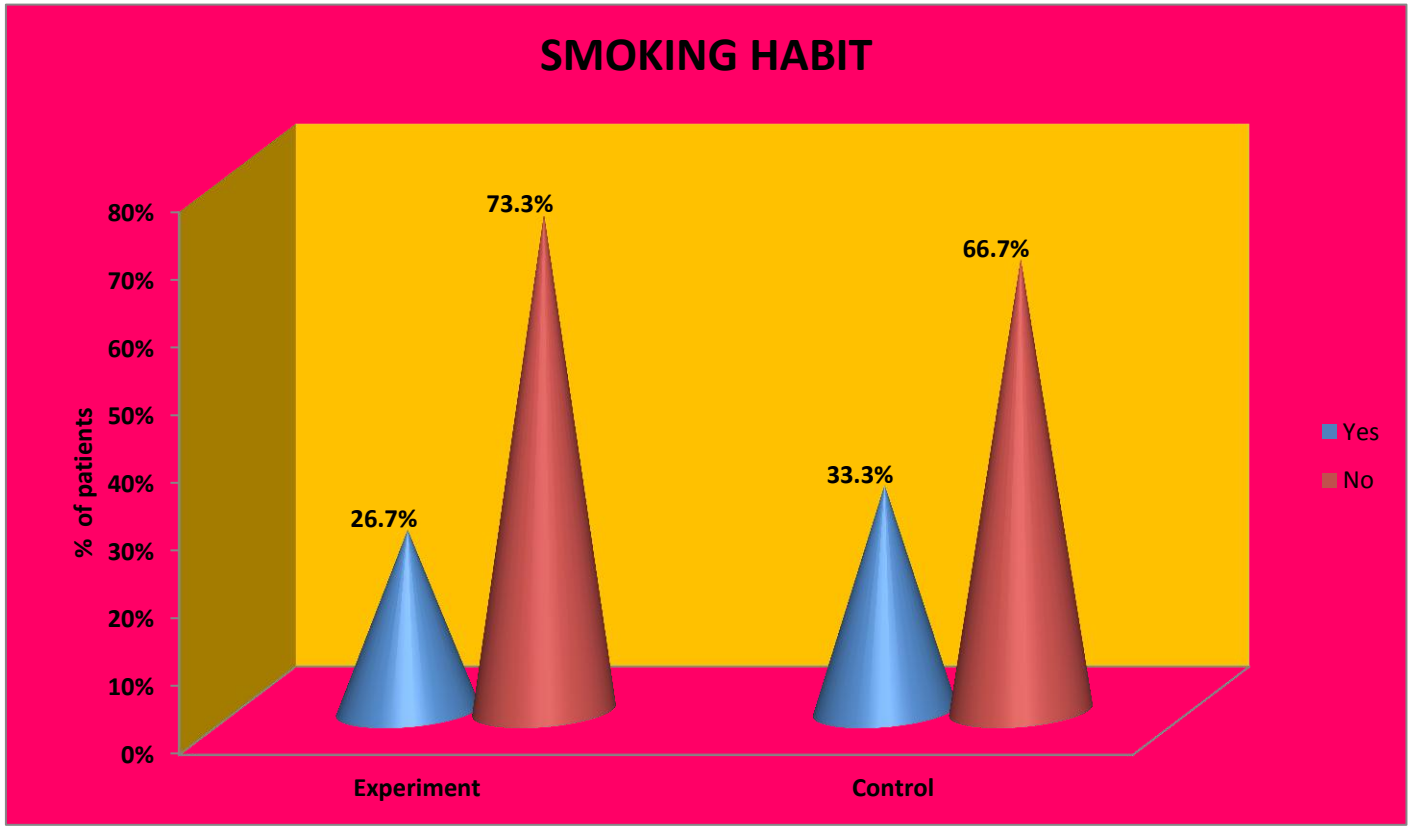


Fig -11 Smoking habit in Experimental and Control group

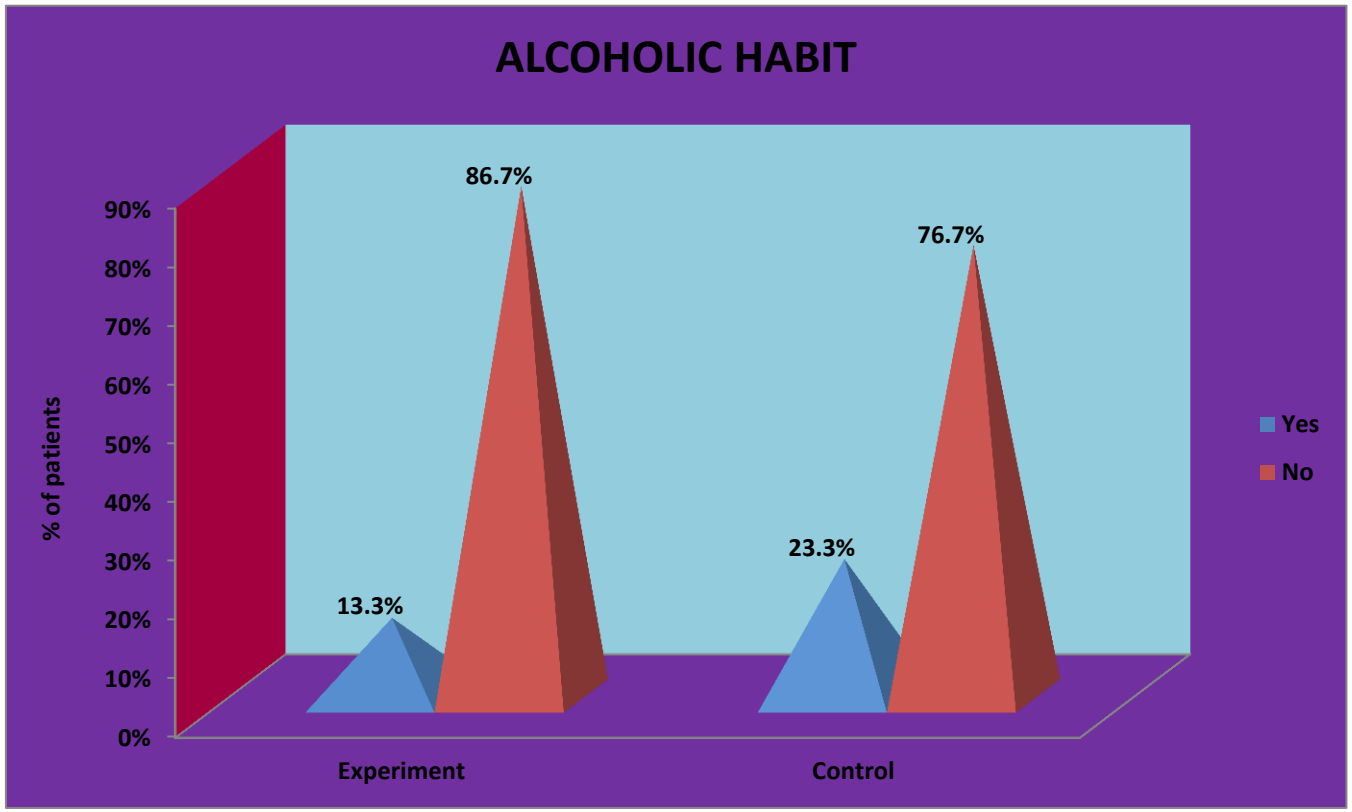


Fig - 12 Alcoholic Habit of Experimental and Control group

SECTION – III : DATA ON LOWER EXTREMITY PERFUSION AMONG DIABETES MELLITUS PATIENTS IN EXPERIMENTAL AND CONTROL GROUP

Table 3: PRE - ASSESSMENT OF THE LOWER EXTREMITY PERFUSION AMONG DIABETES MELLITUS PATIENT IN EXPERIMENTAL AND CONTROL GROUP

SCORE INTERPRETATION	GROUP				CHI SQUARE TEST
	EXPERIMENTAL		CONTROL		
	N	%	N	%	
Very good	0	0.0%	0	0.0%	
Good	0	0.0%	0	0.0%	$\chi 2=0.28$ p=0.59
Moderate	12	40.0%	10	33.3%	
Mild	18	60.0%	20	66.7%	
Poor	0	0.0%	0	0.0%	

* significant at P≤0.05 ** highly significant at P≤0.01 *** very high significant at P≤0.001.

Table 3 shows the pre-assessment of the lower extremity perfusion among diabetes mellitus patient in Experimental and Control group. All the patients are have mild or moderate level in the pre assessment. In Experimental group 60.0 % (18) of them having mild lower extremity perfusion. In Control group 66.7 % (20) of them having mild lower extremity perfusion. Statistically there is no significant difference between experiment and Control group. Statistical significance was calculated using chi square test.

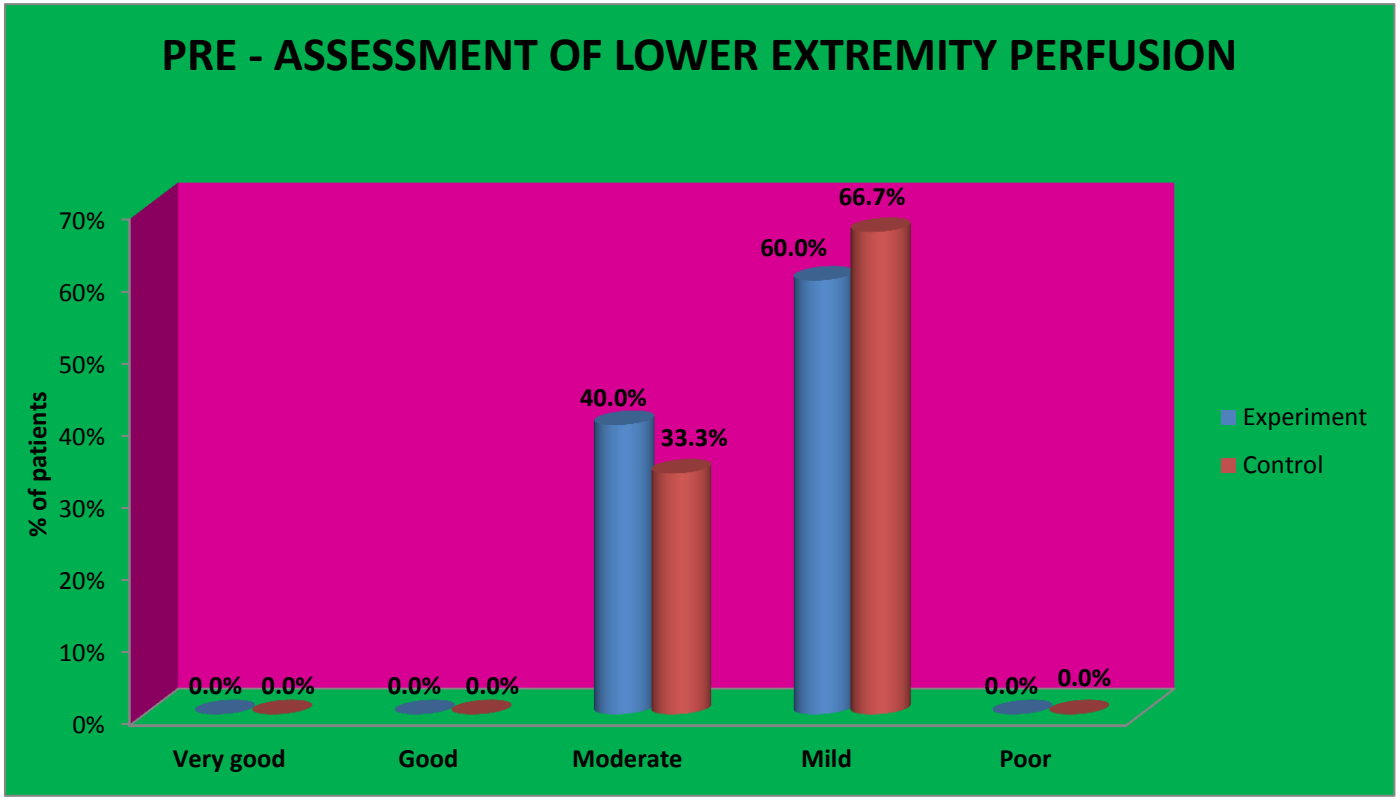


Fig - 13 Pre-Assessment of Lower extremity perfusion in Experimental and Control group

SECTION – IV : DATA ON EFFECTIVENESS OF BUGER ALLEN EXERCISE ON WOUND HEALING PROCESS AMONG EXPERIMENTAL GROUP

Table 4: ASSESSMENT OF WOUND HEALING PROCESS

DAY	SCORE INTERPRETATI ON	GROUP				CHI SQUARE TEST
		EXPERIMENTAL		CONTROL		
		N	%	N	%	
Day1	Mild	18	60.0%	20	66.7%	
	Moderate	12	40.0%	10	33.3%	$\chi 2=0.28$ p=0.59
Day5	Mild	5	16.7%	15	50.0%	
	Moderate	19	63.3%	14	46.7%	$\chi 2=9.32$ p=0.01**
	Good	6	20.0%	1	3.3%	
Day10	Mild			12	40.0%	
	Moderate	18	60.0%	16	53.3%	$\chi 2=19.26$ p=0.001***
	Good	12	40.0%	2	6.7%	
Day15	Mild			11	36.7%	
	Moderate	6	20.0%	17	56.7%	
	Good	21	70.0%	2	6.7%	$\chi 2=34.95$ p=0.001***
	Very good	3	10.0%			

* significant at P≤0.05 ** highly significant at P≤0.01 *** very high significant at P≤0.001.

Table 4 evaluates the effectiveness of Buerger- Allen exercise on wound healing process among the Experimental group comparing with Control group. The post assessment wound healing process in Experimental group showed good lower extremity perfusion in 70.0 % (21) and very good lower extremity perfusion in 10.0 % (3). In Control group moderate lower extremity perfusion in 56.7 % (17) and mild lower extremity perfusion in 36.7 % (11) was noted. In the pre assessment there is no significant difference between Experimental and Control group, but on the 5^{th} day,10^{th} day and 15^{th} day there is a statistically significant difference between Experimental and Control group. Statistical significance was calculated using chi square test.

SECTION – V : DATA ON COMPARISON OF WOUND HEALING PROCESS BETWEEN EXPERIMENTAL AND CONTROL GROUP

Table 5: COMPARISON OF SIZE OF THE WOUND

DAY	SIZE OF THE WOUND	GROUP				CHI SQUARE TEST
		EXPERIMENTAL		CONTROL		
		N	%	N	%	
Day1	Length X width < 16.1 - 36 sq cm	7	23.3%	8	26.7%	
	Length X width < 4 - 16 sq cm	23	76.7%	22	73.3%	$\chi 2=0.09$ p=0.76
Day5	Length X width < 16.1 - 36 sq cm	7	23.3%	6	20.0%	
	Length X width < 4 - 16 sq cm	18	60.0%	23	76.7%	$\chi 2=3.35$p=0.10
	Length X width < 4 sq cm	5	16.7%	1	3.3%	
Day10	Length X width < 16.1 - 36 sq cm			6	20.0%	
	Length X width < 4 - 16 sq cm	19	63.3%	22	73.3%	$\chi 2=12.45$ p=0.02*
	Length X width < 4 sq cm	11	36.7%	2	6.7%	
Day15	Length X width < 16.1 - 36 sq cm	0	0.0%	5	16.7%	
	Length X width < 4 - 16 sq cm	9	30.0%	23	76.7%	$\chi 2=26.82$ p=0.001***
	Length X width < 4 sq cm	21	70.0%	2	6.7%	

* significant at P≤0.05 ** highly significant at P≤0.01 *** very high significant at P≤0.001

Table 5 shows Pre assessment in which there is no significant difference between Experimental and Control group, but in 5th day,10th day and 15th day there is a statistically significant difference between experiment and Control group. The comparison of size of the wound, length X width < 4 sq cm in Experimental group is 70.0 % (21) and in Control group 6.7 % (2). Statistical significance was calculated using chi square test.

