A COMPARATIVE STUDY TO ASSESS THE EFFECTIVENESS OF INFRA RED RADIATION, INSULIN DRESSING AND METRONIDAZOLE DRESSING IN HEALING OF DIABETIC ULCER FOOT AT MAPIMS

By

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A comparative study to assess the effectiveness of Infra Red Radiation, Insulin Dressing and Metronidazole Dressing in healing of diabetic ulcer foot at MAPIMS

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This is to certify that the thesis entitled **"A comparative study to assess the effectiveness of Infrared Radiation, Insulin Dressing and Metronidazole Dressing in healing of diabetic ulcer foot at MAPIMS** is a bonafide work of **Mrs.P.TAMILSELVI** and submitted in fulfillment of the requirement for the Degree of **Doctor of Philosophy in Nursing** to **THE TAMIL NADU DR. M.G.R MEDICAL UNIVERSITY, CHENNAI** under my guidance and supervision.

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This thesis does not contain any part of work that has been submitted for the award of any diploma, degree, associateship or other similar title in this university or any other university without citation.

SIGNATURE OF CANDIDATE

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LIST OF ABBREVIATIONS

NIDDM	-	Non Insulin Dependent diabetes Mellitus
IDDM	-	Insulin Dependent diabetes Mellitus
ATP	-	Adenosine Tri phosphate
IDF	-	International Diabetes Federation
WHO	-	World Health Organization
CDC	-	Centers for Disease Control
MAPIMS	-	Melmaruvathur Adhiparasakthi Institute Of Medical Sciences
HDL	-	High Density Lipoproteins
LDL	-	Low Density Lipoproteins
MDRO	-	Methicillin Drug Resistant Organism
HSE	-	Human Skin Equivalent
LED	-	Light Emitting Diode
ANOVA	-	Analysis of Variance
HSC	-	High School

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ABSTRACT

Diabetes is a worldwide health problem. It may begins around twenty years of age and become more prevalent when age get advances. Diabetes has been detected more in urban population but undiagnosed diabetes is most common in the rural people. In India, one in two out of population has diabetes mellitus. Approximately ninety two million of Indian people may get diabetes in the year 2035. Diabetic foot ulcer is one of the serious complications of diabetes mellitus. Eighty four percent people get lower leg amputation because of diabetes. Peripheral arterial disease and neuropathy are the common causes for foot amputation. Statistics shows that twenty five percent diabetic people develop diabetic ulcer foot in the later stage. Fifty percent diabetic population develops infection and need hospitalization in their lifetime. One out five diabetic people is prone to get amputation. The care of chronic non healing ulcer foot is challenging for health team. There are many human studies that searching for efficient and effective treatment for diabetic ulcer foot. This study compared three different interventions towards the management of diabetic ulcer foot.

Statement of the Problem

A comparative study to assess the effectiveness of Infrared Radiation, Insulin Dressing and Metronidazole dressing in healing of diabetic ulcer foot at MAPIMS

Objectives

1. To assess the pretest condition of diabetic ulcer foot among patients with Diabetes mellitus

2. To evaluate the effectiveness of infra-red radiation application, insulin dressing and metronidazole dressing in healing of diabetic ulcer foot among patients with Diabetes mellitus.
3. To compare the effectiveness of infra-red radiation with insulin dressing and metronidazole dressing in healing of diabetic ulcer foot among patients with Diabetes mellitus.
4. To associate the effectiveness of intervention in healing of diabetic ulcer foot with the selected demographic variables.

Hypotheses

H_1- There will be significant improvement in healing of diabetic ulcer foot at the post test.

H_2- There will be significant differences between infrared radiation, insulin dressing and metronidazole dressing on healing of diabetic ulcer foot.

H_3. There will be significant association of post test score on healing of diabetic ulcer foot with the selected demographic variables among diabetic foot ulcer clients.

Research methodology

Quasi experimental pretest posttest design was adopted for this study and Non probability consecutive sampling technique was used to select the samples. Based on the sampling criteria totally 225 samples were selected for this study, out of this seventy five subjects were treated with infra-red radiation, seventy five treated by insulin dressing and remaining seventy five were treated metronidazole dressing. First day, three interventional group was assessed by using modified Bates Jensen's wound assessment

tool and same day treatment was started, posttest was done on seventh day and tenth day by using the tool.

RESULTS

Infrared Radiation Group.

The pretest and post scores of the Infra-red radiation group, that the pretest mean and standard deviation were respectively 51.5067 and 4.21828. At the post test mean and standard deviation were respectively 20.32 and 3.673. The" t" value was 68.352 it is more than table value. The results shows a high level of significance statistically at $p<0.001$ level. Occupation and education of the diabetic clients had significant influences in the healing of diabetic ulcer foot.

Insulin Dressing Group

The pretest and Post-test score of Insulin Dressing in healing of diabetic foot ulcer that Insulin dressing pretest mean score is 50.24 and standard deviation 5.74, post mean score 24.25, standard deviation 4.02 and the " t" value 45.27 which is greater than table value. The results shows a high level of significance statistically at $p<0.001$ level. Diabetic client's Demographic variables like Age, area of residence and family history of diabetes had significant influences in the healing of diabetic ulcer foot.

Metronidazole Dressing Group

The pretest and Post-test score of Metronidazole Dressing in healing of diabetic foot ulcer. It reveals that in Metronidazole dressing, pretest and posttest mean scores were respectively 50.3 and 27.06 and the standard deviation were 4.0 and 3.58 respectively and the "t" value was 52.825 which is more than table value. The result

shows a high level of significance statistically at $p<0.001$ level. Diabetic client's demographic variables like age and area of residence had significant influences in the healing of diabetic ulcer foot.

CONCLUSION

These study results shows that all the three interventions were effective in healing of diabetic ulcer but infrared radiation was the most effective method when comparing other two interventions in the healing of diabetic ulcer foot.

IMPLICATIONS

The findings of the study have several implications for medical surgical nursing, community health nursing, nursing education, nursing administration and nursing research towards the healing of diabetic ulcer. The study findings help to reduce the complications of diabetic foot ulcer and increase the granulation status of wound. Primary health nurse can plan diabetes education and develop awareness programme regarding risk factors of diabetes and diabetic foot complications. Nursing practice provides a prompt patient care. They will act as a essential role in control of diabetes and care of foot. Nurse educators basically from clinical nursing which gives them, knowledge, skills and attitude of theory. Nurse educators are responsible for teaching current trends in nursing practice in clinical setting. Nurse administrator should plan of programme and strategies about diabetes and diabetic ulcer foot.

CHAPTER – I

INTRODUCTION

Health is considered as the actualization of inherent and acquired human potential through goal oriented behavior, competent self care and satisfying relationship with others. Health is a condition or quality of human organism expressing the adequate functioning of the organism. Health is considered as fourth important aspect in our human life after, food, water and shelter. There are six important dimensions of health. When all these dimensions are fulfilled a person can enjoy the positive health[1]

Health promotion is about joyful living actualizing our potentials and being the best we can be. It is about cleaning up our air, our water, our cities and us. It is for the wellbeing of the individual and humanity; it is for and about creating a healthier internal and external environment for all living creatures on the planet earth. Health promotion has to do with the acquisition of mental, physical and spiritual asserts to protect and buffer us from disease as well as move us along the continuum towards high level wellness.[2]

Health promotion is the process of fostering the awareness, influencing attitudes and identifying alternatives so that individuals can make informed choices and change their behavior to achieve an optimal level of health.[3]

Disease conditions constitute a major challenge to health care providers and health care delivery systems. There are more and more clients with chronic conditions due to an ever –growing number of clients and increasing number of clients who survive

major illnesses. Because some disease conditions cannot be cured, the client needs to learn to adapt to the condition. Helping a client adapt to a chronic illness challenges the health care system, health care providers and society as a whole. Adaptation to chronic conditions is a complex and ongoing process that involves physiological, sociological, psychological, technological and time factors.[3]

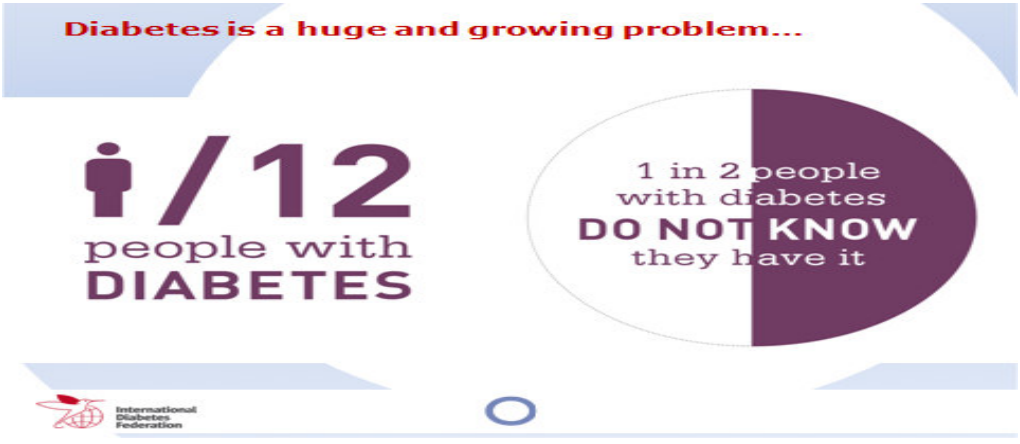
Preventive health care is more dynamic than health maintenance. Preventive approach to health care has to do with health enhancement and promotion, whereas health maintenance is concerned with maintaining the status quo. When we think about the prevention of illness, there is a philosophical consideration that embraces a commitment to wellness and a conscious desire to prevent illness and diseases.[3]

1.1 BACKGROUND OF THE STUDY

Diabetes and its causes

The name "Diabetes mellitus" comes from the Greek Word which means "**to go through or a siphon".** Mellitus word comes from a Latin word "**me describing the sweet odour of urine".** [4]

Fig.1.1.1: Diabetes – A Huge and Growing Health Problem



Source: International Diabetes Federation

''Diabetes Mellitus'' is a metabolic disorder characterized by glucose intolerance. It is a systemic disease caused by an imbalance between insulin supply and insulin demand.

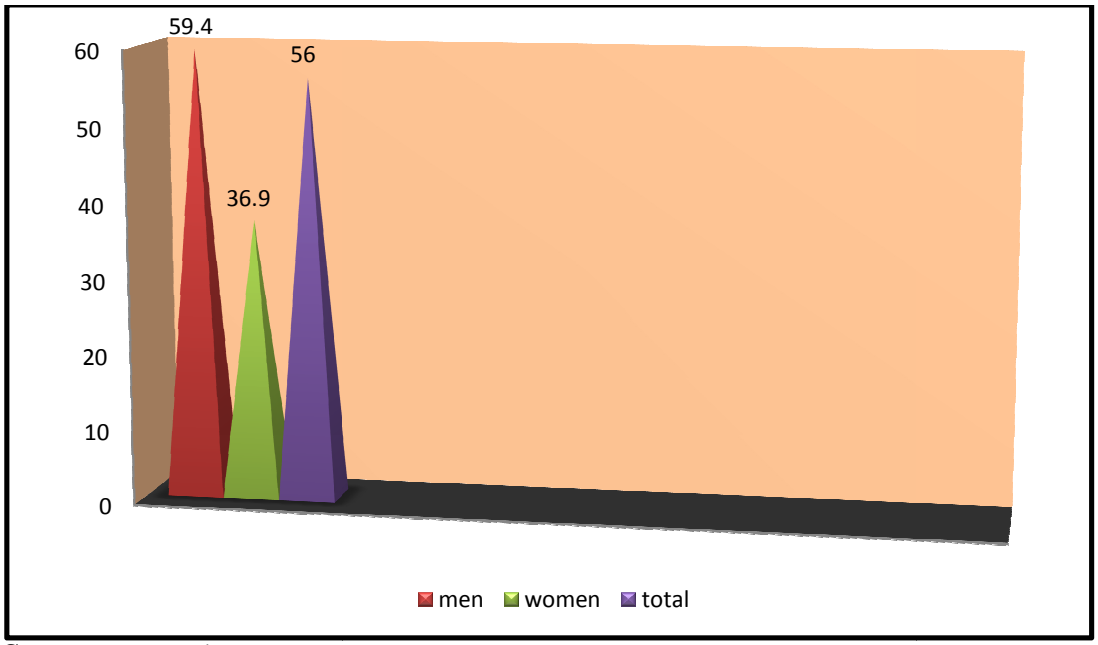
Insulin is peptide hormone, secreted by the beta cells in the endocrine part of the pancreas as its precursor, proinsulin, and routed through liver. Proinsulin is composed of two polypeptide chains, chain A and chain B, which are linked by the C –peptide chain. Insulin is formed when enzymes cleave C off, leaving the A and B chains. The presence of C peptide in serum and urine is a useful indicator of beta cells function and normally maintains the optimal blood glucose level. When the blood glucose level rises, islet cells release insulin in to the blood, allowing glucose transport in tom the cells and glucose conversion to glycogen. As the blood glucose level falls, insulin release slows from the islet cells until blood glucose drops slightly below normal.[5]

In diabetes mellitus, either there is not enough insulin or the insulin that produced is ineffective, resulting in high blood glucose level. Diabetes mellitus also causes disturbances of protein and fat metabolism.[6]

Clients with family history diabetes are at far greater risk for developing diabetes, especially NIDDM. Genetic and environmental factors seem to precipitate IDDM. Because the highest incidence of new cases of IDDM occurs during the winter months, it is believed that environmental factors have a role in the development of diabetes. Certain viruses, such as coxsackie B virus, mumps and rubella are an etiological factor. These viruses attack the islet cells of the pancreas, which renders them useless for producing insulin. Some autoimmune responses and heredity may have influence in the

development of IDDM. Some triggers cause the body to develop islet cell antibodies and anti-insulin antibodies. These antibodies attack the beta cells of the pancreas and also the insulin molecules themselves. Siblings of clients with diabetes have ten times the risk of developing diabetes.[5]

Fig.1.1.2: UNDIAGNOSED DIABETIC PEOPLE (GENDERWISE) PERCENTAGE IN INDIA



Source: www.who.com

Types of diabetes and its pathogenesis

There are three main types of diabetes mellitus; "**Type 1 diabetes mellitus**" genetically susceptible individuals develop islets cell auto antibodies months to years before diagnosis of diabetes. Progressive destruction of beta cells due to autoimmune process insusceptible individuals leads to diabetes. It is known us "juvenile diabetes "or "insulin dependent diabetes" or **Type 1 diabetes mellitus.** The peak age of onset type I diabetes is between eleven and thirteen. The rate of type 1 diabetes more in whites than

nonwhites, incidentally higher in males compared to females, mostly occur lean body type than overweight people.[7]

"Type 2 diabetes", the insulin produced by pancreas that may be insufficient to meet the tissue needs the body or poorly utilized by the tissues. There are three metabolic pathogenesis for development of type II diabetes. Primarily insulin resistance occurs which is a condition in which body tissue do not respond to the action insulin. It leads to insulin receptors unresponsive to the action of insulin. The insulin is not properly used, the entry of glucose in to the cell is impaired, it results hyperglycemia. In beginning stage the insulin production very high because of high blood glucose. This is called hyperinsulinimia. Secondly development of type II diabetes is inadequate production of insulin by pancreas, as the beta cells become fatigued from the compensatory overproduction of insulin. Thirdly inappropriate glucose production in the liver. Instead of regulating the glucose, the liver does not respond body's needs at the time.[8]

Diabetes develops during pregnancy called" **Gestational diabetes".** It detected at 24 – 28 weeks of gestation through oral glucose tolerance test. Mothers with gestational diabetes have a high risk to develop diabetes in future.[9]

"Secondary diabetes" is the abnormally increased blood glucose level due to treatment to medical conditions or medications.