Table 6: COMPARISON OF DEPTH OF THE WOUND

DAY	DEPTH OF THE WOUND	GROUP				CHI SQUARE TEST
		EXPERIMENTAL		CONTROL		
		N	%	N	%	
Day1	Deep crater with or without undermining of adjacent tissue.	12	40.0%	8	26.7%	
	Superficial, abrasion, blister or shallow.	18	60.0%	22	73.3%	χ^2=1.21 p=0.27
Day5	Deep crater with or without undermining of adjacent tissue.	6	20.0%	5	16.7%	
	Superficial, abrasion, blister or shallow.	17	56.7%	23	76.7%	
	Tissues damaged but no break in skin surface.	7	23.3%	2	6.7%	χ^2=3.76 p=0.15
Day10	Deep crater with or without undermining of adjacent tissue.			4	13.3%	
	Superficial, abrasion, blister or shallow.	11	36.7%	24	80.0%	χ^2=22.59 p=0.001***
	Tissues damaged but no break in skin surface.	19	63.3%	2	6.7%	
Day15	Deep crater with or without undermining of adjacent tissue.			4	13.3%	
	Superficial, abrasion, blister or shallow.	8	26.7%	22	73.3%	χ^2=22.99 p=0.001***
	Tissues damaged but no break in skin surface.	22	73.3%	4	13.3%	

* significant at P≤0.05 ** highly significant at P≤0.01 *** very high significant at P≤0.001

Table 6 shows Pre-assessment and on 5 th day there is no significant difference between Experimental and Control group, but on 10th day and 15th day there is a statistically significant difference between Experimental and Control group. The comparison of depth of the wound by assessing the tissue damage but no break in skin surface, in Experimental group is 73.3 % (22) and in Control group 13.3 % (4). Statistical significance was calculated using chi square test.

Table 7: COMPARISON OF EDGES OF THE WOUND

DAY SCORE		GROUP				CHI SQUARE TEST
		EXPERIMENTAL		CONTROL		
		N	%	N	%	
Day1	1	5	16.7%	6	20.0%	
	2	17	56.7%	12	40.0%	$\chi 2=1.76$ p=0.41
	3	8	26.7%	12	40.0%	
Day5	1	1	3.3%	3	10.0%	
	2	9	30.0%	13	43.3%	
	3	16	53.3%	14	46.7%	$\chi 2=5.86$ p=0.11
	4	4	13.3%			
Day10	1			2	6.7%	
	2	4	13.3%	13	43.3%	
	3	20	66.7%	15	50.0%	$\chi 2=13.47$ p=0.001***
	4	6	20.0%			
Day15	1			2	6.7%	
	2	2	6.7%	14	46.7%	
	3	14	46.7%	12	40.0%	$\chi 2=20.29$ p=0.001***
	4	12	40.0%	2	6.7%	
	5	2	6.7%			

* significant at P≤0.05 ** highly significant at P≤0.01 *** very high significant at P≤0.001.

Table 7 shows Pre-assessment and on 5 th day there is no significant difference between Experimental and Control group, but in 10th day and 15th day there is a statistically significant difference between Experimental and Control group. The comparison of edges of the wound by assessing the indistinct wound margin around the edges of the wound, in Experimental group is 40.0 % (12) and in Control group 6.7 % (2). Statistical significance was calculated using chi square test.

Table 8: COMPARISON OF UNDERMINING OF THE WOUND

DAY SCORE		GROUP				CHI SQUARE TEST
		EXPERIMENTAL		CONTROL		
		N	%	N	%	
Day1	1	6	20.0%	7	23.3%	
	2	18	60.0%	14	46.7%	$\chi 2=1.17$ p=0.55
	3	6	20.0%	9	30.0%	
Day5	1	2	6.7%	5	16.7%	
	2	13	43.3%	13	43.3%	
	3	11	36.7%	11	36.7%	$\chi 2=3.08$ p=0.37
	4	4	13.3%	1	3.3%	
Day10	1			3	10.0%	
	2	6	20.0%	13	43.3%	
	3	15	50.0%	13	43.3%	$\chi 2=12.12$ p=0.01**
	4	9	30.0%	1	3.3%	
Day15	1			3	10.0%	
	2	5	16.7%	11	36.7%	
	3	10	33.3%	14	46.7%	$\chi 2=15.89$ p=0.01**
	4	13	43.3%	2	6.7%	
	5	2	6.7%			

* significant at P≤0.05 ** highly significant at P≤0.01 *** very high significant at P≤0.001.

Table 8 shows Pre-assessment and on 5 th day there is no significant difference between Experimental and Control group, but on 10th day and 15th day there is a statistically significant difference between Experimental and Control group. The comparison of undermining of the wound by assessing its size 2 - 4 cm (50 % wound margin) in any area of the wound, in Experimental group is 43.3 % (13) and in Control group 6.7 % (2). Statistical significance was calculated using chi square test.

Table 9: COMPARISON OF NECROTIC TISSUE TYPE OF THE WOUND

DAY SCORE		GROUP				CHI SQUARE TEST
		EXPERIMENTAL		CONTROL		
		N	%	N	%	
Day1	2	3	10.0%	1	3.3%	
	3	16	53.3%	22	73.3%	$\chi 2=2.83$ p=0.24
	4	11	36.7%	7	23.3%	
Day5	2	13	43.3%	18	60.0%	$\chi 2=3.96$ p=0.14
	3	14	46.7%	12	40.0%	
	4	3	10.0%			
Day10	2	6	20.0%	15	50.0%	
	3	12	40.0%	14	46.7%	$\chi 2=13.31$ p=0.001***
	4	12	40.0%	1	3.3%	
Day15	2	2	6.7%	13	43.3%	$\chi 2=24.66$ p=0.001***
	3	10	33.3%	16	53.3%	
	4	18	60.0%	1	3.3%	

* significant at P≤0.05 ** highly significant at P≤0.01 *** very high significant at P≤0.001.

Table 9 shows Pre-assessment and on 5 th day there is no significant difference between Experimental and Control group, but on 10th day and 15th day there is a statistically significant difference between Experimental and Control group. The comparison necrotic tissue type of the wound by assessing the non adherent yellow slough, hard of the wound, in Experimental group is 60.0 % (18) and in Control group 3.3 % (1). Statistical significance was calculated using chi square test.

Table 10: COMPARISON OF NECROTIC TISSUE AMOUNT OF THE WOUND

DAY SCORE		GROUP				CHI SQUARE TEST
		EXPERIMENTAL		CONTROL		
		N	%	N	%	
Day1	1	2	6.7%	1	3.3%	
	2	16	53.3%	19	63.3%	$\chi 2=0.77$ p=0.68
	3	12	40.0%	10	33.3%	
Day5	1	1	3.3%	1	3.3%	
	2	10	33.3%	15	50.0%	
	3	17	56.7%	13	43.3%	$\chi 2=1.86$ p=0.60
	4	2	6.7%	1	3.3%	
Day10	1			1	3.3%	
	2	2	6.7%	11	36.7%	$\chi 2=11.94$ p=0.01**
	3	19	63.3%	16	53.3%	
	4	9	30.0%	2	6.7%	
Dayt15	1			1	3.3%	
	2	2	6.7%	11	36.7%	$\chi 2=18.13$ p=0.001***
	3	9	30.0%	14	46.7%	
	4	19	63.3%	4	13.3%	

* significant at P≤0.05 ** highly significant at P≤0.01 *** very high significant at P≤0.001.

Table 10 shows Pre-assessment and on 5 th day there is no significant difference between Experimental and Control group, but on 10th day and 15th day there is a statistically significant difference between Experimental and Control group. The comparison of necrotic tissue amount of the wound by assessing the wound coverage to <25 % of wound bed covered, in Experimental group is 63.3 % (19) and in Control group 13.3 % (4). Statistical significance was calculated using chi square test.

Table 11: COMPARISON OF EXUDATE TYPE OF THE WOUND

DAY SCORE		GROUP				CHI SQUARE TEST
		EXPERIMENTAL		CONTROL		
		N	%	N	%	
Day1	1	2	6.7%	4	13.3%	
	2	21	70.0%	21	70.0%	$\chi 2=1.00$ p=0.61
	3	7	23.3%	5	16.7%	
Day5	1			2	6.7%	
	2	13	43.3%	19	63.3%	
	3	16	53.3%	8	26.7%	$\chi 2=5.77$ p=0.12
	4	1	3.3%	1	3.3%	
Day 10	1			2	6.7%	
	2	1	3.3%	17	56.7%	$\chi 2=24.45$ p=0.001***
	3	25	83.3%	10	33.3%	
	4	4	13.3%	1	3.3%	
Day 15	1			2	6.7%	
	2	1	3.3%	15	50.0%	$\chi 2=29.50$ p=0.001***
	3	11	36.7%	12	40.0%	
	4	18	60.0%	1	3.3%	

* significant at P≤0.05 ** highly significant at P≤0.01 *** very high significant at P≤0.001

Table 11 shows Pre-assessment and on 5 th day there is no significant difference between experiment and Control group, but on 10th day and 15th day there is a statistically significant difference between Experimental and Control group. The comparison of exudates types of the wound by assessing the exudates may be none or bloody, in Experimental group is 60.0 % (18) and in Control group 3.3 % (1). Statistical significance was calculated using chi square test.

Table 12: COMPARISON OF EXUDATE AMOUNT OF THE WOUND

DAY SCORE		GROUP				CHI SQUARE TEST
		EXPERIMENTAL		CONTROL		
		N	%	N	%	
Day1	1	2	6.7%	6	20.0%	
	2	12	40.0%	13	43.3%	$\chi 2=2.96$ p=0.23
	3	16	53.3%	11	36.7%	
Day5	1			3	10.0%	
	2	7	23.3%	13	43.3%	$\chi 2=10.30$ p=0.02*
	3	18	60.0%	14	46.7%	
	4	5	16.7%			
Day10	1			3	10.0%	
	2	2	6.7%	12	40.0%	$\chi 2=16.04$ p=0.01**
	3	21	70.0%	14	46.7%	
	4	7	23.3%	1	3.3%	
Day15	1			3	10.0%	
	2			12	40.0%	$\chi 2=23.60$ p=0.001***
	3	17	56.7%	13	43.3%	
	4	13	43.3%	2	6.7%	

* significant at P≤0.05 ** highly significant at P≤0.01 *** very high significant at P≤0.001

Table 12 shows Pre -assessment and on 5 th day there is no significant difference between Experimental and Control group, but on 10th day and 15th day there is a statistically significant difference between Experimental and Control group. The comparison of exudates amount of the wound by assessing the scandy exudates of the wound, in Experimental group is 43.3 % (13) and in Control group 6.7 % (2). Statistical significance was calculated using chi square test.

Table 13: COMPARISON OF SKIN COLOUR OF THE WOUND

DAY SCORE		GROUP				CHI SQUARE TEST
		EXPERIMENTAL		CONTROL		
		N	%	N	%	
Day1	1			2	6.7%	
	2	4	13.3%	5	16.7%	
	3	22	73.3%	22	73.3%	$\chi 2=3.91$ p=0.27
	4	4	13.3%	1	3.3%	
Day5	1			2	6.7%	
	2	1	3.3%	4	13.3%	$\chi 2=9.33$ p=0.02*
	3	21	70.0%	23	76.7%	
	4	8	26.7%	1	3.3%	
Day10	1			2	6.7%	
	2			4	13.3%	$\chi 2=14.71$ p=0.01**
	3	17	56.7%	22	73.3%	
	4	13	43.3%	2	6.7%	
Day15	1			2	6.7%	$\chi 2=14.93$p=0.01**
	2			3	10.0%	
	3	13	43.3%	21	70.0%	
	4	17	56.7%	4	13.3%	

* significant at P≤0.05 ** highly significant at P≤0.01 *** very high significant at P≤0.001

Table 13 shows Pre-assessment and on 5 th day there is no significant difference between experiment and Control group, but on 10th day and 15th day there is a statistically significant difference between Experimental and Control group. The comparison of skin colour surrounding the wound by assessing the pigmentation of the wound, in Experimental group is 56.7 % (17) and in Control group 13.3 % (4). Statistical significance was calculated using chi square test.

Table 14: COMPARISON OF PERIPHERAL TISSUE EDEMA OF THE WOUND

DAY SCORE		GROUP				CHI SQUARE TEST
		EXPERIMENTAL		CONTROL		
		N	%	N	%	
Day1	1	3	10.0%			
	2	20	66.7%	26	86.7%	$\chi 2=6.78$ p=0.08
	3	4	13.3%	4	13.3%	
	4	3	10.0%			
Day5	1	2	6.7%			
	2	9	30.0%	22	73.3%	$\chi 2=14.01$ p=0.01**
	3	14	46.7%	8	26.7%	
	4	5	16.7%			
Day10	2	1	3.3%	17	56.7%	
	3	15	50.0%	12	40.0%	$\chi 2=25.82$ p=0.001***
	4	14	46.7%	1	3.3%	
Day15	2			17	56.7%	$\chi 2=31.771$ p=0.001***
	3	10	33.3%	11	36.7%	
	4	20	66.7%	2	6.7%	

* significant at P≤0.05 ** highly significant at P≤0.01 *** very high significant at P≤0.001.

Table 14 shows in the pre-assessment there is no significant difference between Experimental and Control group, but on 5 th day, 10th day and 15th day there is a statistically significant difference between Experimental and Control group. The comparison of peripheral tissue edema of the wound by assessing the pitting edema around the wound, in Experimental group is 66.7 % (20) and in Control group 6.7 % (2). Statistical significance was calculated using chi square test.

Table 15: COMPARISON OF PERIPHERAL TISSUE INDURATION OF THE WOUND

DAY SCORE		GROUP				CHI SQUARE TEST
		EXPERIMENTAL		CONTROL		
		N	%	N	%	
Day1	1			1	3.3%	$\chi 2=2.09$ p=0.54
	2	21	70.0%	22	73.3%	
	3	8	26.7%	7	23.3%	
	4	1	3.3%			
Day5	2	8	26.7%	19	63.3%	
	3	17	56.7%	10	33.3%	$\chi 2=8.96$ p=0.01**
	4	5	16.7%	1	3.3%	
Day10	2			17	56.7%	
	3	21	70.0%	12	40.0%	$\chi 2=25.85$ p=0.001***
	4	9	30.0%	1	3.3%	
Day15	2			16	53.3%	
	3	12	40.0%	13	43.3%	$\chi 2=31.25$ p=0.001***
	4	18	60.0%	1	3.3%	

* significant at P≤0.05 ** highly significant at P≤0.01 *** very high significant at P≤0.001

Table 15 shows in the pre-assessment there is no significant difference between Experimental and Control group, but on 5 th day, 10th day and 15th day there is a statistically significant difference between Experimental and Control group. The comparison of peripheral tissue induration of the wound by assessing the induration around the wound, in Experimental group is 60.0 % (18) and in Control group 3.3 % (1). Statistical significance was calculated using chi square test.

Table 16: COMPARISON OF GRANULATION TISSUE OF THE WOUND

DAY SCORE		GROUP				CHI SQUARE TEST
		EXPERIMENTAL		CONTROL		
		N	%	N	%	
Day1	1	6	20.0%	4	13.3%	$\chi 2=2.01$ p=0.36
	2	18	60.0%	23	76.7%	
	3	6	20.0%	3	10.0%	
Day5	1			1	3.3%	
	2	13	43.3%	22	73.3%	$\chi 2=8.22$ p=0.04*
	3	15	50.0%	7	23.3%	
	4	2	6.7%			
Day10	1			1	3.3%	$\chi 2=20.11$ p=0.001***
	2	4	13.3%	19	63.3%	
	3	20	66.7%	10	33.3%	
	4	6	20.0%			
Day15	1			1	3.3%	$\chi 2=21.47$ p=0.001***
	2	1	3.3%	14	46.7%	
	3	15	50.0%	13	43.3%	
	4	13	43.3%	2	6.7%	
	5	1	3.3%			

* significant at $P \leq 0.05$ ** highly significant at $P \leq 0.01$ *** very high significant at $P \leq 0.001$

Table 16 shows in the pre-assessment there is no significant difference between Experimental and Control group, but on 5 th day, 10th day and 15th day there is a statistically significant difference between Experimental and Control group. The comparison of granulation tissue of the wound by assessing intact of the skin around the wound, in Experimental group is 43.3 % (13) and in Control group 6.7 % (2). Statistical significance was calculated using chi square test.

Table 17: COMPARISON OF EPITHELIALISATION OF THE WOUND

DAY SCORE		GROUP				CHI SQUARE TEST
		EXPERIMENTAL		CONTROL		
		N	%	N	%	
Day1	1	2	6.7%	6	20.0%	
	2	21	70.0%	19	63.3%	$\chi 2=3.19$ p=0.36
	3	6	20.0%	5	16.7%	
	4	1	3.3%			
Day5	1			4	13.3%	
	2	8	26.7%	15	50.0%	$\chi 2=9.91$ p=0.01**
	3	19	63.3%	9	30.0%	
	4	3	10.0%	2	6.7%	
Day10	1			2	6.7%	
	2	2	6.7%	16	53.3%	$\chi 2=19.82$ p=0.001***
	3	20	66.7%	10	33.3%	
	4	8	26.7%	2	6.7%	
Day15	1			1	3.3%	$\chi 2=19.91.01$ p=0.001***
	2	1	3.3%	15	50.0%	
	3	17	56.7%	11	36.7%	
	4	12	40.0%	3	10.0%	

* significant at P≤0.05 ** highly significant at P≤0.01 *** very high significant at P≤0.001.

Table 17 shows in the pre-assessment there is no significant difference between Experimental and Control group, but on 5 th day, 10th day and 15th day there is a statistically significant difference between Experimental and Control group. The comparison of epithelialisation of the wound by assessing the wound bed coverage by epithelialisation, in Experimental group is 56.7 % (17) and in Control group 36.7 % (11). Statistical significance was calculated using chi square test.

SECTION – VI : DATA ON POST TEST ASSESSMENT OF THE LOWER EXTREMITY PERFUSION AMONG DIABETES MELLITUS PATIENTS IN EXPERIMENTAL AND CONTROL GROUP

Table 18 : POST-ASSESSMENT OF THE LOWER EXTREMITY PERFUSION AMONG DIABETES MELLITUS PATIENT IN EXPERIMENTAL AND CONTROL GROUP

POST ASSESSMENT SCORE	GROUP				CHI SQUARE TEST
	EXPERIMENTAL		CONTROL		
	N	%	N	%	
Very good	11	36.7%	0	0.0%	$\chi 2=34.96$ p=0.001***
Good	17	56.7%	6	20.0%	
Moderate	2	6.7%	21	70.0%	
Mild	0	0.0%	3	10.0%	
Poor	0	0.0%	0	0.0%	

* significant at P≤0.05 ** highly significant at P≤0.01 *** very high significant at P≤0.001.

Table 18 shows the post- assessment of the lower extremity perfusion among diabetes mellitus patient in Experimental and Control group. All the patients are having good or moderate level in the pos assessment. In Experimental group 56.7 % (17) of them are having good lower extremity perfusion. In Control group 20.0 % (6) of them are having good lower extremity perfusion. Statistically there is significant difference between Experimental and Control group. Statistical significance was calculated using chi square test.

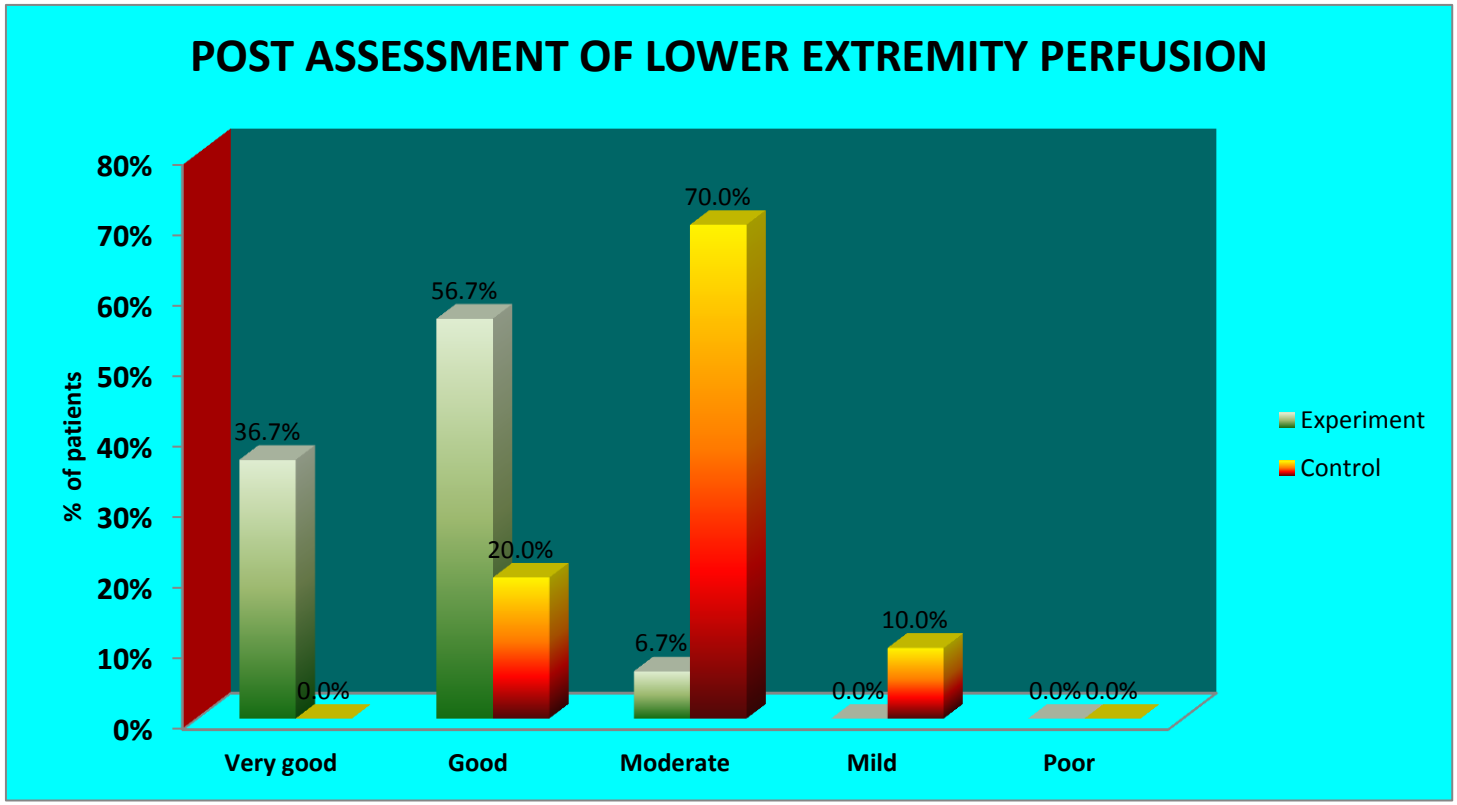


Fig – 14 Post - assessment of lower extremity perfusion in Experimental and Control group

Table 19: EFFECTIVENESS OF BUERGER - ALLEN EXERCISE ON WOUND HEALING PROCESS AMONG THE DIABETIC FOOT ULCER PATIENTS

GROUP	MAX SCORE	PRE ASSESSMENT	POST ASSESSMENT	MEAN DIFFERENCE WITH 95% CI	PERCENTAGE DIFFERENCE WITH 95% CI
Experimental	60	29.27	44.07	14.8(13.1-16.5)	↑**24.6% (21.8%-27.5%)**
Control	60	28.90	32.07	3.2(2.2-4.2)	↑**5.3% (3.7%-7.1%)**

Table 9 shows the effectiveness of Buger Allen exercise : On an average, in Experimental group, subjects are showing enhanced wound healing in **24.6 %** where as in Control group, it is only **5.3 %.** It shows the effectiveness of study. Differences between pre assessment and post assessment score was analysed using Mean difference with 95% CI and proportion with 95% CI and mean difference with 95% CI. **24.6% is the net benefit of** this study.

SECTION - VII : DATA ON ASSOCIATION BETWEEN WOUND HEALING PROCESS AND BUGER ALLEN EXERCISE WITH SELECTED DEMOGRAPHIC VARIABLES AND MEDICAL RELATED INFORMATION AMONG EXPERIMENTAL GROUP

Table 20: ASSOCIATION BETWEEN LEVEL OF WOUND HEALING PROCESS AND SUBJECTS DEMOGRAPHIC VARIABLES

DEMOGRAPHIC VARIABLES		LEVEL OF WOUND HEALING SCORE				CHI SQUARE TEST
		BELOW AVERAGE (<14.8)		ABOVE AVERAGE (>14.8)		
		N	%	N	%	
Age	30 -40 yrs	5	50.0%	5	50.0%	
	40 -50 yrs	6	42.9%	8	57.1%	
	50 -60 yrs	9	45.0%	11	55.0%	$\chi 2=1.48$ p=0.68
	>60 yrs	10	62.5%	6	37.5%	
Sex	Male	9	39.1%	14	60.9%	$\chi 2=1.76$ p=0.18
	Female	21	56.8%	16	43.2%	
Marital status	Married	22	44.0%	28	56.0%	**$\chi 2=4.32$ p=0.04***
	Widowed	8	80.0%	2	20.0%	
Religion	Hindu	26	53.1%	23	46.9%	$\chi 2=1.19$ p=0.55
	Muslim	1	50.0%	1	50.0%	
	Christian	3	33.3%	6	66.7%	
Type of family	Nuclear family	12	35.3%	22	64.7%	**$\chi 2=6.78$ p=0.01****
	Joint family	18	69.2%	8	30.8%	
Educational status	Illiterate	5	55.6%	4	44.4%	
	Primary	15	44.1%	19	55.9%	$\chi 2=1.27$ p=0.73
	Higher secondary	8	61.5%	5	38.5%	
	Graduate and above	2	50.0%	2	50.0%	

Occupation	Government	1	33.3%	2	66.7%	
	Private	11	39.3%	17	60.7%	$\chi 2=3.63$ p=0.30
	Pensioner	5	71.4%	2	28.6%	
	Unemployed	13	59.1%	9	40.9%	
Income	< Rs.1000	20	58.8%	14	41.2%	$\chi 2=6.48$ p=0.09
	Rs.1000 - 2000	6	42.9%	8	57.1%	
	Rs.2000 - 5000	4	57.1%	3	42.9%	
	>Rs.5000			5	100.0%	
Area of residence	Rural	19	61.3%	12	38.7%	**$\chi 2=3.27$ p=0.05***
	Urban	11	37.9%	18	62.1%	
Dietary pattern	Vegetarian	9	69.2%	4	30.8%	$\chi 2=4.06$ p=0.13
	Non-vegetarian	3	75.0%	1	25.0%	
	Mixed	18	41.9%	25	58.1%	

Table no 20 shows the association between level of wound healing gain score and their demographic variables in Experimental group. Married, Nuclear family, Urban patients healed more than others. Statistical significance was calculated using chi square test.