Risk factors of Indian diabetics[10]

- **Age**: Indians develop diabetes mellitus ten to fifteen years earlier than the western population.

- **Family history**: fifty percent diabetes inherits though parents. Higher ratio of diabetes found in first generation diabetic parents.
- **Central obesity:** fat deposition in the abdominal area and increased waist circumference runs with higher incident of diabetes.[11]
- **Sedentary living and impaired physical activity:** TV program, using two wheelers, vehicles for transports decrease the physical activities,
- **Urbanization**: India grows faster towards rural to urban environment. It changes the life pattern results in increases the incident of diabetic millets.[12]

Cardinal Signs of Diabetes[13]

- ❖ Polyphagia
- ❖ Polydipsia
- ❖ Polyuria
- ❖ Weight loss
- ❖ Irritability
- ❖ Delay wound healing.

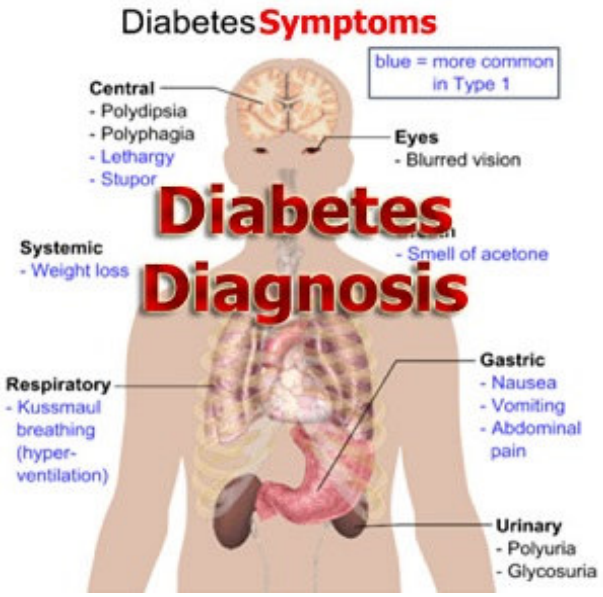


Fig.1.1.3: Diabetes Symptoms

Diabetes complications

Uncontrolled diabetes leads to many complications like

Immediate:[5]

- Giddiness
- Hyperglycemia
- Diabetic ketoacidosis,
- Anorexia
- Nausea
- Vomiting
- Ketonuria
- Hyper Osmolar Non ketotic Coma,
- Hyperinsulinimia
- Hypoglycemia

Late complications[6]

- Retinopathy,
- Peripheral neuropathy,
- Autonomic neuropathy
- Nephropathy,
- Foot ulcer
- Increases the risk of coronary artery disease and stroke.
- Peripheral vascular disease
- Hypertension
- Neurogenic bladder
- Vaginitis

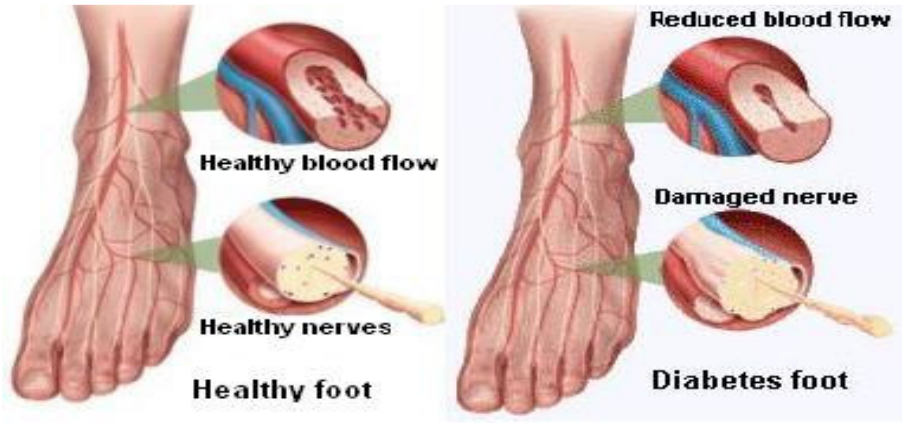
Collaborative care of diabetes:[5]

- ❖ Oral hypoglycemic agents
  - Sulfonylurea
  - Meglitinides
  - Biguanide
  - Alpha-glycosidase inhibitors
  - Thiazolidinediones
- ❖ Insulin therapy
- ❖ Nutritional therapy
  - Protein –fifteen percent to twenty percent daily calories intake
  - Cholesterol-ten percent daily
  - Carbohydrate –seventy percent of calories daily. It includes grains, fruits green vegetables
  - Salt-intake not more than two thousand four hundred milligram per day
- ❖ Exercise therapy
  - Morning and evening brisk walking,
  - DON'T walk vigorously.
  - Check the blood glucose level before, after and during exercise.
- ❖ Yearly eye examination.
- ❖ Find yearly urine protein examination.
- ❖ Check the foot daily at home.
- ❖ Keep the diabetic travel identity card during travelling time.
- ❖ Stop smoking and alcoholism.
- ❖ Aware of low blood glucose symptoms and high blood glucose symptoms.

DIABETIC FOOT ULCER

Neuropathy is a major complication of diabetes, it tend to develop in stages. During the earliest stage client may experience temporary episodes of pain and tingling sensation in the lower extremities. Later the pain augment more nagging and constant in nature, troubles more at night. In the final stage client does not perceive pain this leads to exposure to major foot ulcer and infection. Alternatively blood supply get reduces to the feet due to atherosclerosis leading to delayed healing of foot ulcer and gangrene of the extremities.[15]

Fig.1.1.4: Comparison of Healthy Foot and Diabetes Foot



Diabetes mellitus is a chronic problem which can cause a variety of foot problems where the diabetic foot self-care becomes essential. Skin ulcers, cracked skin, corns, calluses and fungal infections are some of the foot problems that are hard to treat client with diabetes mellitus.

DEFINITION

"World Health Organization" says that diabetic foot syndrome is ulceration of the foot distally from the ankle and including ankle associated with neuropathy and different grades of ischemia and infection[16]

FIG.1.1.5: DIABETIC ULCER FOOT

. **TYPES OF DIABETIC FOOT ULCER AND ITS EPIDEMIOLOGY**

There are two major types of foot ulcer,

1. Neuropathic foot which is dominated by peripheral neuropathy
2. Neuroischaemic Foot is dominated by vascular occlusion also compromised with neuropathy.

Yearly 82000 lower limbs amputated due to diabetes in United States, 80percent non traumatic amputation following diabetes related complication, out of that 85 percent amputation due to diabetic ulceration. If the depth of the infection increases, this affects the bone leads to osteomyelitis result in further increases the chance to get amputate.

In India roughly 40000 limps are amputated every year, from that 75 percent are peripheral neuropathies combined with infection these can preventable. Diabetic ulcer foot is very common and expected to affect 15 percent of all diabetic clients in their life time. In that 15 to 20 percent clients with foot ulcer under goes amputation. Almost 85 percent amputees proceeded with diabetes.

Risk factors of ulcer foot[17]

- Improperly worn shoes or unfit shoes
- Ignorance of diabetes,
- Late presentation by the client,
- Walking by bare foot,
- Illiteracy of disease
- Economically low status
- Alcoholism
- Retinopathy
- Cardiovascular problems from diabetes
- Renal problems from diabetes
- Overweight
- Tobacco use
- Smoking---affects the small blood vessels. It decrease of the blood flow to feet and can cause ulcer

An extensive epidemiological survey said that 60-70percent of diabetes will develop peripheral neuropathy, or lose sensation in their feet and up to 25 percent of diabetes will develop a foot ulcer. It has been estimated that more than 50 percent foot ulcers will become infected, requiring hospitalization and one in five will require an amputation and after a major amputation, most of the clients will have their other limb amputated within two years.[18]

R.Tamilselvi(2014) viewed in her study regarding foot self-care behavior of diabetic clients, around 69 percent of samples belonged to the moderate level of foot

self-care behavior,6 percent of clients adequate level 25 percent client had inadequate level.[19]

Microangiopathy is the alternative cause for diabetic ulcer. Microangiopathy reduces the blood supply to the compromised vessels and reduces the arteriolar-venous response, increases the capillary permeability leads to edema, increases the CO2 retention and reduces the partial pressure of oxygen. Diabetic ulcer with edema increases the morbidity and mortality. Oedema can be the most common indicator for amputation.[20]

CLASSIFICATION

Wager wound classification[21]

- No ulcer, but high-risk foot (bony prominences, callus, deformities,)-0
- Superficial diabetic ulcer -1
- Ulcer extension involving ligament, tendon, joint capsule, or fascia with no abscess or osteomyelitis -2
- Deep ulcers with abscess or osteomyelitis-3
- Gangrene to portion of forefoot-4
- Extensive gangrene of foot-5

University of Texas Wound Classification[22]

- No infection or ischemia- STAGE A
- Infection present- STAGE B
- Ischemia present -STAGE C
- Infection and ischemia present -STAGE D

Grading Description[22]

- Epithelial zed wound-0 GRADE
- Superficial wound-1 GRADE
- Wound penetrates to tendon or capsule - 2 GRADE
- Wound penetrates to bone or joint - 3 GRADE

Clinical features of diabetic foot ulcer

- **Neuropathic ischemia,** it would be located in metatarsal heads, heel and over the dorsum bounding pulse with warm dry skin, pink granulation covered by callus, There is no pain and sensation

- **Ischemic foot ulcer:** it would be located tips of nail edges, toes and lateral border of foot, skin will be cool with pulses, pale color and slough with poor granulation,

- **Neuro ischemic foot ulcer:** There is no sensation, skin will be cool and absent of pulse, poor granulation occur, callus prone to get necrosis in border of foot and toes[23]

WARNING SIGNS OF DIABETIC FOOT ULCER

If clients have diabetes with higher blood glucose level and Clients have corns, blisters and other foot problems it will be infected and develop ulcer

FIG.1.1.6: WARNING SYMPTOMS OF ULCER FOOT

Corns and **calluses** are thick layers of skin caused by too much pressure on same site, it will be infected.

Blisters can form wearing of unfit shoes or wearing of shoes without socks can develop blisters and ulceration.[24]

Ingrown toenails, the edge of the nail grows into the skin. The skin will be red and cut into the corners of toenails when it trim or shoes are tight.

Bunion, the big toe slants towards the small toe or bones near big grows in big size. The toe will be red, sore and infected.

Planter warts caused by viruses in bottoms of the feet.

Hammertoes, it will be developed by nerve damage and muscle weakness. It makes the tendons in the foot shorter and toes curl under the feet. They may get sores at the bottom of feet and anterior of feet

Dry and cracked skin, if blood glucose is high cracks easily allows germs growth and develops infection

Athlete's foot is infected by fungus. It develops itching, redness and cracking of skin and spreads to toe nails and make it thick yellow, hardening skin.[25]

Diabetes affects the feet:

There are two problems occurring because of diabetes and it will affect the feet.

Diabetic neuropathy:

Uncontrolled blood glucose can damage the nerves. If we have damaged nerves in the legs and feet, we cannot feel pain, cold or heat. This sensation is called sensory neuropathy. We cannot feel the injury or cut on the foot, the cut can be get infected. The same time muscles of the foot function improperly, because of neuropathy. It will develop foot ulcer.

Peripheral vascular disease:

Increased blood glucose level affects the flow of blood. Inadequate blood supplies take a long time to heal injury or cut. Reduced blood flow to arms and legs are called peripheral vascular disease and it will develop gangrene or diabetic ulcer foot.

Feet skin changes:

Increased blood glucose can cause dry skin of the foot. Skin will get easily crack and peel.

Diabetic foot care and examination

Inspect feet daily, observe the feet in front of the mirror daily and check foot shape, skin color, blisters, bruises crackling, cuts, peeling of skin, ingrown toe nails, prominent veins or injury ,swelling of skin, discoloration.

Wash feet daily, wash feet with lukewarm water and mild soap, dry between toes, use moisturizing cream keep the skin soft and supple but don't apply cream in-between the toes.