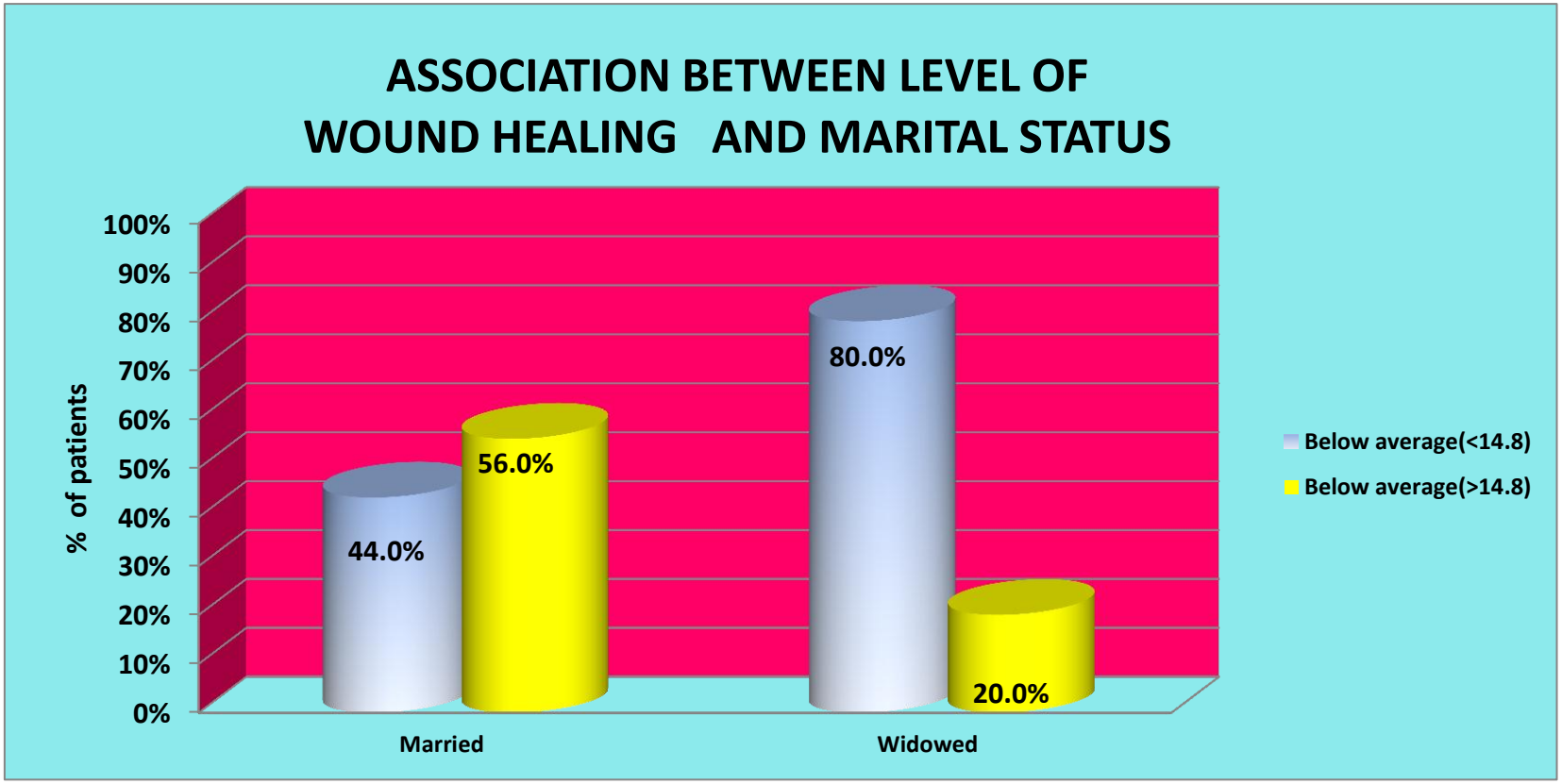


Fig - 15 Association between level of wound healing and marital status (Experimental group)

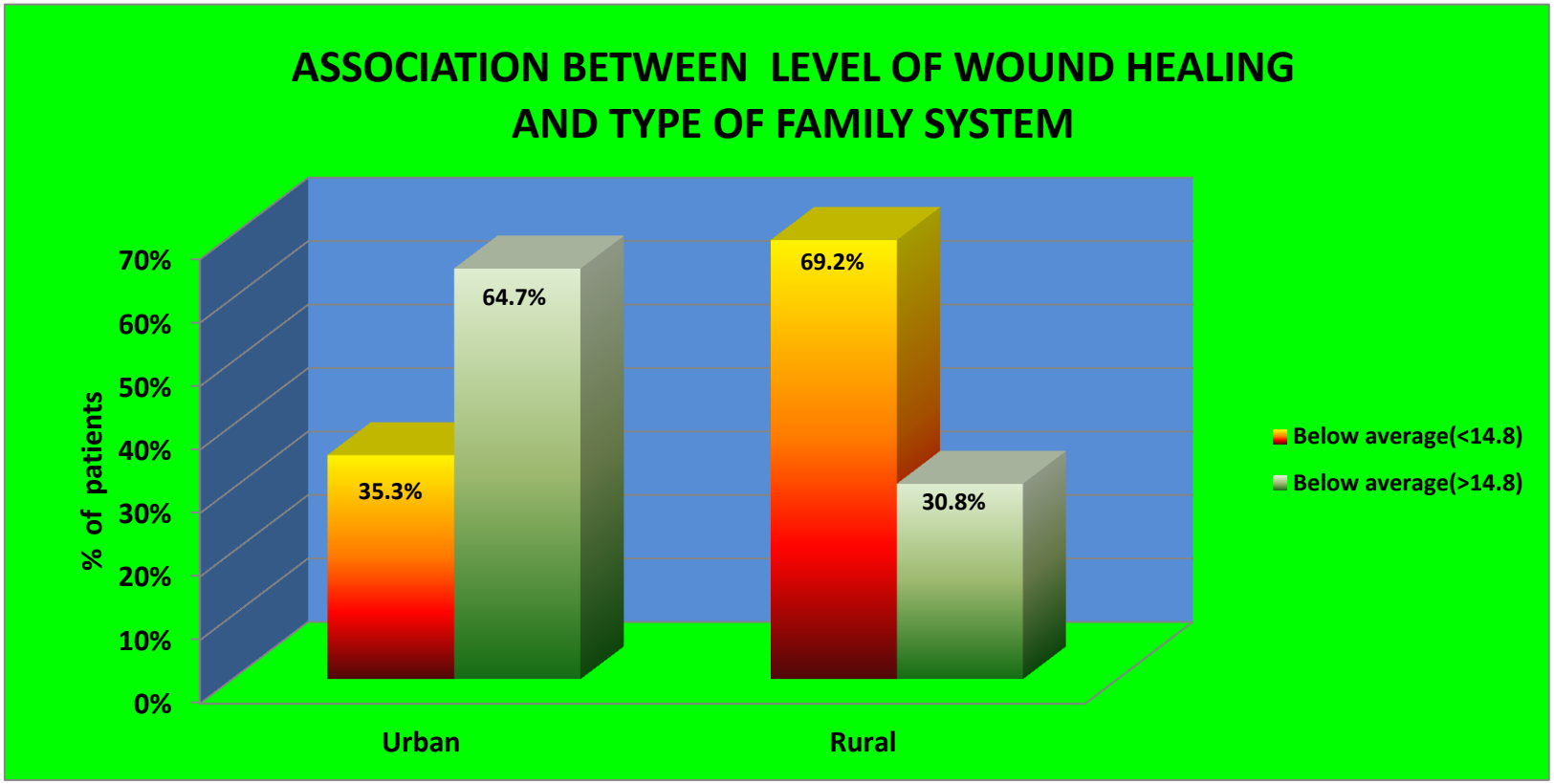


Fig - 16 Association between level of wound healing and Type of family system (Experimental group)

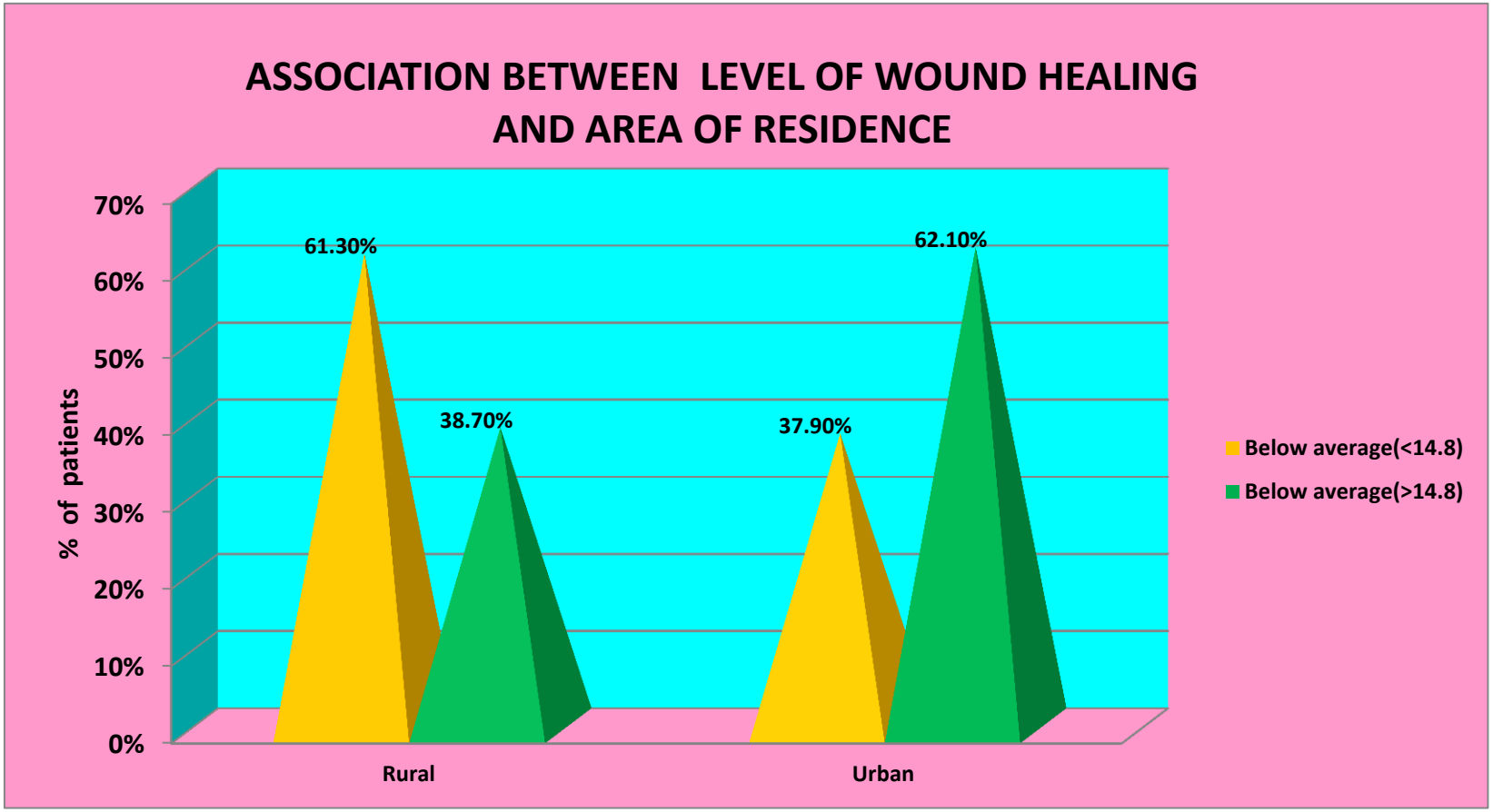


Fig - 17 Association between level of wound healing and area of residence (Experimental group)

Table 21: ASSOCIATION BETWEEN LEVEL OF WOUND HEALING PROCESS AND MEDICAL RELATED INFORMATION

MEDICAL RELATED INFORMATION		LEVEL OF WOUND HEALING SCORE				CHI SQUARE TEST
		BELOW AVERAGE (<14.8)		ABOVE AVERAGE (>14.8)		
		N	%	N	%	
Type of diet	Carbohydrate rich diet	5	50.0%	5	50.0%	$\chi2=0.53$ p=0.91
	Cholesterol rich diet	1	33.3%	2	66.7%	
	Protein rich diet	1	33.3%	2	66.7%	
	Mixed diet	8	57.1%	6	42.9%	
History of chronic illness	Yes	4	66.7%	2	33.3%	$\chi2=0.03$ p=0.85
	No	11	45.8%	13	54.2%	
Duration of illness	1- 2 year	3	100.0%	0	0.0%	**$\chi2=9.64$p=0.02 ***
	2- 5 year	1	11.1%	8	88.9%	
	5- 10 year	4	44.4%	5	55.6%	
	> 10 year	7	77.8%	2	22.2%	
Duration of consuming diabetic medication	1- 2 year	4	57.1%	3	42.9%	$\chi2=3.59$ p=0.31
	2- 5 year	4	28.6%	10	71.4%	
	5- 10 year	2	66.7%	1	33.3%	
	> 10 year	5	83.3%	1	16.7%	
Type of diabetic medication	oral hypoglycemic agent	9	47.4%	10	52.6%	$\chi2=0.43$ p=0.51
	Insulin and oral hypoglycemic agent	6	54.5%	5	45.5%	
History of smoking	Yes	7	87.5%	1	12.5%	**$\chi2=6.14$p=0.01 ****
	No	8	36.3%	14	63.7%	

No. of years of smoking	5-10 years	1	100.0%			$\chi 2=2.89$ p=0.24
	10-20 years	2	40.0%	3	60.0%	
	>20 years	1	50.0%	1	50.0%	
No. of cigarettes per day	1 -2	1	100.0%			
	3 -5	1	20.0%	4	80.0%	$\chi 2=4.58$ p=0.20
	6 -8	1	100.0%			
	>8	1	100.0%			
History of consuming alcohol	Yes	3	75.0%	1	25.0%	$\chi 2=0.02$p=0.98
	No	12	46.2%	14	53.8%	
No. of years of consuming alcohol	5-10 years	2	100.0%			$\chi 2=4.00$ p=0.13
	10-20 years					
	>20 years	1	100.0%	1	100.0%	
Duration of consuming alcohol per week	Once	1	100.0%			$\chi 2=2.00$ p=0.36
	2 -3 times	1	100.0%			
	4 -5 times	1	50.0%	1	50.0%	
Amount of consuming alcohol per day	90 ml			1	100.0%	$\chi 2=1.33$ p=0.25
	180 ml	3	100.0%			

Table no 21 shows the association between level of wound healing gain score and their medical related information. Less duration of illness and non smoker patients healed more than others. Statistical significance was calculated using chi square test.