Cut nails carefully cut the nail straightly and trim the edges. Don't cut shortly, it will form ingrown toe nails

Check foot wear daily, check shoes, socks and stockings for damage before wearing. Small stones and nails irritate and damage the skin. The shoe should be in proper size, soft uppers and roomy at the toes. Always wear clean socks without damage. If feet cold sensation felt at night, immediately wear socks. Never use heating pad or hot water bottle. Never walk by bare foot. Always wear slippers and keep the feet warm and dry. Do not keep the feet get wet in snow or rain.[26]

Avoid burning your feet, The diabetic people do not able to feel heat, cold and pain in the feet. If you use electric blanket or heater, switch off everything before go to bed. Check the bathwater temperature before stepping in to it.[27]

Diabetic foot ulcer examination

- Check the ulcer size, depth, site, and appearance of wound.
- Observe any muscle and bone deformity.
- Find the color of wound, may be yellow, red, pink or black
- Observe the presence of exudates, or necrosis or gangrene
- Detect any malodor of wound discharge
- Monitor the systemic signs and symptoms and pain sensation
- Measure the wound edges, edema, erythema, maceration, callus, undermining.

TEST FOR DIABETIC FOOT SENSATION

a. **By biothesiometer**

This test is used to assess the sensation of the feet a probe will be applied on the great toe of the foot and made it to vibrate through electronically. The intensity of the vibration augmented slowly by tuning the dial and the client is asked to say soon when the sensation of vibration felt. The point in dial is recorded when the vibration felt. The biothesiometer reading has from 00 – 50 volts. The sensation felt with lower volts is ideal it indicates that peripheral nerves are not damaged, it is meant that peripheral nerves are preserved. It's the commonest finding in youngsters. When the age get advances the readings get increases, it still increased in case of neuropathy. This finding helps to identify early stage of neuropathy and to prevent neuropathic ulcer.[28]

b. Monofilament touch test

A standardized monofilament is pressed on the sole of the foot. If the filaments bents it is equivalent to ten gram weight. The filament is pressed all over the sole of the foot wherever the sensation is lost with filament test that part may under high risk to develop neuropathic ulcer. Monofilament test is cost effective and easy to practice compared with biothesiometer.[28]

c. Ankle Brachial Index

For Systolic blood pressure both arm and leg are measured. Blood pressure of arm is called brachial blood pressure and leg is called ankle blood pressure. Ankle brachial is calculated dividing ankle systolic blood pressure by brachial systolic blood pressure. Normal Ankle Brachial Index is 01 to 1.2, 0.6 to 0.9 consider moderate risk of vascular ulcer. Less than 0.6 with the considered as high risk to develop vascular foot ulcer.[29]

COLLABORATIVE CARE OF DIABETIC FOOT ULCER

Tissue debridement

There are many types of debridement used for diabetic foot ulcer. It comprises surgical debridement, sharp debridement, larval debridement, autolytic debridement and hydro surgery. Wound debridement is 4 components to wound bed preparation, which have different types of pathological abnormalities in chronic wound.[30]

Sharp debridement

It is one of the local methods with use of scalpel, scissors and forceps. The advantages of debridement are removing the slough and necrotic tissue, decrease pressure, drain the pus and simulate wound healing.[30]

Larval therapy

It is one of the traumatic methods of remove the slough and engulfs microorganisms in the ulcer site. The larvae of the green bottle applied on the sloughed ulcer site by specially trained practioner only. But it will not remove the callus.[31]

Hydro surgical debridement

This method forces water or saline into a nozzle to create energy cutting beam. It removes the devitalized tissue in the ulcer site.[32]

Autolytic debridement

It is one of the natural methods of moist wound dressing and removes the necrotic tissue.[32]

Topical Antimicrobials

Topical antimicrobial agents raise the wound bioburden and decrease the bacterial load and protect the ulcer contamination. It prevents spread of infection to tissue.[33]

Wound dressing

There are many methods of wound dressing like hydrocolloids, foams, iodine, hydro gels, silicone and polyurethane film.[33]

Polyhexamethylene biguanide

It is used for low to high exuding wounds. It reduces the infection.[33]

Alginates

It absorbs fluid from wound site. It creates autolytic debridement and controls moist environment.[34]

Honey dressing

It hydrates the wound bed and control moist environment. It is used for low to moderate exudated wound.[34]

Protease modulating dressing

It acts on wound positively or negatively and controls ulcer protease levels.[34]

Silver dressing

It contains silver and or silver sulfadiazine cream base. It reduces wound infection and improves the wound healing.[32]

Platelet-Derived Growth Factors

It is topically used to promote wound healing.[32]

Miscellaneous topical agents

Sugar, antacids, vitamin A and vitamin D topically used for healing.[32]

Hyperbaric Oxygen Therapy

Hyperbaric Oxygen Therapy is an efficient method to heal the diabetic foot. It increases wound site tissues hypoxia, improve perfusion, decrease the edema, regulate inflammatory cytokines, enhances fibroblast proliferation, develop angiogenesis,

collagen formation. It treats soft tissue and bone infections by mechanisms destroy microorganisms, activate leukocyte and macrophage function. It reduces the amputation of diabetic ulcer foot.[33]

Vacuum-assisted closure therapy

"Vacuum assisted closure" is the recent trend in the management of diabetic foot ulcer. An electronic device vacuum pump used to apply the negative pressure across the ulcer area. It changes wound size and activate granulation. Vacuum-assisted closure therapy also maintains a sterile, controlled resting environment, exudations wound surfaces. It has been done by wound connected with an intermittent vacuum producing device. The wound covered by sealed dressing, the tip of suction tube kept at the wound site and connected to the suction device. The device produces intermittent and or continuous low atmospheric pressure. The wound is connected with a collection chamber and the wound discharges and exudates collected in the collection chamber.[34]

Skin grafts

Allograft and autologous graft are used for covering the wound and promote wound drainage of serum.[35]

Tissue cultured skin substitutes

Derma graft is applied for diabetic foot ulcer. Xenograft, a cellular collagen matrix used for no infected ulcer.[35]

Infrared radiation

It is electromagnetic spectrum and exposes the heat through light. There are three categories.

- Near infrared
- Mild infrared
- Far infrared

It is not visible light and penetrates the “tissue, bones, muscles, joints”. Infrared also called low level laser therapy or biostimulation or photobiostimulation.[36]

Infrared light absorbed by photoreceptors in cells. It stimulates metabolic events in cellular level. The light accelerates the blood flow, increases oxygen carrying capacity and nutrients supply to cells. It results regeneration started and inflammation and pain also controlled.

Infrared healing mechanism

Infrared rays directly focus the body heals the illness and no other drugs included in this care. The light rays enter into the skin and immediately release the nitric oxide. Nitric oxide dilates the blood vessels and reduces the blood clot formation. It enhances the blood circulation in ulcer area and increase the oxygen supply. All the diabetic clients have inadequate nitric oxide because of insulin low level in blood vessel. Infra red release the nitric oxide and increase the healing of diabetic ulcer foot.[37]

Assessment during infrared application[38]

- Check the skin sensitivity
- Find medical history of mood disorder
- Check underwent photosensitizing drugs
- Check with porphyria enzyme disorder

- Check blood glucose level and blood pressure

Benefits of infrared[36]

- ❖ Destroy the dead bacteria and dead cells and raise the phagocytosis.
- ❖ Activate the lymphatic system and prevent the lymph node enlargement
- ❖ Activate the fibroblast formation and stimulate the synthesis of collagen elastin, proteoglycons.
- ❖ Develop the new connective tissue and capillaries.
- ❖ It fastly releases the ATP and cellular energy.

Indications of infrared radiation[39]

- ➢ Bed sores
- ➢ Burns
- ➢ Diabetic ulcer
- ➢ Acne
- ➢ Psoriasis
- ➢ Eczema
- ➢ Lesions

Insulin Dressing

Topical application of insulin in open wound increase healing of ulcer. Topical use of insulin stimulates keratinocytes and circulation endothelial way. Insulin like growth factor enhances PI3K-Akt-Rac1 signals and raises the epithelization and angiogenesis. It accelerates diabetic wound healing. It results promote the wound healing.[40]

Metronidazole dressing

Topical use of metronidazole solution promotes diabetic ulcer healing. It treats the anaerobic infection and reduces tissue edema. It prevents anaerobic infection and eliminates malodor.

Bio-fil-AB suggested combination of mupirocin and metronidazole for effectively heal the diabetic ulcer foot cost effective manner.[41]

WORLD DIABETES DAY

Every year, November 14 world diabetes day has been celebrated to create an awareness regarding diabetes mellitus by IDF and WHO. World diabetes day is observed by 230 associations of IDF and 160 nations and territories, all the states of United Nations, health organization, persons with diabetes and their families, diabetes health organizations, society, and community. The blue circle is the logo of the world diabetes day. The logo indicates the sky and reflects unity of world diabetes people. Healthy living and diabetes is the theme for world diabetes day from 2014 to 2016.the goal of diabetic day creates awareness regarding risk factors, warning signs, lifestyle modification, diet, exercise, medications, treatment and control of complications of diabetes.[42]

S.Prabhudeva (2013) viewed his article about 'diabetes day message' Asian Indian have clinical and biochemical abnormalities. It increases insulin resistance, abdomen adiposity, lower adeponectin and high level C - reactive protein. This factors increase the risk of diabetes and heart disease. The campaign arouse and motivate local population to encourage and propagate health education and lead activities to strengthen

knowledge among people that diabetes is a world level serious problem and develops life threatening threat for all.[43]

Ramesh Varma et al (2012)[44] Government of India organized National Diabetes Control program 1987 but it was failed due to inadequate fund. The program restarted on 1995 with 12 lakh with following objectives,

1. Control and prevention of Non Communicable diseases.
2. Create an awareness regarding lifestyle modification.
3. Early identification of Non Communicable diseases.
4. Improve the capacity of health system to manage Non Communicable diseases.

The pilot program has been launched in ten districts of ten states with the aims of promotion of health and health education management at different settings.

Program planed the following interventions

1. Health Promotion and education regarding health among the community.
2. Early detection of high risk people through screening.

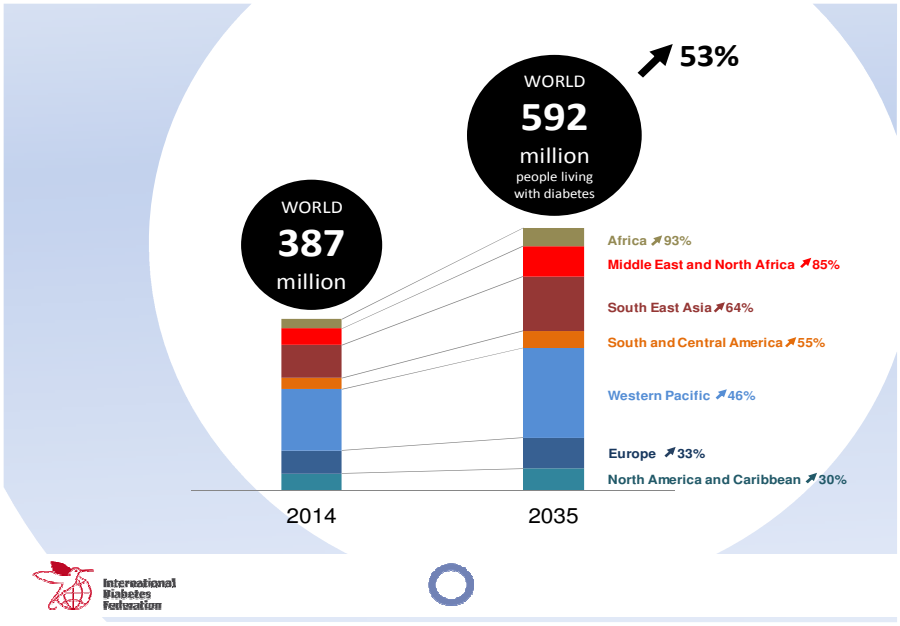
In 2008, India launched the National Program on prevention and control of diabetes, cardiovascular diseases and stroke with the following aims,

1. Early detection of non-communicable diseases
2. Awareness creation and control of diabetes and diabetic foot ulcer.

The program implemented in six hundred and twenty six districts in all states, union territory, all health centers and medical colleges.

1.2. NEED FOR THE STUDY

FIG.1.2.1: GLOBAL LEVEL DIABETES



Diabetes and related diseases are the world wide challenging and economic consuming condition, International Diabetic Federation 2013 statistics revealed that, more than 387 million people had diabetes, the number of people with diabetes was increasing in every country, half of people with diabetes are undiagnosed, 4.8 million people died due to diabetes, more than 471 billion USD were spent on healthcare for diabetes.[45]

American diabetes care association 2010. Diabetes can go silently undetected for a long time without symptoms. Many people first time become aware that they have diabetes when they develop one of its potentially life-threatening complications, such as heart disease, blindness or nerve disease or foot ulcer Worldwide in 2013, projected that nearly 382 million people under the diabetes for frequency of 8.3percent. North America and the Caribbean are the countries with the higher incidence of 11percent having 37 million population with diabetes. Middle east and north Africa have 9.2 percent in 35

million population with diabetes,138 million western pacific population have diabetes There are thirty-five nations out of 219 nations in higher ratio of diabetes in western Pacific, Middle East and North African areas.[46]

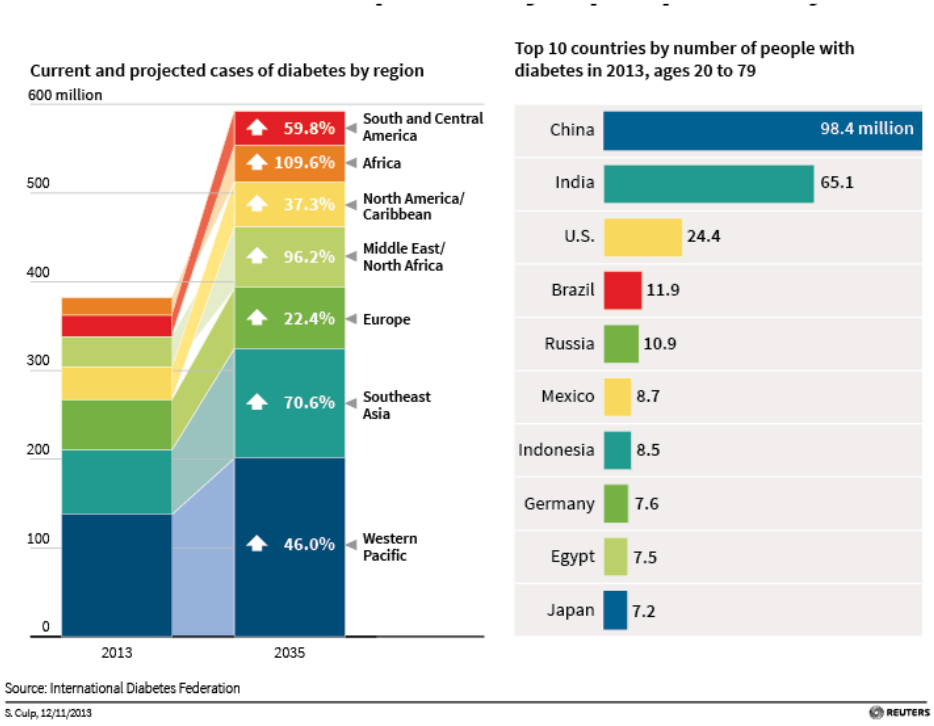


Fig.1.2.2: World Diabetes cases expected to jump 55 percent by 2035

TOP TEN INCIDENCE RATE OF DIABETES IN GLOBAL LEVEL (2014)[47]

AUSTRALIA:

In Australia, Native people have four times highly occurrence and frequency of diabetes than the foreign people.

CHINA:

Chinese people one out often has diabetes. In 2010, reported ninety two million adult populations have the diabetes, with one hundred and fifty million population

showing signs and symptoms of diabetes. The occurrence of diabetes increased very fast in china.

WESTERN PACIFIC REGION

TABLE .1.1.1: PERCENTAGE OF DIABETIC PEOPLE IN WESTERN PACIFIC REGION

COUNTRY	PERCENTAGE
Tokelau	37.5
Federated States of Micronesia	35
Marshall Islands	34.9
Kiribati	28.8
Cook Islands	25.7
Vanuatu	24
Saudi Arabia	23.9
Nauru	23.3
Kuwait	23.1
Qatar	22.9

CANADA

In Canada nearly two million people were affected by diabetes mellitus, out of this 20 percent were above 70 years of age with this 30 percent were purely Canadians. Approximately 14 to 24 percent have diabetic ulcer foot followed by amputation. They spent nearly 1.5 billion for amputation of foot ulcer.

AFRICAN REGION

TABLE 1.1.2: PERCENTAGE OF DIABETIC PEOPLE IN AFRICAN REGION

COUNTRY	PERCENTAGE
Réunion	15.4
Seychelles	12.1
Gabon	10.7

TORONTO

Nearly 150 thousand populations have diabetes out of this 10 thousand people prone to get non healing diabetic ulcer foot and 1000 client underwent limp amputation.

EUROPE

TABLE 1.1.3: PERCENTAGE OF DIABETIC PEOPLE IN EUROPE REGION

COUNTRY	PERCENTAGE
Turkey	14.9
Montenegro	10.1

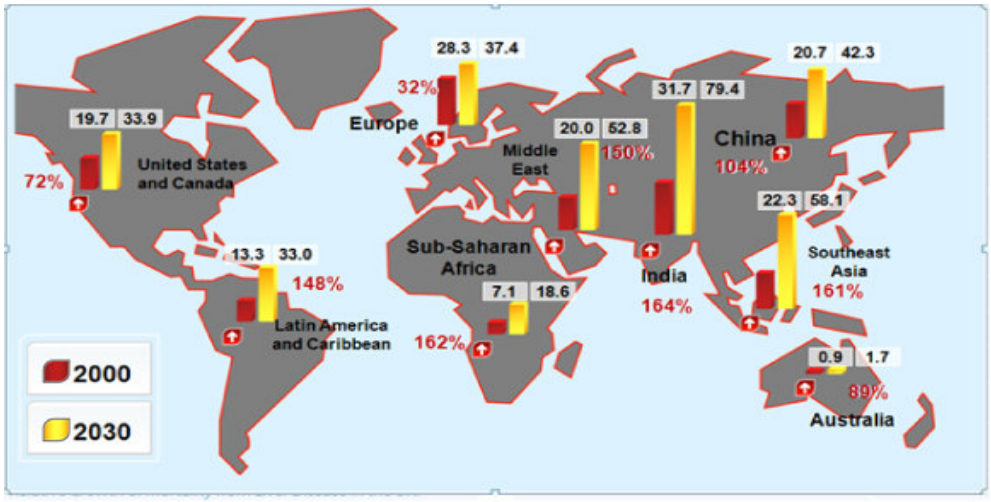
NORTH AMERICA AND CARIBBEAN

TABLE 1.1.4: PERCENTAGE OF DIABETIC PEOPLE IN NORTH AMERICA AND CARIBBEAN REGION

COUNTRY	PERCENTAGE
Belize	15.9
Guyana	15.8
Curacao	14.5

Sources: Health Intelligence, 2013

FIG.1.2.3: WORLDWIDE PREVALENCE OF DIABETES



WORLDWIDE PREVALENCE OF DIABETES, WHICH IS LIKELY TO MIRROR FATTY LIVER DISEASE (MILLIONS), ADAPTED FROM HOSSAIN P ET.AL, NEW ENGLAND J. MEDICINE 2007, 356, 213-5.

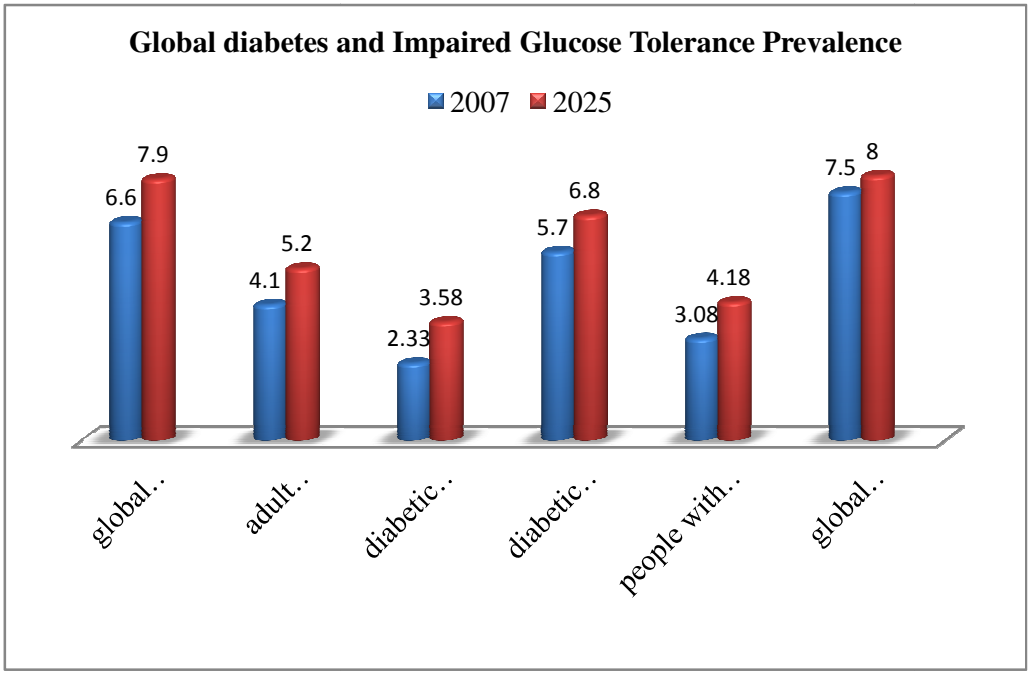
National diabetes statistical report on 2014, the year of 2012, 29.1 million American people had diabetes, out of this21.0 million were known cases, and 8.1 million were unknown case of diabetes. In an average 1.25 million population who are children and adult got diabetes. The incidence of diabetes in 2012 was 1.7 million newly diagnoses/year; in 2010 it was 1.9 million. The prevalence of 86 million population over the age of 20 and elder people had diabetes and rise from 79 million in 2010 censes.

TABLE 1.1.5: PREVALENCE OF DIABETES IN UNITED STATES (2010)

VARIABLE	QUANTITY OF PEOPLE WITH DIABETES
20 years and Above	25.6 Million
65 years and Above	10.9 Million
Male	13.0 Million
Female	12.6 Million
Non Hispanic white people	15.7 Million
Non Hispanic black people	4.9 Million

Sources: CDC and prevention, National diabetes Fact sheet 2011[48]

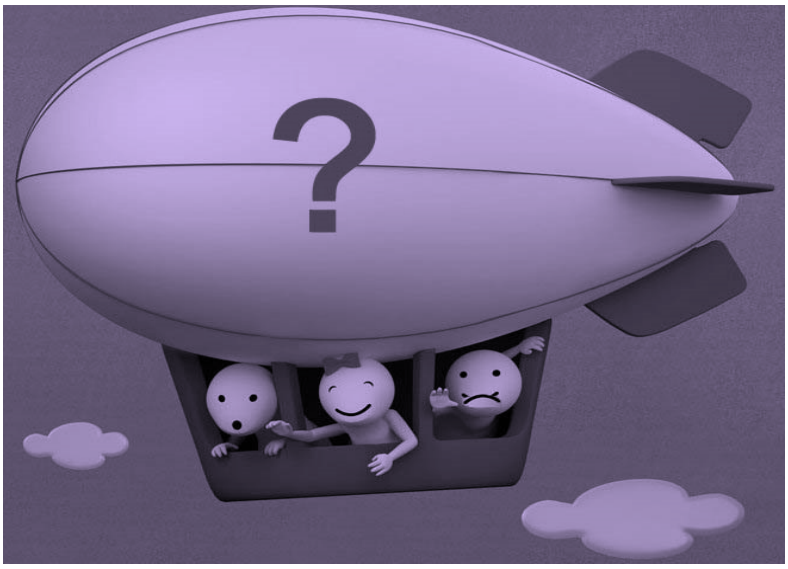
FIG.1.2.4: GLOBAL DIABETES AND IMPAIRED GLUCOSE TOLERANCE PREVALENCE



Sources: Diabetic Atlas 2007-3rd edition

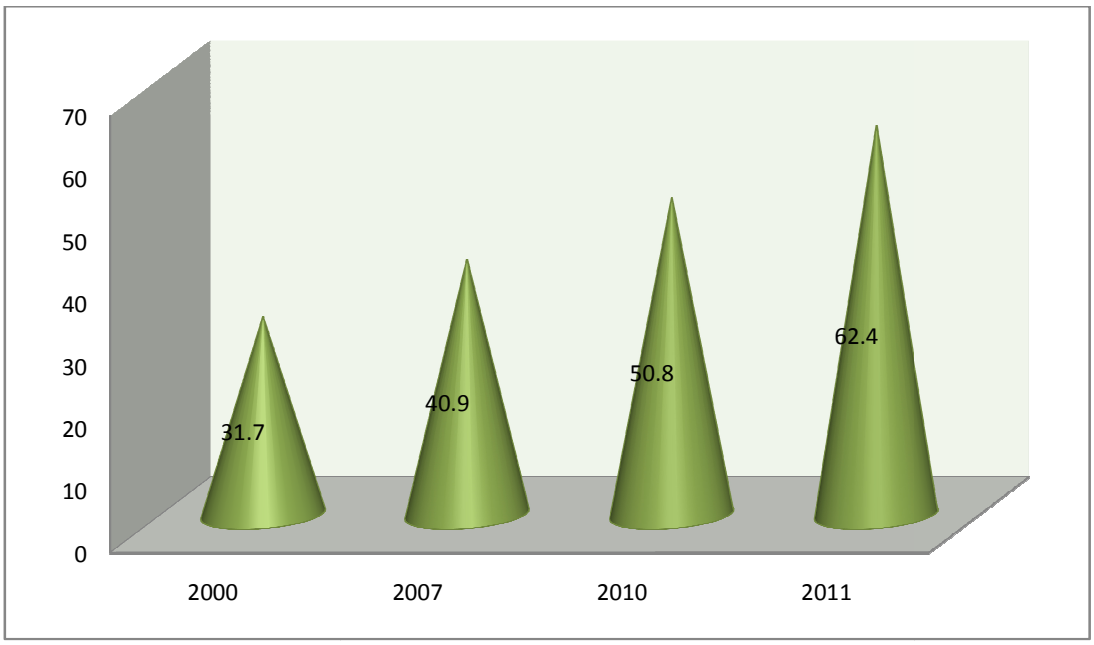
INDIA SITTING ON DIABETES BOMB

Fig.1.2.5: India sitting on diabetes bomb



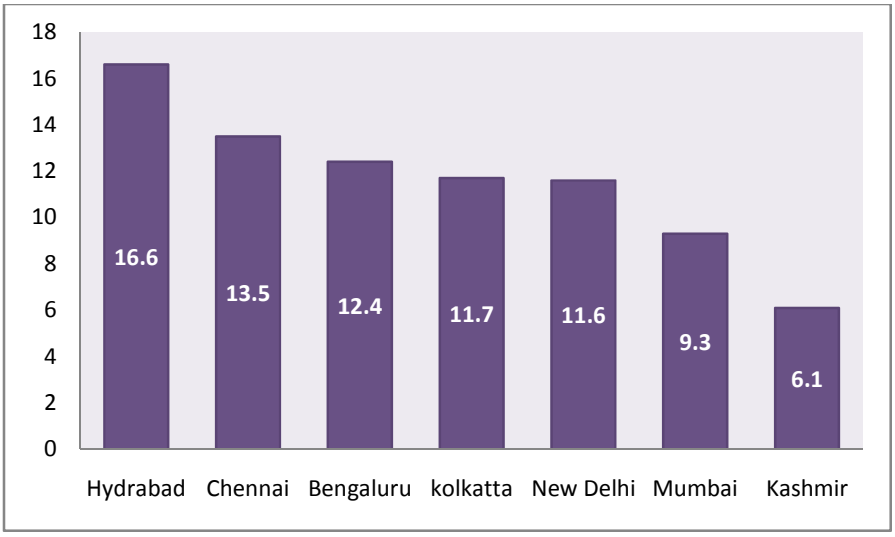
Indian diabetes foundation said that India is the home to the second highest number of people living with diabetes in the world after China. Today there are over 45 million people grappling with this disease, and the numbers showed no signs of reduction in the incidence. India will be the capital of Diabetics in the year 2025. It will jump 25 million to 57 million in 2025. In India most of the foot problems are associated with Neuropathy & Infective rather than Vascular. The prevalence of foot complications such as Neuropathy is 15%, Peripheral Vascular disease 5% & infections 7.6%. In India, 55% of Foot Ulcers are Neuropathic (nerve involvement), 35% are Neuroischaemic and 10% are ischemic.[48]