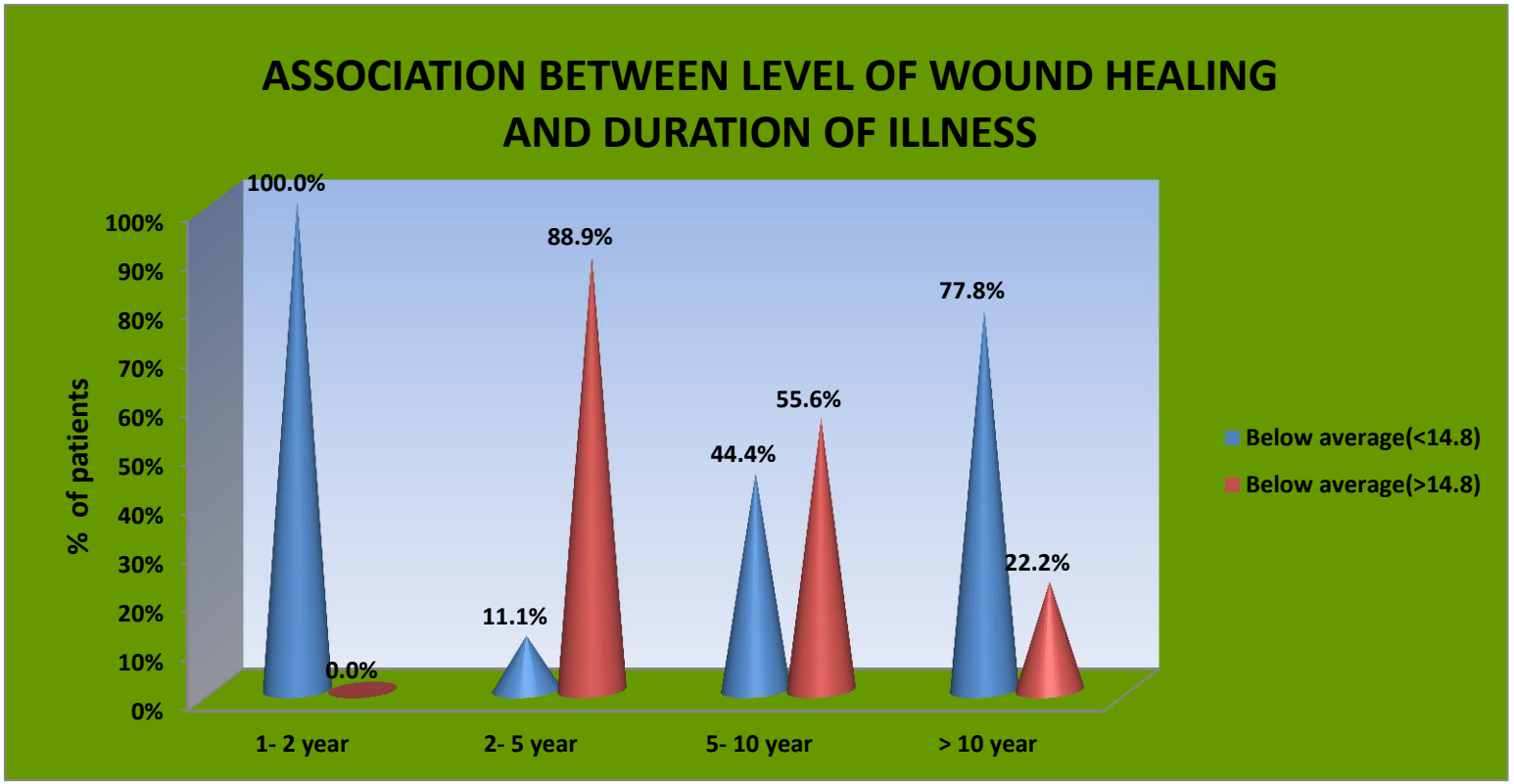


Fig – 18 Association between level of wound healing and duration of illness

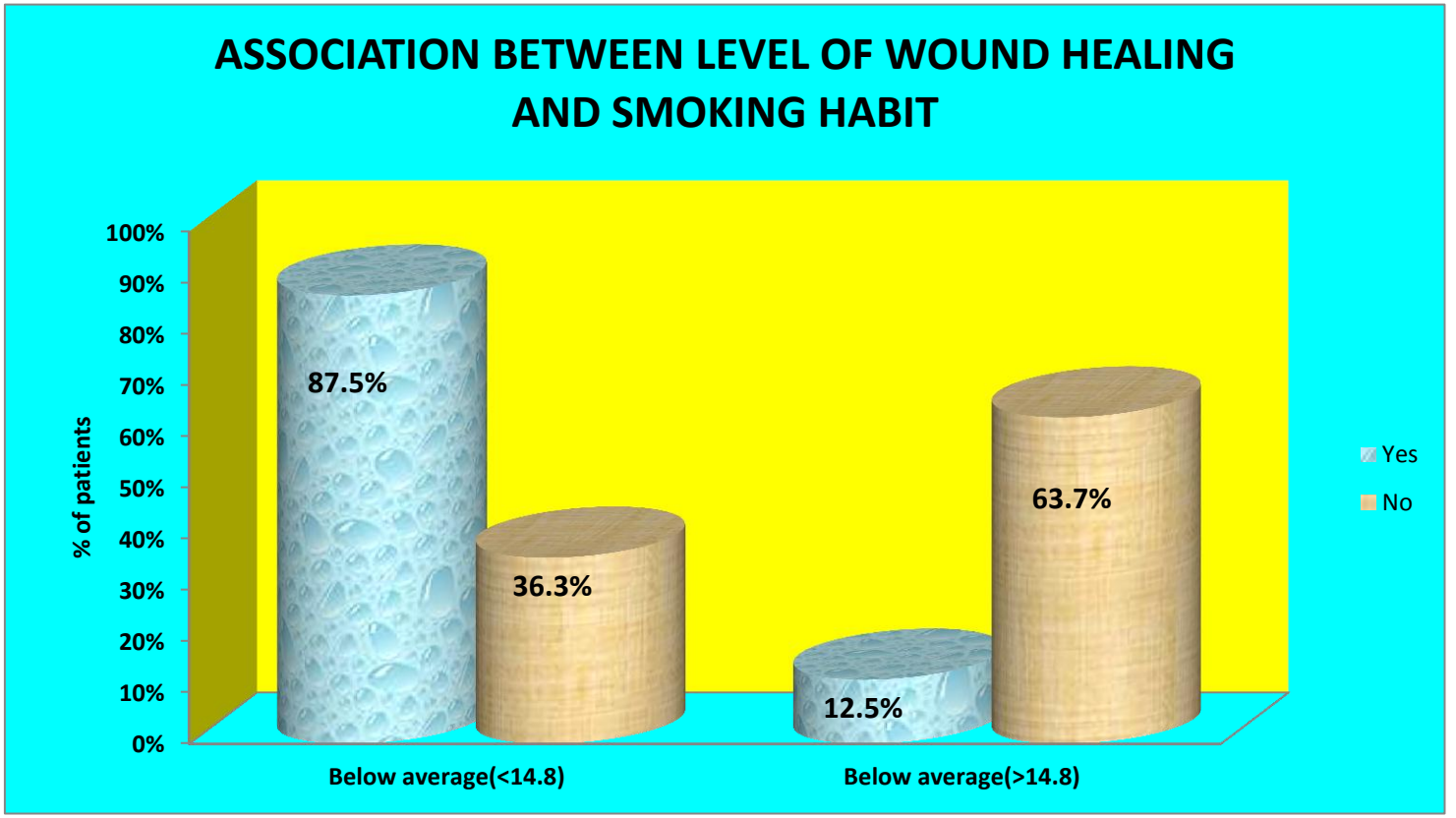


Fig - 19 Association between level of wound healing and smoking habit

CHAPTER V

DISCUSSION

"**Discussion is an exchange of knowledge; an argument is an exchange of ignorance.**"

- **Robert Quillen**

This chapter deals with the detailed discussion on the findings of the study obtained from the statistical analysis. The purpose of the study was to assess the effectiveness of Buerger Allen exercise on wound healing process among the diabetic foot ulcer patients admitted in Diabetology department at Rajiv Gandhi Government General Hospital, Chennai – 03.

Wagner Wound Assessment Scale was used to select the subjects. Totally 60 subjects with type2 diabetes mellitus with foot ulcer were selected and 30 subjects were included for each group of Experimental and Control on the basis of inclusion criteria.

Semi structured interview / observation schedule was used to gather information from the subjects of both groups. Buerger Allen exercise was performed for the Experimental group, and routine medical management was carried out for the Control group. The pre and the post assessment of diabetic foot ulcer were done for both the group by using the wound assessment checklist.

The findings of the study will be discussed based on the objectives.

The objectives of the study were,

1. To assess the lower extremity perfusion among diabetes mellitus subjects in Experimental and Control group.
2. To evaluate the effectiveness of Buerger Allen exercise on wound healing process among the Experimental group.
3. To compare the wound healing process between the Experimental and Control group.
4. To find out the association between wound healing process and Buerger Allen exercise with selected demographic variables among Experimental group.

Characteristics of the demographic variables

The characteristics of the demographic variables are described in the forms of frequency and percentage distribution.

In considering the age wise distribution, 36.7 % of subjects were in 50 to 60 years of age, in the Experimental group. In the Control group 33.3 % of subjects were more than 60 years of age.

In the sex wise distribution, females were high in both Experimental and Control group as 80.0% and 83.3%.

Above 80 % of subjects are married in both the Experimental and Control group.

In religion majority of them are Hindus in both the groups as 76.7 % in Experimental group and 86.7 % in Control group.

When considering the type of family most of them belong to nuclear family in both the groups.

In both the groups when considering the education status most of the subjects had only primary education.

In considering the Occupation most of them are unemployed as 46.7% in Experimental group and 56.7 % in Control group.

In considering the Monthly income, majority of them are has salary less than Rs 1000, in both the groups.

When considering the Diet pattern majority are consuming mixed diet in both the groups.

When considering the area of residence in both the group they are residing in both urban and rural area almost equal.

Characteristics of the medical related information

The characteristics of the medical related information are described in the forms of frequency and percentage distribution.

In considering the history of chronic illness majority of subjects were not having any history of chronic illness, in the Experimental group 80.0 % and in the Control group 70.0 %. Majority of subjects with chronic illness was suffering with Hypertension in Experimental 83.3 % and Control group 87.5%. Subjects constituting history of consuming medications for chronic illness is, in Experimental group 96.7% in Control group 93.3 %.

Regarding duration of illness, mostly subjects in both the groups are having the duration of more than 10 years. Regarding duration of consuming diabetic medications in Experimental group 46.7 % were consuming medications for 2 – 5 years and in Control group, 36.7 % were consuming medications for 1 – 2 years. Regarding type of diabetic medication, majority of the subjects in both the groups are taking consuming Oral Hypoglycemic agent.

Regarding history of smoking majority of the subjects was not having history of smoking in Experimental group 73.3 % and in Control group 66.7 %. Regarding number of years of smoking, majority of the subjects in Experimental group 62.5 % were smoking for 12 - 20 years and in Control

group, 50.0 % were smoking for >20 years. Considering number of cigarettes smoked per day, majority of subjects were smoking 3 – 5 cigarettes per day in both the groups.

Regarding history of consuming alcohol majority of the subjects having no history of consuming alcohol, in Experimental group 86.7 % and in Control group 76.7 % . Regarding number of years of consuming alcohol, majority of the subjects consuming alcohol for 5 – 10 years, in both the groups. Considering duration of consuming alcohol per week in Experimental group 50.0 % were consuming alcohol for 4 – 5 times and in Control group, 57.1 % were consuming alcohol for 2 – 3 times. Regarding amount of consuming alcohol per day in both the group is 180 ml.

FINDINGS BASED ON THE OBJECTIVES

The first objective of the study was to assess the lower extremity perfusion among diabetes mellitus patient in Experimental and Control group.

Table 3- represents pre-assessment of the lower extremity perfusion among Experimental and Control group. In experiment group 60.0 % (18) of them having mild perfusion and 40.0 % (12) of them are having moderate perfusion. In Control group 66.7% (20) of them having mild perfusion and 33.3 % (10) of them are having moderate perfusion. No diabetic subjects are in good, very good or poor lower extremity perfusion in both Experimental and Control group. It is not statistically significant. Statistical calculation was shows that the diabetic subject has mostly the mild to moderate level of perfusion. Table 18 – shows the post assessment of lower extremity perfusion, in Experimental group it is 6.7 % (2) of them are showing moderate level of perfusion, 56.7 % (17) of them are showing good perfusion level and 36.7 % (11) of them are showing very good perfusion level and no diabetic subjects

have shown mild or moderate level of perfusion. In Control group, 10.0 % (3) are showing mild perfusion level, 70.0 % (21) are showing moderate level of perfusion and 20.0% (6), are showing good perfusion level and no diabetic subjects have shown the very good perfusion level. It is statistically significant.

The study findings conducted by Edward. B. Jude Samson, et.al (2001) was consistent with my study stating that the distribution of the PVD in diabetics and non – diabetic patients have more worsened peripheral vascular diseases and are at high risk lower extremity amputation. These findings are consistent with the study findings done by **Osmundson (1990),** to assess the level of diminished or absence of dorsalis pedis artery pulse among the diabetic patients reveals that the prevalence of vascular disease is frequently more in diabetic patients than with non diabetic.

Thus the hypothesis H-1 which states that there will be a significant difference between the pre and post assessment interventional score regarding the lower extremity perfusion among diabetes mellitus subjects in both Experimental and Control group was rejected.

The second objective was to evaluate the effectiveness of Buerger- Allen exercise on wound healing process among the Experimental group.

Table 4- shows the post-assessment of wound healing process in Experimental group 70.0 % (21) of them having good perfusion level and 20.0 % (6) of them are having moderate level of perfusion and 10.0 % (3) of them are having very good perfusion level. No diabetic subjects are in mild level of perfusion after performing Buerger Allen exercise. In Control group 6.7% (2) of them having good perfusion level, 56.7 % (17) of them having moderate level of perfusion and 36.7 % (11) of them having mile level of perfusion. No diabetic subjects have very good perfusion level. So there is statistically significant difference between the Experimental and Control group.

Table 19 - shows the post-assessment effectiveness of Buerger Allen exercise on wound healing process among diabetic foot ulcer subjects mean difference score in Experimental group is 14.8 and in Control group it is 3.2. In considering the percentage difference with 95% CI it is 24.6 % in Experimental group and it is 5.3 % in Control group. So there is statistically significant difference between the Experimental and Control group, this is statistically significant.

The study findings conducted **by Felix W. Tasi, et. al (1999),** conducted a study on skin perfusion pressure of the foot reveals that there is a significant variation with toe pressure between diabetic and non diabetic patients. My study findings goes parallel with the study conducted by **Williams, et.al (2007)** to find out the effectiveness of the Buerger Allen exercise among PVD subjects was consistent with my study by showing that increased subcutaneous blood flow during the patient doing the exercise and improves the lower extremity circulation.

Thus the hypothesis H - 2 which states that there will be a significant difference between the pre assessment and post assessment interventional scores regarding the lower extremity perfusion among diabetic patient of Experimental group on administering Buerger Allen exercise was accepted.

The third objective was to compare the wound healing process between the Experimental and Control group.

Table 5 to 18 shows the status of the wound healing process between the Experimental and Control group.

Pre and post-assessment of wound in Experimental group

In pre-assessment while comparing the size of the wound on day 1, 76.7 % (23) of them shown the wound size of Length X Width < 4 – 16 sq cm

but on day 15 it came down to 30.0 % (9), and 70.0 % (21) are showing the wound size of Length X Width < 4 sq cm. In comparison of depth of wound, on day 1, 60.0 % (18) are shown superficial, abrasion and shallow blisters, but on day 15 it came down to 26.7 % (8), and 73.3 % (22) are shown no break in the skin. During comparison of edges, on day 1, hyperkeratosis, callous formation was seen in 56.7 % (17) and on day 15 it came down to 6.7 % (2). On comparison of undermining, 60.0 % (18) shown > 4 cm on day 1, on day 15 it came down to 16.7 % (5). While comparing the necrotic tissue type on day 1 it was 53.3 % (16) shown adherent, hard and black eschar and on day 15, only 6.7 % (2), shown the same. While comparing necrotic tissue amount, on day 1, 53.3 % (16) shown > 50 % and < 75 % of wound coverage and on day 15, 63.3 % (19), shown < 25 % wound bed coverage. While comparing the exudates type on day 1 nearly 70.0 % (21) shown serous, thin, watery or clear exudates and on day 15, 60.0 % (18) shown none of the exudates. While comparing the exudates amount on day 1 nearly 40.0 % (12) of them shown moderate exudates amount and on day 15, nearly 43.3 % (13) of them are showing scanty exudates. During comparing the skin colour on day 1, 13.3 % (4) are shown white or gray or hypopigmented skin colour but on day 15, 56.7% (17) shown the same. While considering the peripheral tissue edema, 10.0 % (3), of them shown non pitting edema extends < 4 cm around wound, but on day 15, 66.7 % (20) are shown the same. While comparing peripheral tissue induration, 70.0 % (21) of them shown 2 – 4 cm extending > 50 % around the wound on day 1, but on day 15, 60.0 % (18) of them shown induration < 2 cm around the wound. While comparing granulation tissue 60.0 % (18) are shown pink or dusky red fills < 25 % of wound but on day 15, only 3.3 % (1) has shown the same. While comparing the epithelialisation on day 1, 70.0 % (21) of them shown 25 % to 50 % of wound coverage, but on day 15, 40.0 (12) % of them shown 75 % to 100 % of wound coverage.

Pre and post assessment of wound in Control group

In pre-assessment while comparing the size of the wound on day 1, 73.3 % (22) of them shown the wound size of Length X Width < 4 – 16 sq cm but on day 15 it is been increased to 76.7 % (23), and 6.7 % (2) are showing the wound size of Length X Width < 4 sq cm. In comparison of depth of wound, on day 1, 73.3 % (22) are shown superficial, abrasion and shallow blisters, but on day 15 it is been raised to 73.3 % (22), and 13.3 % (4) are shown no break in the skin. During comparison of edges, on day 1 hyperkeratosis, callous formation was seen in 40.0 % (12) and on day 15 it was 46.7 % (14). On comparison of undermining, 46.7 % (14) shown > 4 cm on day 1, on day 15 it was 36.7 % (11). While comparing the necrotic tissue type on day 1, it was 73.3 % (22) shown adherent, hard and black eschar and on day 15, it was 43.3 % (13), shown the same. While comparing necrotic tissue amount, on day 1, 63.3 % (19) shown > 50 % and < 75 % of wound coverage and on day 15, 36.7 % (11), shown the same. While comparing the exudates type on day 1 nearly 70.0 % (21) shown serous, thin, watery or clear exudates and on day 15, 50.0 % (15) shown none of the exudates. While comparing the exudates amount on day 1 nearly 43.3 % (13) of them shown moderate exudates amount and on day 15, only 6.7 % (2) of them are showing scanty exudates. During comparing the skin colour on day 1, 3.3 % (1) are shown white or gray or hypopigmented skin colour but on day 15, 13.3% (4) shown the same. While considering the peripheral tissue edema, 13.3 % (4), of them shown non pitting edema extends > 4 cm around wound, but on day 15, 36.7 % (11) are shown the same. While comparing peripheral tissue induration, 73.3 % (22) of them shown 2 – 4 cm extending > 50 % around the wound on day 1, but on day 15, 3.3 % (1) of them shown induration < 2 cm around the wound. While comparing granulation tissue 76.7 % (23) are shown pink or dusky red fills < 25 % of wound but on day 15 only 46.7 % (14) has shown the same. While comparing the epithelialisation on day 1, 63.3 % (19) of them shown 25 % to 50 % of wound coverage, but on day 15, 10.0 (3) % of them shown 75 % to 100 % of wound coverage.

On an average, in Experimental group, diabetic subjects are **having 24.6 % improved wound healing** where as in Control group, on an average, diabetic subjects were having only **5.3 % wound healing.** It shows the **effectiveness** of the study.

This study findings goes consistent with the study done by **L.Ted Frigrurd Dynamic (2005)** regarding conservative approach to the management of lower extrtemity, described that Buerger Allen exercise helps to improve lower extrtemity blood circulation. It is consistent with the study done by **Adam. J, et.al, (1998),** it proves that exercise results in improvement in patient with type2 DM.

Thus the hypothesis H - 3 which states that there will be a significant difference between pre and post interventional score on Buerger Allen exercise on improving lower extremity perfusion among Experimental and Control group was accepted.

The fourth objective was to find out the association between wound healing process and Buerger - Allen exercise with selected demographic variables among Experimental group.

Table 20 - represents the association between level of wound healing gain score and their demographic variables in Experimental group. **Married, Nuclear family, Urban subjects** healed more than others. Statistical significance was calculated using chi square test.

On an average, in Experimental group, 56.0 % of married and belongs to nuclear family 64.7 % and living in urban area 62.1 % has shown association between wound healing gain score with their demographic variables.

On an average, in Experimental group, 88.9 % of subjects having history of chronic illness for a period of 2 – 5 years, 63.7 % of subjects with no history of

smoking has shown association between wound healing gain score with their medical related information.

A community study conducted by **Shen. Q. Jia, et.al, (2004),** to determine the prevalence of PVD among diabetic patients reveals that the demographic variables has the independent effect on the prevalence of PVD. Like associating the life style intervention in diabetic subjects a study was conducted by **Gianna M. Rodrighuer, et.al, (2008),** in community basis.

Thus the hypothesis H - 4 states that there will be significant association between interventional scores with selected demographic variables was accepted.

CHAPTER VI

SUMMARY, IMPLICATIONS AND CONCLUSION

"In literature and in life we ultimately pursue, not conclusions, but beginnings."

– Sam Tanenhaus

This chapter deals with the summary of the study and the conclusions drawn. It clarifies the limitations of the study. The implications and recommendations are given for different areas of Nursing such as practice, education, research and administration in the Health care delivery system.

6.1 SUMMARY OF THE STUDY

Hence, this study was undertaken to determine the effectiveness of performing Buerger Allen exercise to promote wound healing process among the type2 diabetic patients with foot ulcer at the Diabetology Department, Rajiv Gandhi Government General Hospital, Chennai -03.

Extensive literature review and studies related to supervised exercise programme to improve of lower extremity perfusion among diabetic patients provided evidence based guidance for the study. This has helped to design the methodology, develop the tool for data collection and the protocol for performing Buerger Allen exercise. The conceptual framework developed for the study was based on the Modified Orem's theory of self-care deficit.

The tool used for data collection was validated by the experts from the area of Medical and Nursing. Reliability of the tool was assessed by using

inter rater reliability correlation coefficient. The instrument was found to be reliable. Pilot study was conducted on six samples to find out the appropriateness and feasibility of conducting the study and it was found feasible.

Formal permission was obtained from the Head of the Diabetology Department. The data collection was done in the Diabetology wards at Rajiv Gandhi Government General Hospital, Chennai- 03.

The researcher adopted the Quasi-Experimental pre-test and post-test control design. Non probability purposive sampling technique was used to select 60 samples based on the inclusion criteria.

Pre-assessment of the wound was done by using Wagner Wound Assessment Scale and the characteristics of the foot ulcer was pre-assessed with help of wound assessment check list in both Experimental and Control group on the first day. The intervention Buerger Allen exercise was performed to Experimental group 10 to 15 minutes for 3 to 5 times in a day for fifteen consecutive days. Control group received their routine treatment. The wound assessment was done on every fifth day during the intervention period.

Post- assessment of the wound of the foot ulcer was done with the same check list on the fifteenth day. The evidence of intervention and wound healing were marked. Intervention was done at the bedside.

Descriptive (percentage distribution, mean, standard deviation) and inferential statistics (t- test, chi square test) were used to analyze the data and to assess the hypothesis. The data were then interpreted and discussed based on the objectives of the study, hypotheses and relevant studies from literature reviewed.

6.2 MAJOR FINDINGS OF THE STUDY

- In this study majority of the samples were in the age group of 50 - 60 years are 36.7 % (11).
- Regarding sex majority of the samples were female 66.7 % (20).
- Married people were 86.7% (26).
- Samples constituting were mainly Hindus 76.7 % (23).
- Regarding Type of family, majority of them 60.0 % (18) belongs to Nuclear family.
- Regarding Education, majority was educated up to primary education 50.0 % (15).
- Majority of them were unemployed 46.7 % (14).
- Regarding Monthly income 66.7 % (20) were getting less than Rs 1000 per month.
- Majority of the samples were residing in rural area 53.3 % (16).
- Majority of the samples were consuming mixed diet 66.7 % (20).
- Regarding Area of residence, majority of the samples were residing in the rural area 53.3% (16).
- In considering the history of chronic illness majority of samples were not having any history of chronic illness 80.0 % (24).
- Majority of samples with chronic illness was suffering with Hypertension 83.3 % (5).
- Regarding duration of illness, most of the samples are having more than 10 years 30.0 % (9).
- Regarding duration of consuming diabetic medications is 46.7 % (14) were consuming medications for 2 – 5 years.
- Regarding type of diabetic medication, majority of the samples 63.3% (19) were consuming Oral Hypoglycemic agent.
- Regarding history of smoking majority 73.3 % (22) of the samples having history of smoking.
- Regarding number of years of smoking, majority of the samples 62.5 % (5) were smoking for 12 - 20 years.

- Regarding history of consuming alcohol majority of the samples having no history of consuming alcohol 86.7 % (26).
- In this study pre assessment showed the result of most of the patients having mild or moderate level of lower extremity perfusion 60.0 % (18).
- Post assessment showed the result of most of the patients 56.7 % (17) were had the moderate to good lower extremity perfusion.
- Comparison of the pre assessment and post wound assessment score showed the result of statistically significant of intervention.
- On an average, in Experimental group, patients **56.7 % (17)** of them having good lower extremity perfusion. Where as in Control group patients **20.0 % (6)** having good lower extremity perfusion. Statistically there is significant difference between experiment and Control group. **It shows the effectiveness of study.**
- On an average, the effectiveness of Buerger Allen exercise in Experimental group patients are showing better wound healing is **24.6 %** where as in Control group, it is only **5.3 %. It shows the effectiveness of study.**
- Regarding the association between level of wound healing gain score and their demographic variables in Experimental group, **Married, Nuclear family, Urban patients** healed more than others.
- Regarding the association between level of wound healing gain score and their medical related variables, **less duration of illness and non smoker patients healed more than others.**

6.3 NURSING IMPLICATION

The findings of the study have the following implications in nursing,

Implications for Nursing Practice

- Buerger Allen exercise is an effective measure to promote lower extremity perfusion. Nurse should effectively use this measure to promote wound healing process.

- Buerger Allen exercise helps in reducing the need and frequency of administration of antibiotics.

- Buerger Allen exercise promotes sleep, comfort and feeling of wellness.

- Nurses can plan the goal of nursing management and enhance the nurse patient relationship and sense of well being to the patient through the development of mutually agreeable goals.

- It is an effective means of communication which provides physical contact in a very acceptable way within the Indian culture.

- Buerger Allen exercise can be taught to the loved ones who are caring for diabetic patients with foot ulcer.

Implications in Nursing Education

- Complimentary therapies like exercises need to be included in the curriculum and practiced.

- In service education program should be conducted for nursing personnel and help nurses to gain knowledge upon which further researches can be conducted.

Implications in Nursing Administration

- Nursing Administrator should conduct in-service education program for staff nurses about caring patients with Diabetic foot ulcer.
- Nursing administrator should supervise and guide nurses application of dressings and care of foot ulcer.
- Nursing administrator should monitor the standard of practice to promote excellence of caring patients with diabetic foot ulcer.

Implications in Nursing Research

- Nursing researcher should encourage the clinical nurse to apply the research findings in this daily nursing care activity.
- Nursing researcher should motivate the clinical nurse to do further research studies on the effect of Buerger Allen exercise on promoting wound healing process.
- Nursing Researcher should conduct periodic review of research findings and disseminate findings through conference, national and international journals.

6.4. RECOMMENDATIONS

- Randomized Controlled trial can be done.
- Similar study can be conducted for a larger group.
- Effect of Buerger Allen exercise for a prolonged period can be studied
- A comparative study can be conducted to assess the effectiveness of Buerger Allen exercise and combination with other complementary therapies.

6.5 CONCLUSION

The following conclusion was drawn from the above study. The type2 diabetic patient with foot ulcer in the Experimental group had improved lower extremity perfusion and thereby faster wound healing of the foot ulcer. So in addition to the pharmacological treatment Buerger Allen exercise can be used as an effective complimentary treatment modality for managing diabetic foot ulcer. The future of this field of nursing science promised to be one of the rapid significant growths, the results of which will directly influence patient care in the aspect of promoting wound healing as that of "evidence based nursing care".

REFERENCES

BOOKS

1. Altman, et.al, (2000). Fundementals & advanced nursing skill. 1st edition. Canada: Thomson learning publication.
2. Barbara Lauristen Christensen., Elaine kockrow., (1995). Foundations of nursing. 1st edition. Missouri: Mosby.
3. Black M. Joyce., (2005). Medical Surgical Nursing Clinical Management for positive outcomes. Saint Louis: Elsevier.
4. Brunner and Suddarth., (2001). Medical and Surgical Nursing. 8th edition, Philadelphia: J.B. Lippincott.
5. Carol Taylor, et.al., (2008) Fundamentals of Nursing. 1st edition. New Delhi: wolters kluwer.
6. Dr Bernstein., (2007). Diabetes Solution, UK: Sphere; Newly Rev. and Updated edition.
7. Dr. Diana Guthrie., Dr. Richard Guthrie., (2008). Management of Diabetes Mellitus: A Guide to the Pattern Approach. 6th Edition. US: Springer Publishing Company.
8. Gretchen Becker., (2007). Type 2 Diabetes. 2nd edition, UK: Marlowe & Co.
9. Joe's Rough Guide to Diabetes., (2006). A Personal Guide to the Highs and Lows of Blood Sugar. 1st edition. Philadelphia: Gray Brown Publications.
10. Joseph Fraser., (2006). Type2 Diabetes in Children, Adolescents and Young Adults. United Kingdom: Class Publishing - class.co.
11. Julia M.Leaky., practicia E. Kililay., (1998). Fundamentals of Nursing Practice. 1st edition. Pennislavania: W.B.Saunders company.
12. Julia B.G., (2006). Nursing Theories the Base for professional Nursing practice application. Philadelphia: Lange Publication.

13. Helen Harkoreader., Mary Annhogan., Marshelle Thobaben., (2009). Fundamentals of Nursing. 3rd edition. India: Elsevier.
14. Lewis et al., (2007). Text Book of Medical Surgical Nursing, 8th edition. US: Mosby publications.
15. Luckmann's., (1996). Core principles and practice of Medical Surgical Nursing. 1st edition. Philadelphia: W.B. Saunders Company.
16. Lippincott., (1982) Manual of Nursing Practice. 5th edition U.S.A: Lippincott publications.
17. Polit. D.I., Hungler. P., (1999). Principles and Methods of Nursing Research. 6th edition. Philadelphia: Lippincott Company.
18. Potter & Perry., (2005). Fundamentals of Nursing. 6th edition. Missourie: Mosby.
19. Ruth F Crares., Censtance., (2003). Fundementals of Nursing. 4th edition. Philadelpia: J.B.Lippincott Company.
20. Rao., (2004). Methods of Biostatistics. 2nd edition. Hyderabad: Paras Medical Publications.
21. Smeltzer C., Bare G., Hinkel., L & Cheever H. Brunner & Suddardh., (2008). Text book of Medical Surgical Nursing. 11th edition. New Delhi: Wolter Kluwer pvt.Ltd.
22. Williams & Wilkins., (2007). A Fundamental and Clinical Text Book on Diabetes Mellitus - A Guide to Patient Care. Philadelphia: Lippincott.