FIG.1.2.6: YEAR WISE PROGRESS OF DIABETES IN INDIA (Million)



Source: The Hindu daily newspaper (29th September 2011)[49]

FIG.1.2.7: STATEWISE DIABETES POPULATION PERCENTAGE IN INDIA (2009)



Source: National Urban Health Administrator 2009[49]

TABLE 1.1.6: DIABETES AND PRE DIABETES PREVALENCE IN INDIA-2011

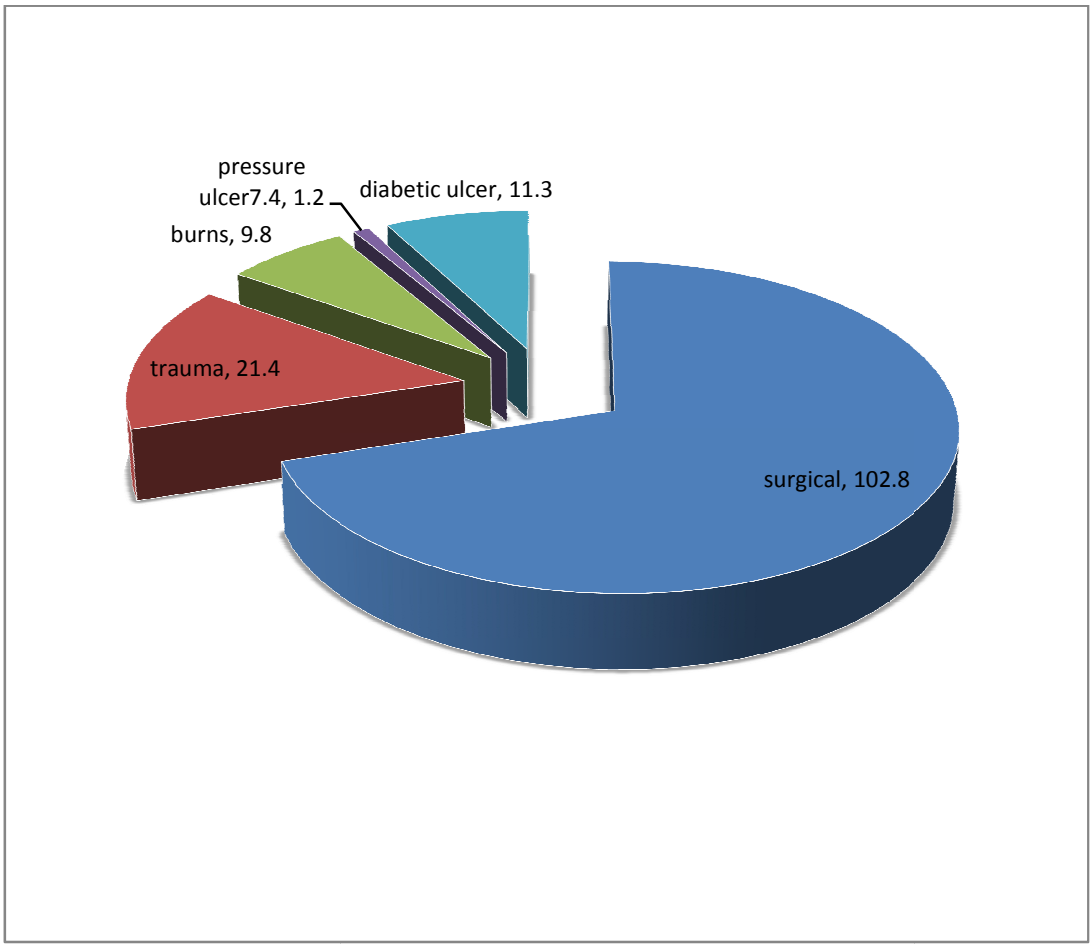
STATE	DIABETES (Million)	PRE-DIABETES (Million)
Tamil Nadu	4.8	3.9%
Maharashtra	6.0	9.2
Jharkhand	0.96	1.50
Chandigarh	0.19	0.13

Source: Diabetology-2011

Anjana 29th September 2011, Viduthalai newspaper reported that forty eight lakh people had diabetic in Tamil Nadu.[49]

In **Tamil Nadu one out of ten** people are diabetic. The survey was conducted by "Madras Diabetic Foundation" and the same was supported by ICMR. Also they have said that two in twenty five people are in the pre diabetic stage. This shows that forty two lakh peoples have active diabetic and thirty lakh pre diabetic stage. The team also studied the diabetic control level. Around one third have good control over their blood sugar. One third and one third had average and poor control over their blood sugar respectively. Additionally they have reported that in urban area two out of three aware about diabetes but in rural people one out of two about diabetes.[49]

FIG.1.2.8: COMPARISON OF DIABETIC FOOT ULCER WITH OTHER ULCERS IN WORLD WIDE



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Source: Seeking alpha.com

DIABETIC FOOT ULCER IN INDIA

Director of public health (2011) conducted the study of comprehensive public evaluation of the non communicable diseases in rural Tamil Nadu, 13.5% with diabetes at 1, 83,914 population. According to survey Diabetes affected people 1, 23919 male, 170242 female out of 2, 94, 61 population.[50]

Diabetic foot ulcer clients who have not taking care of foot increases the death rate compared with the clients those who take care their foot. Out of 3619 diabetic clients, fifty eight per thousand deaths occurs in every year. Most of the ulcer develops ball of the foot, toes or the pressure points of foot approximately twenty five percent foot ulcer. Nearly fifty percent diabetic foot developed foot infection and 20 percent of infected feet require amputation. Most of fifty percent of population get amputated remaining leg in two years.

Every thirty second-five percent diabetic people develop foot ulcer

Every ten second-one new case of diabetic foot ulcer

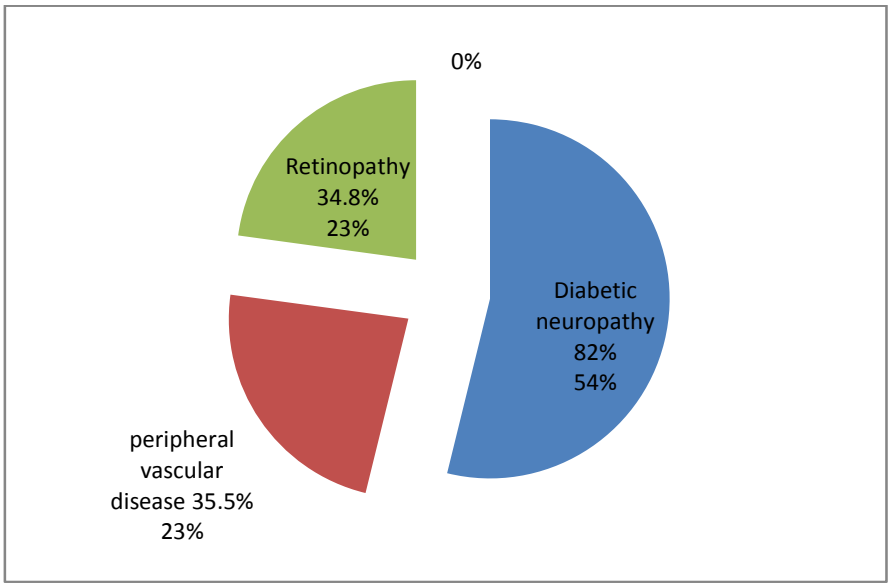
Every thirty second-one diabetic foot amputation

Every ten second – one diabetic death[57]

DIABETIC FOOT ULCER IN TAMIL NADU

M.V.HOSPITAL, Chennai 2011 studied regarding screened diabetes 1,295 amputees, all diabetics, from31 hospital across the country. Average age of these patients was found to be 53 above knee amputations 60(4.9%); below knee 80(6.6%); minor amputation 1.068 (88.4%) average years with diabetes 10 years.[50]

FIG.1.2.9: AMPUTATION OF DIABETIC FOOT WITH REASONS



Source: The Hindu, Sept.2011

1.3 STATEMENT OF THE PROBLEM

A comparative study to assess the effectiveness of Infra Red Radiation, Insulin Dressing and Metronidazole Dressing in healing of diabetic ulcer foot at MAPIMS.

1.4 OBJECTIVES

1. to assess the pretest condition of diabetic ulcer foot among patients with Diabetes mellitus
2. to evaluate the effectiveness of infra red radiation application, insulin dressing and metronidazole dressing in healing diabetic ulcer foot among patients with Diabetes mellitus.

3. to compare the effectiveness of infrared radiation with insulin dressing and metronidazole dressing in healing of diabetic ulcer foot among patients with Diabetes mellitus.
4. To associate the effectiveness of intervention in healing of diabetic ulcer foot with the selected demographic variables.

1.5 OPERATIONAL DEFINITIONS

1.5.1Assess

It refers to wound inspected by modified Bates Jensen wound assessment tool.

1.5.2 Effectiveness

It refers to improvement in healing of diabetic ulcer foot among diabetes patients with infra red radiation, insulin dressing and metronidazole dressing which will be evaluated on the pre and post intervention assessment.

1.5.3 Foot Ulcer

It refers to ulceration surface of tissue, caused by arterial blood insufficiency or excess pressure or traumatic injury in the foot.

1.5.4 Diabetic

The clients who have increased glucose level in blood due to defect in insulin secretion or target function or both.

1.5.5 Insulin Dressing

Insulin is a hormone where it secreted in beta cells of pancreas. 0.1 ml of Regular Insulin diluted with 10ml normal saline and it applied over foot ulcer for the period of 10 days.

1.5.6 Metronidazole Dressing

Metronidazole is a drug which reduces the infection caused by aerobic bacteria. 10ml of metronidazole diluted with 100ml of normal saline and it should be applied over the foot ulcer for 10 days.

1.5.7 Infrared Radiation

It refers to infrared lamp radiation which is an electrically charged unit and radiates the therapeutic doses of heat. The lamp was placed 18 inches distances from the clients and apply the heat in foot ulcer over15 minutes for 10 days.

1.5.8 Healing

It refers to process of granulation and regeneration of defective subcutaneous tissue and skin

1.6 Hypotheses

H_1 – There will be significant improvement in healing of diabetic ulcer foot.

H_2 – There will be significant difference between healing of diabetic ulcer foot with infrared radiation, insulin dressing and metronidazole dressing.

H_3- There will be significant association of post test score of diabetic ulcer foot.

1.7 ASSUMPTIONS

1. Insulin dressing, metronidazole dressing infrared radiation may improve the healing of diabetic foot ulcer. The rate of healing may vary with different intervention.
2. Insulin dressing, metronidazole dressing infrared radiation may prevent the complications of diabetic foot ulcer.

1.8 DELIMITATION

The study was delimited to client with diabetic foot ulcer only.

1.9 CONCEPTUAL FRAMEWORK

Conceptual frame work or model explains the schematic or symbolic representation of viewpoints. Model can be of verbal, schematic and quantitative in nature. They have high level of abstraction than that of physical model. They are no longer having physical forms recognizably. Schematic models can be diagrams, arts, pictures or graphical representation.[52]

Quantitative models can be mathematical representation. Frame work can be used to explain the relationships between the concepts and project research process.

Kerlinger views theory as a set of interrelated concepts that gives systematic view of a phenomenon that is explanatory and predictive in nature. According to Wiedenbach, the practice of nursing comprises a wide variety of services, each directed towards the attainment of one of its three components.

STEP – I: IDENTIFICATION OF THE NEED FOR HELP

There are four components in Wiedenbach prescriptive theory that includes general information, central purpose, prescription and realities.

(a) General Information:

The general information includes participant's information and the nature of the subjects. Which comprises the demographic variables like age, sex, religion, education, occupation, income, wound condition, duration of foot ulcer and residential area. Also the inclusion and exclusion criteria for selection of samples.

(b) The Central Purpose:

Central purpose refers to what the nurse wants to accomplish. It's the quality of health that the nurse wants to attain to their clients. Central purpose is the overall goal which the nurse wants to achieve. Here the central purpose is to heal the diabetic foot ulcer.

(c) Prescription:

It refers to the plan of care, the nature of action that will fulfill the central purpose. It is a directive to activity. Prescription specifies both nature of activity that may leads to achieve the nurse's central purpose. The prescription stipulates the wide general action relevant to implementation of basic concepts along with it suggest a form of behavior needed to do the action in accordance with central purpose. Here the prescription is infrared radiation, insulin dressing and metronidazole dressing which are relevant in healing of diabetic ulcer foot.

STEP – II: MINISTERING THE NEEDED HELP

Reality:

The realities are the immediate situation that influences the fulfillment of the central purposes. The reality consists of all factors like "physical, physiological, emotional, psychological and spiritual" that plays in a situation on which nurses activity take place at a given time. Nurse should consider the realities of the situation in which she is to provide nursing care. Wiedenbach defines the five realities that are the agent, the recipient, the goal, the means and the facilities.

1. **The Agent:** who is the practicing nurse or her delegate characterized by personal attributes, problems, capacities, commitment and competence in nursing. The nurse has few basic responsibilities that "reconcile her responsibilities about the realities", "to specify the objectives of her action in terms of behavioral outcome that may be readily attainable", practice nursing based on her objectives", and "involve activities towards the improvement in the nursing practice". Here the nurse investigator who has engaged in the study.
2. **The Recipient:** is the patient who is characterized by the personal attributes, problems, capacities, aspirations and ability to cope with the concern or problems being experienced. Here the patient is the nurse's action on behalf of the action is taken. Here it is the patients who are having diabetic foot ulcer.
3. **The Goal:** is defined that the desired outcome, the nurse wishes to achieve. The stipulation of an activity that focuses to the nurse's action and implies the reason for taking the action. Here it is to heal the diabetic foot ulcer.
4. **The Means:** Comprises the activities and devices through which the practitioners attain the goal. The means include skills, techniques, procedure and devices that

may be used to facilitate nursing practice. Here the means are infrared radiation, insulin dressing and metronidazole dressing over the diabetic ulcer foot.