JOURNAL REFERRENCES

1. Bjerre-Jepsen, I. Faris, O. Henriksen and B. Paaschburg-Nielsen. (2004). European Journal of Nuclear Medicine and Molecular Imaging. Increased subcutaneous blood flow for 24 hours. Dec 11.
2. Boynton PR, Jaworski D & Paustian C. (2003), Diabetes Atlas, Meeting the challenges of healing Executive Summary. Brussels, Belgium: International Diabetes Federation.
3. Edward B jude Samson O, Oyido Nicholas et.al, (2001), Diabetes care, Peripheral arterial disease in diabetic and non diabetic patients - a comparison of severity and complication. Aug vol 24(8), 1443-47.
4. Gianna M. Rodrighuer, Brine. M. Kelly, M Catherine Spires, (2008). Emedicine. Vascular disease and rehabilitation. Dec 18.
5. Kennath, Partrise, William .L. lsely, (2007). Type2 diabetes, Oct 28.
6. Kerry.J. Stewart, D. William. R.Hiatt, (2002). The New England journal of medicine. Exercise training for claudication. Dec12: vol 347:1941-1951.
7. Matvieko QA , Hoehns JD A, (1998). Translation of a research intervention into practice lifestyle intervention study in patient with diabetes or impaired glucose tolerance. Sep-oct; 8(5):509-14.
8. Mohan v, Sandeep, Deepa R: Indian Journal of Medicine, Indian scenario: 2007 125;225-30.
9. Mundet X, Pou A, PiquerN et.al, (2008). Journal of Diabetes, Prevalence and incidence of chronic complications and mortality in a cohort of type 2 diabetic patients in Spain. Sep: 2(3):135-40.
10. Neil j. Snowling, Will G Hopkins, (2006). Effect of different mode of exercise programme on glucose control and risk factors for complication in type2 diabeteic patients, Nov 29.
11. Neburrsfranssem MH, Housen AJ, Tokke JE, (2002). The effect of ployneorpathy on foot microcirculation in type2 diabtes, Aug: 45(8), 116471.

12. G Premletha, S Shanti rani, R. Deepa, (2009). Journal of Diabetes. Diabetes Prevalence and risk factors of peripheral vascular disease in a selected south Indian population study, Oct; 60(5):546-53.

13. Rajabharan Yadav, Permil Tiwari and Ethiraj Dhana raj, (2008). Risk factors and complication of type2 diabetes mellitus: 2008 April –Sep.

14. Saurbh j, sharma P, Maheswari, (2005). Medical journal for armed force, India, Study of Retinopathy and Neuropathic complication in diabetes, Oct - 46(4):243-8.

15. L. Ted Frigrurd, (2005). Journal of Chiropractic medicine, Dynamic Chriopractic media intermittent claudication. Mar 26, vol 23 issue 07.

16. Treesak C, Kasemgup, V. Treat –Jacobson, (1993). Cost effectiveness of exercise training to improve claudication symptoms in patient with peripheral arterial disease, Mar48 (13): 150-56.

17. R. Vincent Dynamic, (1995). Chriopractic media, A conservative approach to the management of diabetic inability. May22, vol 13, issue 11; 1-2.

18. V. Viswanathan, N. Thomas, A. Ramachandran, Seena Rajasekar, (2005). Proflie of Diabetic Foot Complications and its associated Complications, A Multicentric Study form India. Nov.

19. D.T. Williams, K G Harding and P E Princine, (2007). The influence of exercise on foot perfusion in diabetes. June 25.

NET REFERENCE

1. www.american article.com
2. emedicine medscape .com
3. www.google.com
4. www.gov.mb.ca/health/publichealth/diabetes/care/mdcr.pdf.
5. www.indian jmedsci.org
6. www.nurses journal.com
7. www.pubmed.com
8. www.tn/edessertation. com
9. www.wikipedia.com
10. www.wrongdiagnosis.com/p/peripheral_vascular_disease/stats
11. http://www.idf.org/annual-reports.
12. http://cintent.nejm.org/cgi/content/short.
13. ,http://www.ncbi.nlm.nih.gov/PMC.
14. : http://www.ncbi.nlm.nih.gov/PMC .
15. http:// care.diabetesjournals.org.
16. www. diabetic medicine .com

APPENDIX I

SECTION I

DEMOGRAPHIC PROFILE

Subject no :

1. Age of the person

a) 30 - 40 years ☐ b) 40 -50 years ☐ c) 50 - 60 years ☐

d) Above 60 years ☐

2. Sex

a). Male ☐ b). Female ☐

3. Marital status

a) Married ☐ b) Unmarried ☐ c) Divorced / Separated ☐

d) Widower / widow ☐

4. Religion

a) Hindu ☐ b) Muslim ☐ c) Christian ☐

d) Others ☐

5. Type of family

a) Nuclear ☐ b) Joint ☐ c) Broken ☐ d) Paying guest ☐

6. Educational status

a) Illiterate ☐ b) Elementary ☐ c) Higher secondary ☐

d) Graduate and above ☐

7. Occupation

a) Government ☐ b) Private ☐

c) Pensioner ☐ d) Unemployed ☐

8. Income

a) < Rs 1000 / month ☐ b) Rs 1000- 2000 / month ☐

c) Rs 2000- 5000 / month ☐ d) > Rs 5000 /month ☐

9. Area of residence

a) Rural ☐ b) Urban ☐

10. Dietary pattern

a) Vegetarian ☐ b) Non- vegetarian ☐ c) Mixed ☐

SECTION II

MEDICAL RELATED INFORMATION

1. Type of diet

a) Carbohydrate rich diet ☐ b) Cholesterol rich diet ☐

c) Protein rich diet ☐ d) Mixed diet ☐

2. History of chronic illness

a) Yes ☐ b) No ☐

2 - a. If yes, specify

a) Hypertension ☐ b) Cardio Vascular problems ☐

c) Chronic kidney disease ☐ d) Neurological problems ☐

3. History of consuming any medication for the chronic illness,

a) Yes ☐ b) No ☐

3 - a. If yes, specify

---

4. Duration of illness (Type 2 diabetes mellitus)

a) 1- 2 year ☐ b) 2-5 years ☐ c) 5- 10 years ☐

d) > 10 years ☐

5. The duration of which she or he under diabetic medication

a) <2 years ☐ b) 2-5 years ☐ c) 5-10 years ☐ d) > 10 years ☐

6. Type of diabetic medication

a) Diet / Exercise only ☐ b) oral hypoglycemic agent ☐

c) Insulin ☐ d) Insulin and oral hypoglycemic agent ☐

7. History of smoking,

a)Yes ☐ b) No ☐

If yes,

7 - i) Number of years of smoking

a) 1 - years ☐ b) 5 - 10 years ☐

c) 10 - 20 years ☐ d) > 20 years ☐

7 - ii) Number of cigarettes per day

a) 1 - 2 ☐ b) 3 -5 ☐ c) 6 - 8 ☐ d) >8 ☐

8. History of consuming alcohol,

a) Yes ☐ b) No ☐

If yes,

8 - i) Number of years of consuming alcohol

a) 1 – 5 years ☐ b) 6 – 10 years ☐

c) 10 – 20 years ☐ d) >20 years ☐

8- ii) Duration of consuming alcohol per week

a) Once ☐ b) 2 -3 times ☐ c) 4 – 5 times ☐ d) 6 -7 times ☐

8 - iii) Amount of consuming alcohol per day

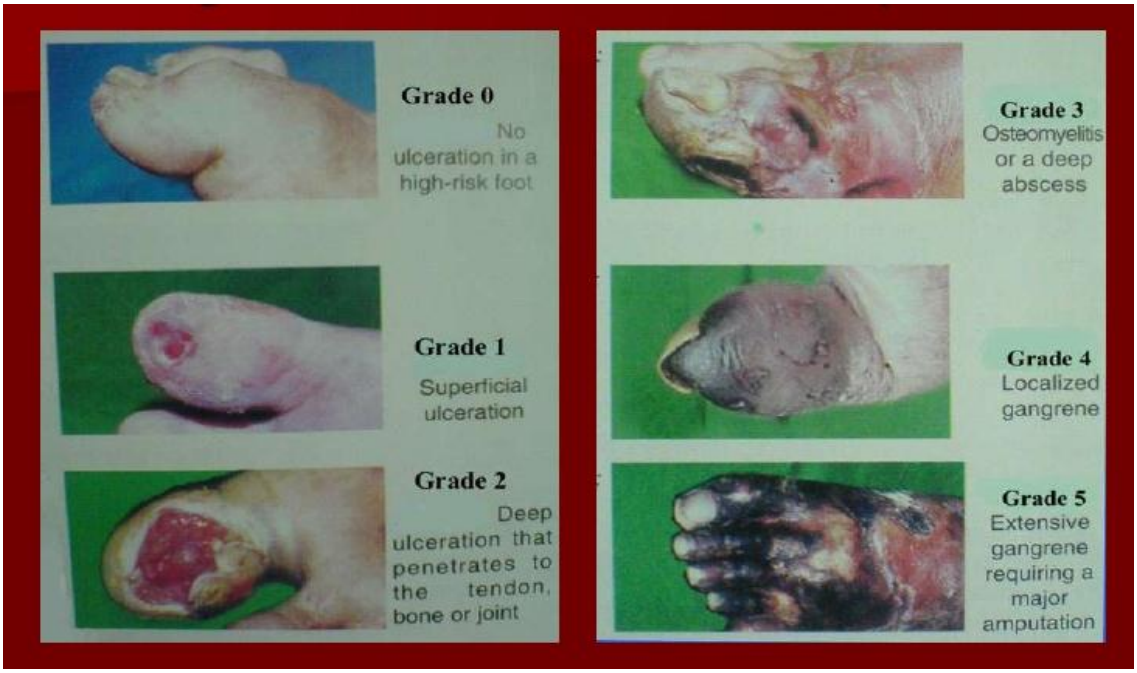
a) 90 ml ☐ b) 180 ml ☐ c) 360 ml ☐ d) 720 ml ☐

SECTION III

WAGNER WOUND ASSESSMENT SCALE

Lesion Grade :

S.NO.	CHARECTERISTICS	SCORE
1.	Open lesions: may have deformity or cellulitis	0
2.	Superficial ulcer	1
3.	Deep ulcer to tendon or joint capsule	2
4.	Deep ulcer with abscess, osteomyelitis, or joint sepsis	3
5.	Local gangrene – forefoot or heel	4
6.	Extensive gangrene, needs major amputation	5



SECTION IV

CHECK LIST TO ASSESS THE WOUND HEALING PROCESS

S.No	Item	Assessment	Score	Day 1	Day 5	Day 10	Day 15
1.	Size	• Length X width < 4 sq cm • Length X width < 4 - 16 sq cm • Length X width < 16.1 - 36 sq cm	**3** **2** **1**				
2.	Depth	• Tissues damaged but no break in skin surface. • Superficial, abrasion, blister or shallow crater. Even with, &/or elevated above skin surface (e.g., hyperplasia). • Deep crater with or without undermining of adjacent tissue.	**3** **2** **1**				
3.	Edges	• Not attached sides or walls are present; floor or base of wound is deeper than edge. • Rolled under, thickened soft to firm and flexible to touch. Indistinct, diffuse unable to clearly distinguish wound outline. • Attached even or flush with wound • Hyperkeratosis callous-like tissue formation around wound & at edges. • Fibrotic, scarred hard, rigid to touch.	**5** **4** **3** **2** **1**				
4.	Undermining	• Undermining < 2 cm in any area. • Undermining 2-4 cm involving <50% wound margin. • Undermining 2-4 cm involving >50% wound margin. • Undermining >4 cm in any area. • Tunneling and or sinus tract formation.	**5** **4** **3** **2** **1**				
5.	Necrotic tissue type	• Non visible. • White / grey non – viable tissue and or non adherent yellow slough. • Loosely adherent yellow slough. • Adherent, soft, black eschar. Firmly adherent, hard, black eschar.	**4** **3** **2** **1**				
6.	Necrotic tissue amount	• Non visible. • < 25% of wound bed covered. • 25% to 50% of wound covered. • > 50% and < 75% of wound covered. • 75% to 100% of wound covered.	**5** **4** **3** **2** **1**				

S.No	Item	Assessment	Score	Day 1	Day 5	Day 10	Day 15
7.	Exudate type	• None or bloody. • Serous: thin, watery, clear. • Purulent: thin or thick, opaque, tan/yellow. • Foul Purulent: Thick, opaque, yellow/green with odour.	**4** **3** **2** **1**				
8.	Exudate amount	• None • Scanty • Small • Moderate • Large	**5** **4** **3** **2** **1**				
9.	Skin colour surrounding the wound	• Pink or normal • Bright red and or blanches to touch. • White or grey pallor or hypo pigmented • Dark red or purple and or non blanchable • Dark red blanchable • Black or hyper pigmented.	**6** **5** **4** **3** **2** **1**				
10**.**	Peripheral tissue edema	• Minimal swelling around wound. • Non pitting oedema extends < 4cm around wound. • Non pitting oedema extends > 4cm around wound • Pitting oedema extends < 4cm around wound. • Crepitus and or pitting edema extends > 4cm	**5** **4** **3** **2** **1**				
11.	Peripheral tissue induration	• Minimal firmness around the wound. • Induration < 2cm around the wound. • Induration 2 – 4 cm extending < 50% around the wound. • Induration 2 – 4 cm extending >50% around the wound. • Induration > 4cm in any area.	**5** **4** **3** **2** **1**				
12.	Granulation tissue	• Skin intact or partial thickness wound. • Bright, beefy red; < 75% and > 25% of wound filled. Pink, and or dull, dusky red and or fills < 25% of wound. • No granulation tissue present.	**4** **3** **2** **1**				

S.No	Item	Assessment	Score	Day 1	Day 5	Day 10	Day 15
13.	Epithelialisation	• 100% wound covered, surface intact. • 75% to 100% wound covered. • 50% to 75% wound covered. • 25% to 50% wound covered. • <25% wound covered.	**5** **4** **3** **2** **1**				
SCORE			**60**				

INTERPRETATION:

S. NO.	SCORE	RESULT
1.	50 to 60	Very good
2.	40 to 49	Good
3.	30 to 39	Moderate
4.	20 to 29	Mild
5.	< 19	Poor

APPENDIX II

Lr.No. 284/CON/MMC/Chennai-3 dt 10.7.13.

From:

Mrs. M.Vijayabarathi ,
M.Sc (Nursing) II year,
College of Nursing,
Madras Medical College,
Chennai-3.

To:

The Dean,
Madras Medical College,
Chennai-03.

Through Proper Channel,

Respected Sir,

Sub: Requesting Permission to conduct a research study - reg

I, Mrs.M.Vijayabarathi, studying M.Sc.Nursing II year, College of nursing, Madras Medical college, kindly request you to grant me permission for the study proposed to conduct on the topic **"A study to assess the effectiveness of Buerger - Allen exercise on wound healing process among the diabetic foot ulcer patients admitted in Diabetology Department at Rajiv Gandhi Government General Hospital, Chennai - 03"** to fulfill the requirement of data collection. I assure you that it will not interfere with routine activities of the study settings.

Forwarded
16/07/13

Thanking you,

Date: 16.07.13

Place: Chennai-03

Yours obediently,

Vijayabarathi

(M.Vijayabarathi)

APPENDIX II

INSTITUTIONAL ETHICS COMMITTEE
MADRAS MEDICAL COLLEGE, CHENNAI -3

EC RegNo.ECR/270/Inst./TN/2013
Telephone No : 044 25305301
Fax : 044 25363970

CERTIFICATE OF APPROVAL

To
M.Vijaya barathi
M.Sc.,(N) II year,
College of Nursing,
Madras Medical College, Chennai-3.

Dear Vijaya barathi

The Institutional Ethics committee of Madras Medical College, reviewed and discussed your application for approval of the proposal entitled "A Study to assess the effectiveness of Buerger – Allen exercise on wound healing process among the diabetic foot ulcer patients admitted in Diabetology department at Rajiv Gandhi Government General Hospital, Ch.03" No.08072013.

The following members of Ethics Committee were present in the meeting held on 06.07.2013 conducted at Madras Medical College, Chennai -3.

1. Dr.G.SivaKumar, MS FICS FAIS --- Chairperson
2. Prof. R. Nandhini MD -- Member Secretary
   Director, Instt. of Pharmacology ,MMC, Ch-3
3. Prof. Shyamraj MD -- Member
   Director i/c , Instt. of Biochemistry , MMC, Ch-3
4. Prof. P. Karkuzhali. MD -- Member
   Prof., Instt. of Pathology, MMC, Ch-3
5. Prof. Kalai Selvi -- Member
   Prof of Pharmacology, MMC, Ch-3
6. Prof. Siva Subramanian, -- Member
   Director, Instt. of Internal Medicine, MMC, Ch-3
7. Thiru. S. Govindsamy. BABL -- Lawyer
8. Tmt. Arnold Saulina MA MSW -- Social Scientist

We approve the proposal to be conducted in its presented form.

Sd/ Chairman & Other Members

The Institutional Ethics Committee expects to be informed about the progress of the study, and SAE occurring in the course of the study, any changes in the protocol and patients information / informed consent and asks to be provided a copy of the final report.

R Nandini

Member Secretary, Ethics Committee

APPENDIX IV

Lr.no. 284/CON/MMC/Chennai-3 dt 16.7.13.

From:

Mrs. M.Vijayabarathi ,
M.Sc (Nursing) II year,
College of Nursing,
Madras Medical College,
Chennai-3.

To:

The Professor and HOD,
Department of Diabetology,
Rajiv Gandhi Government General Hospital,
Chennai-03.

Through Proper Channel,

Respected Sir,

Sub: Requesting Permission to conduct a research study - reg

I, Mrs.M.Vijayabarathi, studying M.Sc.Nursing II year, College of nursing, Madras Medical college, kindly request you to grant me permission for the study proposed to conduct on the topic **"A study to assess the effectiveness of Buerger - Allen exercise on wound healing process among the diabetic foot ulcer patients admitted in Diabetology Department at Rajiv Gandhi Government General Hospital, Chennai - 03"** to fulfill the requirement of data collection. I assure you that it will not interfere with routine activities of the study settings.

Forwarded
16/07/13

Thanking you,

Date: 16.07.13

Place: Chennai-03

Yours obediently,

(M.Vijayabarathi)

Permitted
P/o contact Surgery dept also for care

18/7/13
Prof of Diabetology

APPENDIX V

CERTIFICATE OF CONTENT VALIDITY

This is to certify that a tool prepared by Mrs. M.Vijayabarathi, M.Sc. Nursing, II year of College of Nursing, Madras Medical College, undertaking a research study on "A study to assess the effectiveness of Buerger - Allen exercise on wound healing process among the diabetic foot ulcer patients admitted in Diabetology department at Rajiv Gandhi Government General Hospital, Chennai - 03", has been validated by me and is found to be valid and up to date and she can proceed with this tool to conduct the main study.

Signature :

Name : Dr. P. DHARMARAJAN

Designation : Prof. + HOD I/c
INST. OF DIABETOLOGY

Date : 31/8/2013

Place : CHENNAI - 3

Seal :

DR. P. DHARMARAJAN M.D., DIP. DIAB.,
PROF. OF DIABETOLOGY
INSTITUTE OF DIABETOLOGY,
MADRAS MEDICAL COLLEGE &
RAJIV GANDHI GOVT. GEN. HOSPITAL
CHENNAI - 600 003.
REGN. NO : 47322

APPENDIX VI

CERTIFICATE OF CONTENT VALIDITY

This is to certify that a tool prepared by Mrs. M.Vijayabarathi, M.Sc. Nursing, II year of College of Nursing, Madras Medical College, undertaking a research study on "A study to assess the effectiveness of Buerger - Allen exercise on wound healing process among the diabetic foot ulcer patients admitted in Diabetology department at Rajiv Gandhi Government General Hospital, Chennai - 03", has been validated by me and is found to be valid and up to date and she can proceed with this tool to conduct the main study.

Signature :

Name :

PRINCIPAL
MADHA COLLEGE OF NURSING
MADHANAGAR, KUNDRATHUR
CHENNAI - 600 069
PHONE: 24780736

Designation :

Date :

Place :

Seal :

APPENDIX VII

<u>சுய ஒப்புதல் படிவம்</u>

ஆய்வு செய்யப்படும் தலைப்பு

"இரண்டாம் வகை சர்க்கரை வியாதியுடன் பாதத்தில் ஊண் உடையவர்களுக்கு பியூகர் ஆலன் உடற்பயிற்சி செய்வதன்மூலம் பாதத்தில் ஊண் ஆறும் விதத்தில் ஏற்படக்கூடிய மேம்பாட்டுத் திறனை அறிய ஓர் ஆய்வு"

பங்கு பெறுபவரின் பெயர்: வயது: தேதி: உள் நோயாளி எண்:

..... என்பவராகிய நான் இந்த ஆய்வின் விவரங்களும் அதன் நோக்கங்களும் முறையாக அறிந்து கொண்டேன். எனது சந்தேகங்கள் அனைத்திற்கும் தகுந்த விளக்கம் அளிக்கப்பட்டது. இந்த ஆய்வில் முழு சுந்திரத்துடன் மற்றும் சுயநினைவுடன் பங்கு கொள்ள சம்மதிக்கிறேன்.

எனக்கு விளக்கப்பட்ட விஷயங்களை நான் புரிந்துகொண்டு நான் எனது சம்மதத்தைத் தெரிவிக்கிறேன். இச்சுய ஒப்புதல் படிவத்தை பற்றி எனக்கு விளக்கப்பட்டது.

இந்த ஆய்வினை பற்றிய அனைத்து தகவல்களும் எனக்கு தெரிவிக்கப்பட்டது. இந்த ஆய்வில் எனது உரிமை மற்றும் பங்கினை பற்றி அறிந்து கொண்டேன்.

இந்த ஆய்வில் பிறரின் நிர்பந்தமின்றி என் சொந்த விருப்பத்தின்பேரில் தான் பங்கு பெறுகிறேன் மற்றும் நான் இந்த ஆராய்ச்சியிலிருந்து எந்நேரமும் பின்வாங்கலாம் என்பதையும் அதனால் எந்த பாதிப்பும் ஏற்படாது என்பதையும் நான் புரிந்து கொண்டேன்.

இந்த ஆய்வில் கலந்து கொள்வதன்மூலம் என்னிடம் பெறப்படும் தகவலை ஆய்வாளர் இன்ஸ்டிட்யூசனல் எத்திக்ஸ் கமிட்டியினரிடமோ, அரசு நிறுவனத்திடமோ தேவைப்பட்டால் பகிர்ந்து கொள்ளலாம் என சம்மதிக்கிறேன்.

இந்த ஆய்வின் முடிவுகளை வெளியிடும்போது எனது பெயரோ, அடையாளமோ வெளியப்படாது என அறிந்து கொண்டேன். இந்த ஆய்வின் விவரங்களைக் கொண்ட தகவல்தாளைப் பெற்றுக் கொண்டேன்.

இந்த ஆய்வில் பங்கேற்கும்பொழுது ஏதேனும் சந்தேகம் ஏற்பட்டால், உடனே ஆய்வாளரை தொடர்பு கொள்ள வேண்டும் என அறிந்து கொண்டேன்.

நான் இந்த ஆய்வில் பியூகர் ஆலன் உடற்பயிற்சி செய்து கொள்ள சம்மதிக்கிறேன்.

இச்சுய ஒப்புதல் படிவத்தில் கையெழுத்திடுவதன்மூலம் இதிலுள்ள அனைத்து விஷயஹ்களும் எனக்கு தெளிவாக விளக்கப்பட்டது என்று தெரிவிக்கிறேன் என்று புரிந்து கொண்டேன். இசுய ஒப்புதல் படிவத்தின் ஒரு நகல் எனக்கு கொடுக்கப்படும் என்று தெரிந்து கொண்டேன்.

ஆராய்ச்சியாளர் கையொப்பம்
தேதி:

பங்கேற்பாளர் கையொப்பம்
தேதி:

APPENDIX VIII

ஆய்வு தகவல் தாள்

பங்கேற்பாளர் பெயர் :

ஆராய்ச்சியாளர் பெயர் :

ஆய்வு தலைப்பு : **இரண்டாம் வகை சர்க்கரை வியாதியுடன் பாதத்தில் ஊண் உடையவர்களுக்கு பியூகர் ஆலன் உடற்பயிற்சி செய்வதன்மூலம் பாதத்தில் ஊண் ஆறும் விதத்தில் ஏற்படக்கூடிய மேம்பாட்டுத் திறனை அறிய ஓர் ஆய்வு.**

இந்த ஆய்வு சென்னை ராஜீவ்காந்தி அரசு பொது மருத்துவமனையின் நீரிழிவு துறையில் மேற்கொள்ளப்பட உள்ளது.

நீங்கள் இந்த ஆய்வில் பங்கேற்க அழைக்கிறோம். நீங்கள் இந்த ஆய்வில் பங்கேற்கலாமா அல்லது வேண்டாமா? என்பதை முடிவு செய்ய இந்த ஆவணத்தில் உள்ள தகவல் உதவியாக இருக்கும். உங்களுக்கு ஏதேனும் சந்தேகம் இருந்தால் நீங்கள் எங்களிடம் வெளிப்படையாக கேட்கலாம்.

எங்களுடைய அடிப்படை தகுதிகளில் நீங்கள் திருப்தியாக இருப்பதால் உங்களை இந்த ஆய்வில் பங்கேற்க அழைக்கிறோம்.

ஆய்வின் நோக்கம் மற்றும் செயல்பாடு:

பிய்ூகர் ஆலன் உடற்பயிற்சி செய்வதன்மூலம் இரண்டாம் நிலை சர்க்கரை வியாதியுடன் பாதத்தில் ஊண் உடையவர்களின், ஊண் ஆறும் விதத்தில் ஏற்படக்கூடிய மேம்பாட்டு திறனை அறிய ஓர் ஆய்வு.

இந்த ஆய்வில் உங்கள் பெயர், வயது, பரிந்துரைக்கப்பட்ட மருந்து களின் பெயர், சிகிச்சை கால அளவு ஆகிய தகவல்கள் பெற்றுக் கொள்வோம்.

சில தகவல்கள் உங்களிடம் பெறப்படும்:

உங்களுக்கு உங்களுடைய மருத்துவத் தகவலை இரகசியமாக வைக்க உரிமை உண்டு. நீங்கள் இந்த ஆய்வில் கையொப்பமிடுவதால் நீங்கள் உங்களுடைய தகவலை ஆய்வு குழு மற்றும் நிறுவனத்திடம் காட்ட வேண்டும். இந்த ஆராய்ச்சியின் தகவல்கள் விஞ்ஞான இதழ்கள் மற்றும் விஞ்ஞான கூடத்தில் வெளியிடப்பட்டாலும் உங்களுடைய அடையாளங்கள் காட்டப்படமாட்டாது.

ஆராய்ச்சியாளர் கையொப்பம்
தேதி:

பங்கேற்பாளர் கையொப்பம்
தேதி:

APPENDIX IX

CERTIFICATE OF ENGLISH EDITING

TO WHOM SO EVER IT MAY CONCERN

This is to certify that the dissertation topic "**A study to assess the effectiveness of Buerger Allen exercise on wound healing process among the diabetic foot ulcer patients admitted in Diabetology Department at Rajiv Gandhi Government General Hospital, Chennai - 03**" done by **Mrs. M.Vijayabarathi,** M.Sc Nursing II year, College of Nursing, Madras Medical College, Chennai – 03, has been edited for English language appropriateness.

Date : 06. 02. 2014

Place: Chennai – 03.

(M. Gokul Praveen Babu, M.A)
Assistant Professor,
Department of English,
Tagore College of Arts and Science,
Chrompet,
Chennai – 44.

APPENDIX X

BUERGER ALLEN EXERCISE

The feet are easily accessible and require no repositioning. While exercising, the nurse can assess the feet, stimulate circulation, decrease pain, provide a local form of passive exercise and promote lower extremity perfusion. Through this therapy patients receive attention and touch, which are vital elements of care that promote comfort and well-being. Buerger Allen exercise is the one through which the lower extremity perfusion can be improved, whereby it is used to promote the wound healing process.

Definition:

Exercise:

- Exercise is physical activity that is planned, structured, and repetitive for the purpose of conditioning any part of the body. Exercise is used to improve health, maintain fitness and is important as a means of physical rehabilitation.

Buerger Allen exercise:

- Specific exercises intended to improve circulation to the feet and legs.
- Exercises used to empty engorged vessels, stimulate circulation, and at least partially relieve swelling (oedema) in patients with insufficiency of circulation to the lower limbs and feet.

Purposes:

- Reduces pain
- Promotes circulation
- Improves wound healing process
- Promotes relaxation
- Reduces anxiety and depression
- Decreases the need of medications

Procedure:

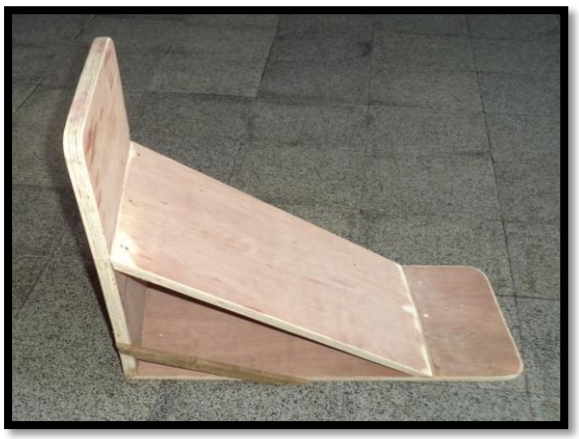
1. Select the subject according to the Wagner wound assessment scale (within the range of 0 to 1). Assess the condition of the foot ulcer.

2. Explain the procedure.

3. Provide privacy.

4. Make the sample to lie down in a comfortable position.

5. Keep the Buerger Allen exercise board on the cot.



6. Elevate the lower extremities to an angle of 45^0 to 90^0 with the help of exercise board. Provide support to the lower extremities to maintain the position.

7. Make the subject to maintain the same position in the same manner until the skin blanches (appears dead white).

8. Lower the feet and the legs 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).

9. Place the legs flat on the bed for a few minutes. Ask the subjects to sit in a relaxed position while each foot is flexed and extended then inverted and everted for 3 minutes till the feet turns entirely pink. Ask the subject to rotate the feet in all the direction.

10. Make the subject to lie quietly for 5 minutes, keeping legs warm with a blanket.

Note:

The length of time for each position varies with the subject's tolerance and the speed with which color change occurs. Usually the exercises are prescribed so that the legs are elevated for 2 to 3 minutes, down 5 to 10 minutes and then flat on the bed for 10 minutes. If the feet are blue or painful, elevate them and relax as necessary. Repeat the procedure for three to four times in a day.