5. **The Facilities:** Consists of the human, environmental, professional, organization facilities that not only make up the context which nursing practices but also constitutes. It is currently existing limits. Here the investigator utilized "Melmaruvarthur Adhiparasakthi Institute of Medical sciences and Research" hospital as a facilities for man and material power.

STEP – III: VALIDATING THAT THE NEEDED HELP WAS MET

It is validating that the needed help was delivered in achieving the central purpose. This step involves the post assessment done after ministering the help and the comparison / analysis to infer the outcome. This approach thereby enables the researcher to make suitable decision and recommended action to continue, drop or modify the nursing action. Here the investigator compared foot ulcer condition before and after stipulated period with three type intervention. Also within these three groups of clients wound were compared between then to predict the most effective treatment that had more impact on the wound healing.

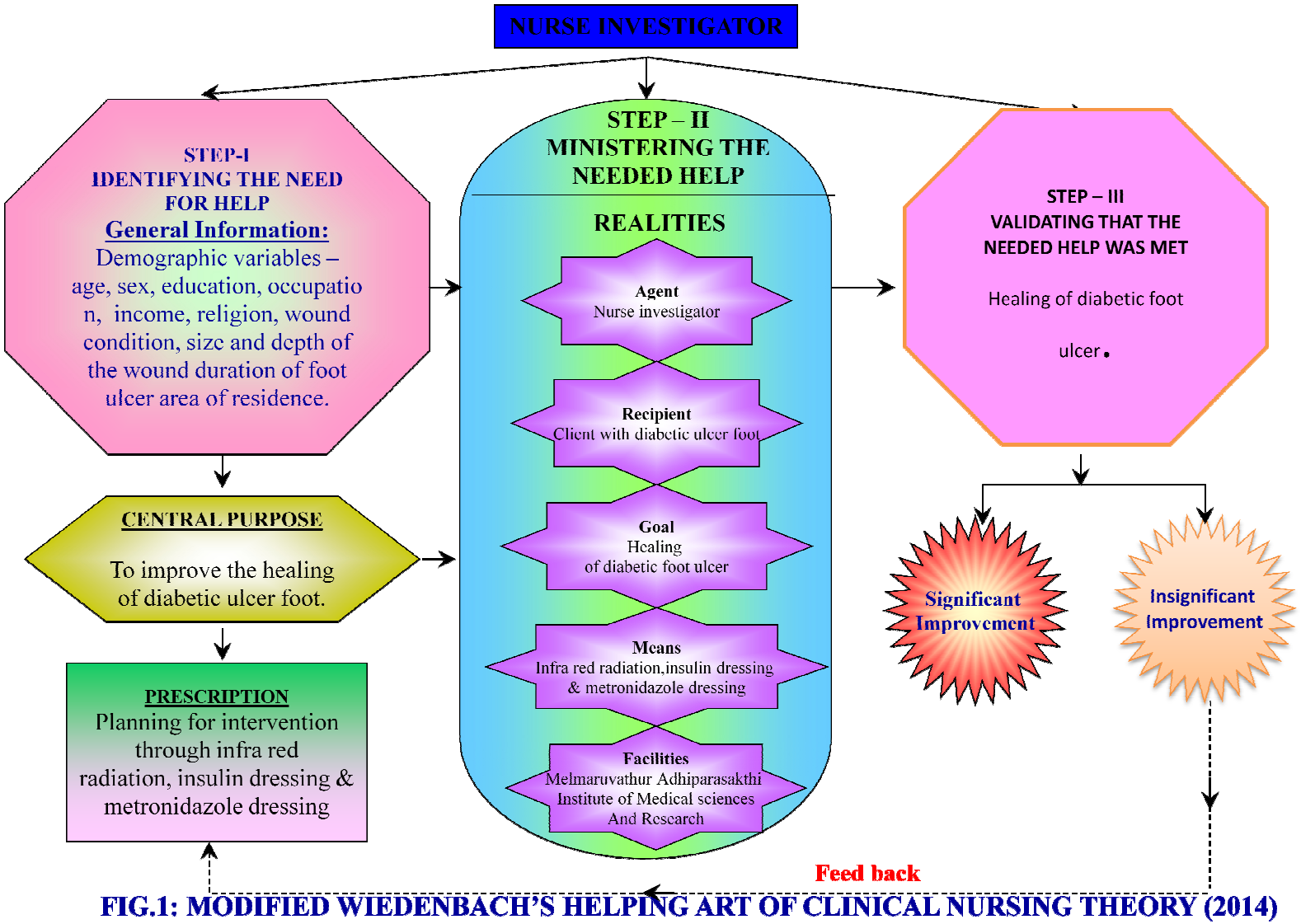


FIG.1: MODIFIED WIEDENBACH'S HELPING ART OF CLINICAL NURSING THEORY (2014)

SUMMARY

This chapter has dealt with Introduction, background of the study, need for the study, and statement of the problem, objective, operational definitions, hypothesis, delimitation and conceptual framework of the study.

1.10 OUTLINE OF THE REPORT

Further aspects of the study are presented in the following chapters.

Chapter II: Review of related literature.

Chapter III: Review Methodology which includes research approach design, setting, population, sample, and sampling technique, data collection, description of tools, validity and reliability of tools, pilot study, data collection procedure, and plan for analysis of data.

Chapter IV: Data analysis and data interpretation

Chapter V: Discussion

Chapter VI: Summary, conclusion, nursing implications, recommendations and limitations of the study.

The report end with bibliography and Appendices

CHAPTER – II

REVIEW OF LITERATURE

Review of literature is one of the essential steps in research process. Literature is to give the information to the readers regarding the study already done and the knowledge and the concept that have been already published on a specified topic. A literature review is a account and examine of the literature significant to a specific topic. It gives an outline of concepts, author's particulars, procedural methods, theoretical frame work, and tools of the concept, analysis of the study and suggestions of the topic. Literature assist guide to constant topic.

The literature review was based on an extensive survey of journals, books, online journals and electronic basis. This chapter deals with a review of research and non research literature relevant to the study are classified under the following headings.[53]

SECTION A- REVIEWS RELATED TO DIABETES MELLITUS

SECTION B- REVIEWS RELATED TO DIABETIC FOOT ULCER

SECTION C- REVIEWS RELATED TO METRONIDAZOLE DRESSING ON DIABETIC FOOT ULCER

SECTION D- REVIEWS RELATED TO INSULIN DRESSING ON DIABETIC FOOT ULCER

SECTION E- REVIEWS RELATED TO INFRAREDRADIATION ON DIABETIC FOOT ULCER

2.1 SECTION-A: REVIEWS RELATED TO DIABETES MELLITUS

A scientific article viewed that the prevalence of diabetes in 2000, 31.7 million, 20.8 million and 17.8 million in India, China and United States respectively. In 2030 diabetic population expected to increased 79.4 million, 42.3 million and 30.3 million in India, China and United States respectively.[54]

A scientific article reported that china is in the first place with 92 million diabetic people followed by 62 million diabetic people are residing in India. Metabolic surgery may reduce "in cretin's intestinal hormone" normalize glucose level in the blood. Metabolic surgery reduces 80 percent of diabetes.[55]

A scientific study assessed the awareness of diabetic foot self care in this study, descriptive survey research approach, non experimental design was used. Total of sixty diabetic clients were selected by convenient sampling technique. This study results reveals that, out of sixty, thirty eight people under the age sixty-one years, fifty seven percent people were women, fifty two percent people were not working people, thirty-three percent people were got above ten thousand and one, sixty eight percent people had known history of diabetic, eighty percent people had oral diabetic drugs and sixty eight percent of the clients had knowledge of foot care message from health system. The investigator found that 56.7 percent of the people had dry skin, 58.3 percent of the people had thickened toe nails,41.7 percent of the clients had burning sensation, 33.3 percent of the people daily check their feet,26.6 percent of the people check their feet calluses and blisters, Eighty five percent people daily wash their feet,28.3 percent people cut their toe nails.41.7 percent people check their inside the shoes, forty five percent people had correct size of shoes, 38.3 percent of the people were not used leather

slippers,45.8percent people were not used laces and buckles,76.6 percent of the people never use cotton socks in cool climate, seventy percent of the samples walked barefoot in home, sixty nine percent people had self- care behavior, six percent had adequate foot care and twenty five percent people had inadequate foot care.[56]

A descriptive study surveyed the risk status of coronary artery disease among diabetes. Sixty two clients were selected by purposive sampling technique. The study results showed that thirty nine percent and thirty two percent inadequate and moderate knowledge respectively. Sixty percent, eighteen percent and eleven percent had high risk, moderate risk and low risk of coronary artery disease respectively. The study reveals that create awareness of risk factors to prevent heart disease in diabetic people.[57]

A research that had reported in a scientific article to evaluate the effectiveness of fenugreek powder reduces the blood glucose level. Pretest and post test control group design utilized for this study. Totally thirty clients, out of this, fifteen clients were in experimental group under the treatment of fenugreek powder and remaining was in control group. Fenugreek powder reduces the absorption of carbohydrates and decrease insulin requirements. This powder reduces the glucose uptake from intestine and increase peripheral insulin sensitivity. The study results shown that pre test, fasting blood glucose, fourteen clients in control group and eleven clients in treatment group was two hundred milligram per deciliter and post prandial blood glucose nine clients in control group and ten clients in treatment group was two hundred and one milligram per deciliter and more. In post test results, 175 mg/dl for twelve clients in control group and twelve clients in treatment group respectively. The researcher found that there was difference in pre test

and post values in treatment group and there was no difference in pre test and post values in control group. She concluded natural measures reduce the blood glucose level.[58]

A descriptive survey studied the prevalence of diabetes in interior villages of Haryana. The result showed that 41.96 percent of people aged between 46 and 60 were diabetic. Out of that 19.36 percent were male and 16.98 percent were female. The mean fasting blood glucose level was 149.36, 147.43 males and females respectively and the mean post prandial blood glucose was 259.94mg/dl in males and 259.65 in females.[59].

One International reported that the diabetic population 98.4 million in India, 65.1 million in china and 24.4 million in United States. The statistics shows that higher range diabetic found at urban population. Lifestyle modification, obesity, dietary pattern and impaired physical activities are the major risk factor for the diabetes.[48]

A researcher in his Chennai based diabetic centers study reported that 50 percent diabetic population residing at villages, 30 percentages in town. 1:1.8 diagnosed and undiagnosed diabetic are residing in town area. 1:3.3 known and unknown cases are residing in villages.[60]

A group of investigators studied the prevalence of diabetes and the risk factors of pre diabetes in Bangladesh. 600 subjects were utilized in this study by two stage stratified cluster random sampling technique. Out of 83731 house hold subject, 17141 subjects were interviewed completely. Each sample interviewed regarding diagnosis and treatment of diabetes mellitus, and blood pressure, blood glucose level, height and weight also measured. The investigator found 56 percent were not known diabetes, 40

percent were known diabetes on regular treatment. Diabetes and pre diabetes develops age 35 and above. People between60 and 65 years in age were under high risk to develop diabetes and pre diabetes 1.64 times higher than in people aged between 35 and 39 years.[61]

A team of researchers in their cross sectional survey compared the knowledge on diabetes between rural and urban people. They found that people residing at rural area do not have adequate knowledge regarding diabetes. They have suggested conducting more screening camps, creating awareness regarding the risk factor of diabetes and pre diabetes and also the life style modification, diet and medications.[62]

An article viewed by the team of researchers that in global level, diabetes and cardiovascular diseases are the emerging problem and raise the coast of care. China and India have more number of populations with diabetes and cardiovascular diseases. In the past two decades, 80 percentage of cardiovascular and diabetic problems in the low and middle in income nations and mostly affects the youngsters. The following reasons like genetic factors, demographic changes, urbanization, industrialization, and lifestyle changes and environment plays the major role to enhance the problems. Nowadays government and non governmental agencies are formulating the objectives related to early detection and management, culturally population based care to prevent the global burden of diabetes and cardiovascular diseases and its complications.[63]

An investigator studied the self reported knowledge among diabetic patients. Totally hundred clients utilized for this study. The study reveals that 70.4 percent had

adequate knowledge about drug, diet, hygiene, exercise and practice of diabetic clients 64.3 percent moderate aspect of self-care activities.[64]

A team of investigators in their prospective case control study analyzed the risk factors of diabetes mellitus. The study was conducted selected poly clinics at Nagpur, India. 92 diabetic and 23 non diabetic clients were utilized for this study. They were monitored Body Mass Index, waist circumference and waist to hip ratio, blood pressure and skin fold thickness in both the groups. The investigator found that increased HDL, waist to hip ratio and cholesterol levels were risk factors to develop diabetes mellitus.[65]

A researcher in his Meta analysis analyzed 15 years diabetic related articles. He has reported that approximately 2.02 in thousand rural populations had diabetes. The prevalence of diabetes was 3.3 in 1000 males per year, 0.88 in thousand females per year. He has concluded that increased impaired glucose tolerance and impaired fasting glucose.[66]

An author in point viewed that, Type 2 Diabetes emergent rapidly in Asian people. Asian people have diabetes ant associated diseases and its effects in young age group compared to white people. The youngest people have more incidences of cardiovascular diseases and its risk factors and they have cost of burden related to diabetes in individual, society based country aspects level increased. In this study they suggested to create the community awareness regarding diabetes care, execute the programme and prevention of complications.[67]

An applied educational intervention aimed at patients with type 2 diabetes had improved their knowledge about diabetic foot care (P<0.0001 and P=0.011).[68]

A group of researcher in their descriptive survey studied the awareness regarding diabetes mellitus at Chennai. The result revealed that nearly 25 percent peoples not aware of diabetes, 40 percent people aware of diabetes, 22 percent people know about how to prevent diabetes and its management. Also they have reported that obesity and physical inactivity were the reason for diabetes. 40.6 percent subjects viewed that diabetes is due organ damage and 46 percent subjects said "it is the temporary phenomena".[69]

An article stated that old age people gets diabetic foot ulcer due to chronic diabetes, peripheral arterial diseases, neuropathy, foot deformity, gait abnormality and retinopathy. Early detection and proper foot care may prevent amputations. Treatment of diabetic foot ulcer is offloading the infection, wound debridement, control of blood pressure and dyslipidemia, and avoid alcohol and smoking, aware of glycemic control and special attention regarding diet to reduce the risk of amputations.[70]

A survey conducted by the team of researcher stated that type 2 diabetes rapidly increased and health care expenditure also increased. In developing countries spend more amounts for diabetes care. Diabetic clients allocate more budget 15% to 25% for diabetes care. Effective treatment is the paramount important to prevent the complications. They prioritized three levels of treatment with cost effectiveness.[47]

A population based survey reported that, recently High prevalence of diabetes Asian Indians, national non communicable diseases examined of risk factors in different various areas in India, totally 44,523 peoplewith15 years of age to 64 years of age from east, central, west, north, south places .The investigator were selected 15,239 samples in urban area, 15,760samples in slum area, and 13,524 samples in rural areas .The risk factors observed by " WHO STEPS" and self-reported diabetes diagnosed by a doctor and the prevalence of diabetes in 3.1 percent in rural areas,3.2percent in slums areas, 7.3 percent in urban areas He concluded The rural areas low prevalence 0.7percentbecause of without abdominal obesity physical activity and increase rate 11.3 percent in urban areas people with abdominal obesity and less physical activity.[71]

A longitudinal study surveyed the diabetes population rise based on age in years between 2000 and 2030.in this data collected from 191 states membership of "world health organization" and united country people. The town and rural people were participated separately for developing nations. In this study result diabetes for all age groups globally occur 2.8percent in 2000 and 4.4 percent in 2030 and population with diabetes estimated to up from 171million in 2000 to 366 million in 2030. The frequency of diabetes is increase in males than females. But there were female with diabetes than male. Diabetes occur nearly all people above the age of 65. The study concluded that diabetes wave will keep on rising with obesity complications.[72]

A predictive future oriented study reported that current 4 percentages diabetic adult population in1995 may get increased to 5.4% in 2025. The adult population 135 million in 1995 may get raised to 300 million in 2025. Most of the diabetic people age

ranges between 45 and 65 years in that more female than the male to be affected by diabetes.[73]

A prospective extended population based survey regarding diabetes mellitus and coronary artery disease utilized 17232 samples with age group between 30 and 70 years. They reported that 26.2 percent were males with diabetes, 21.5 percent were females. 25.5 percent of urban population 19.5 percent in rural population was diabetic. 27.9 percent population was undiagnosed to diabetic.[74]

2.2 SECTION-B: REVIEWS RELATED TO DIABETIC FOOT ULCER

A randomized control trial evaluated the effectiveness of education and training program on diabetic foot care. The study was conducted at diabetes and obesity care centre in Punjab. Total of 132 diabetic clients were included in this study. Sixty one were kept in interventional group and they were intensive education training and follow customized foot wear. Out of 61 samples 34 were males and 27 were females. Seventy one were under control group, they underwent standardized oral and written message regarding diabetic foot ulcer. Out of 71 samples 41 were males and 30 were females. After a year 31 percent diabetic client in the control group had developed foot ulcer. In the intervention group only 18 percent developed diabetic ulcer. They have concluded that intensive education regarding diabetes and its related complications and proper follow up can significantly reduces diabetic foot ulcer.[75]

A group of researchers in their interventional study evaluated the effectiveness of topical application natural honey on healing of diabetic ulcer foot. Total of 12 clients were included for this study. Client's wounds were cleaned by normal saline and covered

glycerin impregnated gauze. After four weeks of intervention they have concluded that topical application honey may be effective and coast effective for the management of diabetic foot ulcer.[76]

A randomized control trial compared the effectiveness local use of Phenytoin with regular treatment among 100 diabetic foot ulcer clients. Fifty clients were treated with topical Phenytoin and remaining was treated with regular treatment. After fourteen days of treatment they found that 84 percent wounds were granulated in the treatment group ant in the control 58.7 wounds in the control group were granulated. They have concluded that topical Phenytoin accelerates the wound healing then the treatment by other conservative management.[77]

A team in their comparative study compared the clinical features of client with type II diabetic ulcer foot and type II diabetic clients without ulcer foot. They have analyzed cardiovascular risk factors, subclinical changes in cardiovascular damages, prevalence of cardiovascular morbidity and new occurrence of vascular problems. They found that above factors highly presented in diabetic ulcer foot clients and higher level of plasma, LDL, elevated triglycerides, hypercholesterolemia and proteinuria in diabetic ulcer client compared to diabetic clients without ulcer foot. Nowadays diabetic foot ulcer clients are prone to get transient ischemic attack and ischemic stork.[78]

A study to evaluate the educational programme regarding prevention of diabetic foot among diabetic clients. An evaluative pre-experimental one group pre test and post test design was adopted for this study. Totally thirty clients utilized for this study. Out of this nineteen clients were between the age of forty two to fifty and nearly twenty were

men and had higher secondary education respectively. Twenty seven clients not have diabetic ulcer and twenty not aware of ulcer foot. It reveals that before intervention most of the clients had inadequate knowledge regarding prevention of foot ulcer. After teaching education the diabetic clients had knowledge regarding meaning, symptoms and twenty one got moderate adequate knowledge.[79]

An author viewed her study, diagnosed case of type II diabetes over the age of 30 years in Chidambaram urban population in Tamil Nadu was 12.3 percent. Out of that 4.71were mild peripheral neuropathy, 2.53 percent moderate and 5.06 percent were severe neuropathy according to Toronto clinical system. Diabetic foot ulcer mostly occurs because sensory neuropathy and peripheral arterial diseases. 26 to 33 percentage of diabetic ulcer had developed by peripheral arterial diseases. 66.6 percentages had peripheral neuropathy with 1 to 10 years duration of diabetes. 30.7 percentages had peripheral neuropathy with 11 to 20 years duration of diabetes.[80]

Diabetic ulcer foot and deformities of ankle are complications of chronic diabetes. Reconstructive surgeries for ankle deformity and diabetic foot to reduce plantar pressure pain and attain normal function. The surgery depend on condition and type of foot. During surgery fixation devices and pins used for correct the deformity.[81]

A descriptive cross sectional survey reported that diabetic foot ulcer is the most common complication of type II diabetes mellitus (25 percent). Total of 216 diabetic people were utilized for this study and study was performed based socio-demographic variables, knowledge regarding diabetes, practice and attitude of diabetes and food care. Out of 216 clients 32 clients had ulcer foot, 129 were men, sixty one from villages, 132

were obese and 97 has inadequate foot care practice. Most of the people had ten years of diabetic treatment, 43.8 and 31.2 percentages of people were farmer and merchant respectively.[82]

A group of investigators in their study evaluated the organism and its susceptibility of infected diabetic foot ulcer. The study was conducted Salem district Tamil Nadu. Total of sixty type II diabetic clients were included for this study from that fifty client's culture were gram positive and ten clients gram negative organisms. The following organisms were isolated. Staphylococcus aureus, Staphylococcus saprophytic, Staphyloepidermidis, Escherichia coli and enterococcus so on. Out of sixty samples thirty one were male diabetic clients, twenty nine clients were female. Most of the clients were approximately fifty eight years of age, Duration of diabetes between ten and nineteen years. Seventy two percent diabetic ulcer clients were Wagner's grade I category, 23 percent and 6 percent grade II &III category. Oxacillin and meropenem were the drugs of choice for effective treatment.[83]

An interventional study designed to evaluate the effectiveness of education intervention regarding knowledge on diabetes and diabetic foot care. The result revealed that the people gained more knowledge, developed skill to care of their foot. Age, duration of illness, family history of diabetes and occupation had significant association on knowledge of diabetic foot ulcer.[84]

A study evaluated the bacteriology on type II diabetic foot ulcer and antibiotic susceptibility. The investigator analyzed totally 530 type II diabetic foot ulcer clients, from that 430 were men and 120 were women. Client was almost under the age 40 to 90

years, 385 diabetic isolates were infected, and 145 had infection in the ulcer foot site. Sixty five type II diabetic clients presented with two micro organisms in the wound and 320 clients shown one micro organism. The investigator found most of the gram positive bacteria very sensitive nearly all antibiotics and enterococcus faecalis less sensitive to antibiotics. Nowadays Piperacillin plus Tazobactum, ticarcillin calvinate effectively heal the infected diabetic foot ulcer.[85]

A descriptive study analyzed 62 diabetic clients with Biofilm on Diabetic Foot Ulcer. Out of those 42were men and 20 were women. Most of diabetic foot ulcer clients were between 41 and 60 years in age. Pus swab were taken from 82 isolates out of 62 diabetic foot ulcer clients, thirty six isolates were gram positive cocci and forty six isolates were gram negative bacilli. From eighty two isolates twenty four were non Biofilm produces, twenty two non film produces. Gram negative bacilli better Biofilm produces than gram positive. This study reveals sixty two specimens approximately 1.32 percentage organism growths in ulcer and 32.2 percentages mixed growth. 68.78 percentage of staphylococcus aureus were MRSA resistant, 62.19 percentage MDRO and less percentage polymicrobial growth.[86]

An author in her article reported that in kingdom Saudi Arabia 325 diabetic feet are being amputated annually in Jeddah, 741 were amputated in Riyadh, 3970 in Saudi Arabia. She has predicted that half of the million may get amputated in future due to diabetes.[87]

A team of investigators in their cross section survey studied the recently diagnosed diabetic people regarding diabetic ulcer. With one year duration total of 1674

subjects were utilized for this study. They found that 4.54 percentage were having diabetic foot ulcer out of this 52.5 percent and 38.88 percent were male and female respectively. 19.4 percent client had ischemic foot ulcer, 34.2 had Neuroischaemic foot ulcer and 46.06 percent client had neuropathic foot ulcer.[88]

A retrospective study to analyze the management of diabetic foot ulcer. Totally one hundred and nine clients utilized for this study from 1998 to 2000.out of this, sixty-five male clients and forty four female clients. The average age of the client was fifty five years. Out of one hundred and nine clients, seventy two percent clients have diabetic foot ulcer, sixty seven percent clients had neuropathy, and thirty three percent had neuropathy with peripheral arterial disease. These clients treated with hyperbaric oxygen, vacuum assisted device and debridement. The study result reveals that out of 109 clients, 94 clients had lower extremity amputation and fifteen clients had not amputation.[89]

A prospective observational study, 94 diabetic foot ulcer clients were selected through consecutive sampling method and followed around three year duration. Out of 94, 63 clients were male and 31 were female. They found that 69 wounds were healed without amputation and remaining was amputated. Clients with advanced age and renal impairment were the major reason for amputations.[90]

A study conducted by the researcher, reported in his article that diabetic foot ulcer develops average fifteen percent of diabetic clients. Wound infection, delayed wound healing and ischemia were reason for eighty five percent of foot amputations. Nearly 80 thousand amputations in United States and in India 80 thousand to one lakh amputations were performed every year. Chronic diabetic foot ulcer client have

inadequate fibroblast production, extracellular matrix and keratinocytes. High level of local pressure, reduced offloading, improper vascular assessment, improper debridement and dressing, imprompt antibiotics were reason for delay in diabetic ulcer foot healing. Few drugs like steroids, eusol, chlorhexidine, liquid detergents, povidone so on delays the wound healing. Emotional status, hypertension, increased cortisol level and low immunity may delays wound healing.[91]

A study surveyed around 110 diabetic clients regarding knowledge of diabetic foot ulcer and practice about foot care. They had selected samples by non probability consecutive method. The clients were interviewed regarding knowledge diabetic ulcer foot and how they care about the foot ulcer. The result indicated that most of the client's demonstrated average knowledge regarding diabetic foot ulcer disease but the practice to prevent the ulcer foot was not satisfactory.[92]

A comparative study compared the plasma adeponectin, interleukin-6 and Resistin between client who had hospitalized with foot ulcer and client hospitalized without foot ulcer. 34 clients with foot ulcer and 37 without foot ulcer were included for this study. Both group had increased level of interleukin-6 and Resistin and decreased level of plasma adeponectin.[93]

In 2010 a survey reported that in India 15 percentage of diabetic population develops diabetic foot ulcer, out of that 15 to 20 percent foot require amputation. 54 percent were neuropathic diabetic foot ulcer, 34 percent ischemic and 40 thousand diabetic feet are amputated annually.[94]

A scientific article reported that hyperglycemia leads to lack blood supply to legs. Foot ulcer and lack of sensation caused by nerve damage with high level of blood glucose. Nearly 60 to 70 percent diabetic clients have severe form neuropathy, it results in foot amputation.[95]

A team of researcher in their cross sectional study measured the immune status of diabetic clients with or without ulcer foot. They have compared acute phase proteins, cytokines, and chemokine's between client with diabetic ulcer foot and diabetic clients without ulcer foot by multivariate regression model. The result showed that diabetic ulcer foot clients had more level of C - reactive protein, Gamma Interferon, macrophages inflammatory protein I-B, interleukin-6, fibrinogen and inadequate level of T-cells.[96]

In 2001 a prospective case control study followed 225 diabetic clients. The clients were divided in to four groups: O group-diabetic clients without neuropathy, group: I- diabetic clients with neuropathy. Group: II- diabetic clients with neuropathy and deformity. Group: III- diabetic clients with foot ulcer or lower limb amputation. After three years of follow up they reported that client in the O group 5.1percent developed diabetic foot ulcer, client in the group I, 14.3percent developed diabetic foot ulcer, client in the group II, 18.8 percent developed diabetic foot ulcer and group III 55.8 percent developed diabetic foot ulcer. 3.1 percent and 20.9 percent limbs were amputated Clients in group I& II respectively.[97]

A comparative study compared Human Skin Equivalent and air therapy with air mattress. Total of 41 clients were utilized through consecutive sampling method for this study. 23 clients with diabetic foot ulcer were treated with HSE after wound debridement

and remaining were pressure ulcer clients treated with air therapy with air mattress. Seven diabetic wound healed within 42 days and 7 bed sores were healed within 29 days. The researcher suggested that HSE application can the treatment of choice for diabetic ulcer foot.[98]

A human research team in their data based Meta analysis analyzed 23 reviews related management of diabetic foot ulcer (1986-1996). The reviews were taken from MEDLINE, CINHAL, HEALTH STAR and EMBASE. An inclusion criterion for this study was study should be in English, interventional in nature and should be conducted between 1986 1996. Approximately 412 studied were reviewed and 117 interventional studies were identified. Out of these 79 were clinical trial interventions. The trials were based on drug therapy, hyperbaric oxygen therapy, topical applications, wound grafting and wound dressing. Most of the studies compared the age, sex, severity of wound, extend of neuropathy, complications and vascular problem. They have concluded that need more interventional studies to promote wound healing prevent the complications, monitor the clinical outcome compliance, quality of life and coast effective care.[99]

An investigator in their interventional study evaluated the effectiveness of topical hyperbaric oxygen on healing of diabetic foot ulcer with twenty eight diabetic foot ulcer clients. Out of 28 clients twelve clients were treated with hyperbaric oxygen and remaining was treated conservatively. Wound culture were taken on the first day, 7th and 14th day of treatment, there was no improvement in treatment and the control group.[100]

2.3 SECTION-C: REVIEWS RELATED TO METRONIDAZOLE DRESSING ON DIABETIC FOOT ULCER

A group of researchers in their prospective comparative study evaluated topical application of coloagenase and metronidazole dressing. Total of 82 clients were included in this study. 42 clients were in treatment group and their wounds were dressed with coloagenase and metronidazole and remaining 40 underwent traditional treatment with wound debridement. The result indicated that client's wound in the treatment group granulated faster than the control group. In the experimental group granulation started 3rd. 4th, 5th, 6th and 7th week than the control.[101]

An author in his scientific article stated that metronidazole gel is the drug of choice for diabetic ulcer treatment. Metronidazole creates the moist wound healing environment when used five to seven days. Crushed tablet also can be used for that purpose.[102]

An investigators in their scientific article on "a practical approach to choice of wound care on diabetic foot ulcer" stated that metronidazole gel has better anaerobic coverage and helps in maintain moist environment and promotes wound healing. Topical metronidazole gel is easy to apply topically once in a day. Alternatively metronidazole tablets crushed and applied over the wound, this helps for wound healing and reduces the bad odor.[103]

A comparative study compared the efficacy of healing in foot ulcer with povidone iodine and combination povidone iodine with metronidazole dressing. Total of 56 clients were included in this study. From this data 30 clients kept under povidone

iodine dressing and 26 were in under treatment of povidone iodine and metronidazole dressing. The result revealed that almost all clients have acute phase of wound healing and the both group same improvement in the granulation of wound.[104]

An author in his scientific article reported that low grade infected ulcer foot with microbial organisms treated by topical metronidazole gel. It reduces the tissue edema and malodor of wound.[105]

An article stated that metronidazole dressing eliminate the wound odor and eradicate the anaerobic infection.[106]

A researcher in his secondary analysis reported that topical application metronidazole on the fungating wound is actively eradicates the organism and decreases the bad smell of the wound.[107]

A team of investigators in their clinical trial applied metronidazole 0.75 % gel on 16 diabetic ulcer foot over two weeks. Ten client's wound became completely odor free and six wound's bad odor almost reduced and also wound healing improved.[108]

A researcher in their scientific article reported that Phenytoin, mesoprostol and metronidazole combined these three drugs is most effective for the treatment of diabetic ulcer. Phenytoin enhances the granulation and reduces the inflammation. Mesoprostol and metronidazole increases the wound healing. Topical metronidazole solution or gel which is directly applied over the wound or shallow cavity. It is very effectively reduces the abnormal odor of wound infection.[109]

2.4 SECTION-D: REVIEWS RELATED TO INSULIN DRESSING ON DIABETIC FOOT ULCER

In 2014 a randomized control trial **a** team of researchers studied the effectiveness of topically applied insulin in wound healing in terms of wound healing, safety and duration of hospital stay with 50 clients. They were compared both saline and insulin dressing on diabetic and non diabetic clients. After 12 week of treatment the result revealed that wound healing was better and faster in topical insulin group also significantly reduces the duration stay with reduced economic burden.[110]

An interventional study evaluated the effectiveness topical insulin therapy on healing of diabetic foot ulcer. Total of eight clients with full thickness diabetic wound were utilized for this study. From the above four clients were treated with regular insulin wash and the remaining had regular treatment. After fourteen days of treatment in both the group surface biopsy was obtained and ruled out for formulation of new vessels and fibrosis. The result shown that wounds in the insulin group vessels developed 96 plus or minus 47 and there was a significant difference in mean temperature in the insulin treated group (1.27 plus or minus 1.12 degree Celsius) vs.non insulin treatment group (0.13 plus or minus 1.22 degree Celsius). They have concluded that topical insulin significantly improves the wound healing.[111]

A researcher viewed in her article, topical application of insulin combined with zinc reduces wound inflammation. It helps for proliferation and migration of macrophages and keratinocytes in the affected area.[112]

An author stated in his article that insulin activate the function of macrophages, stimulates monocytes and chemotactic proteins. It facilitates monocytes infiltration, phagocytosis and secretes inflammatory mediators. The author strongly suggested that insulin accelerates the healing and decrease inflammation.[113]

A randomized double blind controlled study evaluated the effectiveness of topical insulin on healing of diabetic ulcer foot. People above the age of 18 were included in this study. Around eight week duration the treatment group was treated with topical insulin and control by placebo. The outcome of the study was wound in the treatment group was healed better than the control group.[114]

An investigator in his scientific article stated that topical insulin application facilitate keratinocytes action and activates P13K – AKT pathway and $RAC_{1.}$ Insulin stimulate regenerative process and granulation of wound. [115]

Nursing Essay in their comparative study compared the effectiveness of topical application of povidone iodine and topical insulin on healing of diabetic ulcer foot. Total of 46 clients were included for this study. 23 diabetic foot ulcer were treated with topical insulin and remaining was treated with topical povidone iodine. Wound was assessed with Bates Jensen wound assessment tool. Wound size of 26 clients was ranges between four and sixteen square centimeter and three client's wounds between 36 and 80 square centimeter. Most of the clients aged between 55 and 70 years. Around 31 clients were male and also 31 clients belong to IDDM. Most of the clients (33) hospitalized around 15 to 30 days. The finding revealed that client in the topical insulin group wound was granulated faster and better than the povidone iodine group.[116]

An author in his book stated that insulin like growth factors stimulate the proliferation and migration of the endothelial cells and extra cellular matrix excreted by the keratinocytes which develops fibroblast and granulation. Local application insulin accelerates the wound healing and reduces the blood glucose level in peripheral tissues.[117]

A study proved that topically applied insulin over the skin incision and or chronic wounds accelerate re-epithelialization and stimulate maturation of the healing tissues. Also they stated that these effect s are depends on insulin receptor. This may be the powerful therapy without any major side effects.[118]

An interventional study evaluated the efficacy of local use insulin on wound healing. Total of forty five clients with acute and chronic wound were included for this study. Twenty nine clients in the experimental group were applied with ten unite regular insulin diluted with one ml saline and sprayed two times a day. The average wound healing score was 46.09 mille meter square treatment group. Control group those received regular treatment wound healing score was 32.24 mille meter square. The study concluded that there was no side effect by local insulin therapy and also effectively improves the wound healing.[119/]

2.5 SECTION-E: REVIEWS RELATED TO APPLICATION OF INFRARED RADIATION ON DIABETIC FOOT ULCER

A team of researcher in their interventional study evaluated the effectiveness Diffuse Near Infrared Spectroscopy on improvement in the sensation of diabetic foot with 24 diabetic foot clients. Treatment was given for the period of twenty weeks,

posttest was done 4th, 10th and 20th week. 84 percent diabetic neuropathic sensation improved at fourth week and further improvement taken at 20th week.[120]

An article stated that low level laser therapy activate the angiogenesis, microcirculation and enhance the vasodilatation. The low level laser therapy reduces the complication and facilitates wound healing.[121]

An interventional study assessed the effect of Diffuse near Infrared Spectroscopy on Diabetic Foot Ulcers Forty-six human diabetic foot ulcers were measured with Diffuse Near-Infrared Spectroscopy. The weekly change in oxy-hemoglobin concentration could distinguish healing and non-healing ulcers with a sensitivity of 0.9 and specificity of 0.86 ($p<0.002$).[122]

Researchers in their interventional study evaluated the effect of Near-infrared radiation on staphylococcus aureus, pseudomonas aeruginosa and healing of chronic wounds. After a stipulated period of treatment the result revealed that there was morbid reduction in number of bacterial growth and potential improvement in wound healing.[123]

An interventional study evaluated the effectiveness of Near Infrared Light (NIR) as a choice of treatment for diabetic stalled ulcer healing. 15 diabetic foot clients were included, infrared (NIR) therapy was applied directly to the wound for 20 minutes daily for 8 weeks. Results shown that the patients received 8 weeks treatment was change in wound size as measured by a wound tracking system.[124]

A prospective study evaluated the efficacy of low intensity lasers therapy on improvement in skin perfusion and prevention of potential complications with 30

diabetic clients. The result shown that, there was significant improvement in perfusion to skin and subcutaneous tissues.[125]

A randomized clinical trial evaluated the effectiveness of low level laser therapy on healing of diabetic foot ulcer. 23 clients included in the random basis, out 23 clients, thirteen client exposed low level laser therapy and ten clients underwent placebo treatment. The result shown that after twenty weeks eight clients have wound were completely healed those received low level laser therapy and three clients wound incompletely healed in placebo group.[126]

A randomized double blind study evaluated the effectiveness of broad band light device on healing of diabetes foot ulcer. Total of 16 subjects, 10 were kept in the treatment group and remaining were in the control group received placebo. They proved that nine out of ten client's wound were healed in the treatment group. In the placebo group two out of six wound were healed. 89 and 54 percent wound size was reduced in treatment and control group respectively.[127]

A group of investigators in their double blind randomized control trial evaluated the effectiveness of low level Laser therapy on healing of diabetic foot ulcer with twenty three diabetic foot ulcer clients. Ten clients with foot ulcer treated with low level Laser therapy and remaining were treated placebo. After twenty weeks of treatment the result shown that in the treatment group out of ten foot ulcer eight were healed and in placebo group only three wounds were healed. So that the investigator concluded that low level Laser therapy is efficient, effective and cost effective for the treatment of diabetic foot ulcer.[128]

In 2010 a randomized control trial evaluated the effectiveness local application of Light emitting Diode on healing of diabetic foot ulcer with fifty diabetic clients. Twenty five clients exposed to LED and remaining treated with regular treatment. Treatment was given 30 minutes duration for the period of two weeks. The study result revealed that sixteen percent of the wounds were healed fairly, 76 percent and eight percent wound healed moderately and neat respectively.[129]

A team of investigators compared the combination effect of "3 channel electrode delivery system with local heat" on diabetic ulcer foot healing. They have used multi electrode electrical stimulation instrument along with local heat on non healing chronic wounds. 18 clients with diabetic ulcer were included for this experiment. Their wound was exposed in electrical stimulation 3 times in a week for four weeks. A heating lamp was used to keep the ulcer and the surrounding area warmth. Electrical stimulation was applied over thirty minutes with twenty mA. The blood flow was assessed by using "laser Doppler Imager". Wound size also assessed before and after the treatment. After one month treatment the mean wound size was significantly reduced.[130]

Researcher in their new trial evaluated the effectiveness of the newly designed electrode on the outcome of non healing diabetic ulcer. They have compared 2 electrode system and 3 electrode devices and its stimulation on healing of chronic ulcers among diabetic clients. 8 diabetic clients with chronic ulcer were included for this trial. Electrical stimulation was applied for the period of a month and they were evaluated in the meant of healing of ulcer and the blood flow to the surface area of the wound. The result showed that, three channeled electrical stimulation was dispersed evenly and even deeply than the traditional 2 channeled electrical stimulation and the ulcer was

completely healed in one month. They have concluded that 3, channel electrical stimulation was most effective comparing to 2, channel electrical stimulation.[131]

Researchers in his article said that monochromatic near infrared light applied over diabetic foot ulcer around thirty minute, approximately two to four times a day facilitates the blood circulation and improve the wound healing.[106]

A randomized blinded control study evaluated the effectiveness of "water filtered infrared –A" on healing of chronic venous ulcer foot. "Water filtered infrared –A" is radiation without much heat and has good tissue penetration capacity. Ten subjects were included for this study out of that five were male and five clients were female. They were treated with "water filtered infrared –A", the venous ulcer were exposed by infrared radiation around 2 to 5 times in a week for the duration of thirty minutes for each session. The device was kept approximately twenty five centimeter from the wound. Intervention was given up to two months. The study result shown that out of ten wounds seven wounds were healed completely, two client's wound was decreased in size. They have concluded that "water filtered infrared –A" is the effective method in treating venous ulcer in the cost effective manner.[132]

In 2008 researchers in their randomized control trial evaluated the effectiveness of Monochromatic Near Infrared photo energy to improve the sensation of the neuropathic foot. Total of eighteen diabetic clients with neuropathic foot were included for this study. Client in the interventional group exposed to Monochromatic Near Infrared photo energy around 1.5 J/cm^2 and client in the control group received only heat

therapy. The study result revealed that clients in the both group sensation had improved equally.[133]

In 2007 a comparative study compared the effectiveness between local and global heat therapy on the "healing of chronic wounds" in clients with diabetes. Based on their previous study experience they have designed this one. Total of 29 both male and female clients were included in this study. This 29 client's wounds were exposed in to local heat by heat emitting lamp and these subjects were compared with global heating of the samples in warmth room. Heat was generated through electrical stimulation at twenty mA for thirty minutes 3 times in a week for the period of four weeks. Local heat exposed at the rate of thirty seven degree calicoes and global room heat at the rate of thirty two degree calicoes. The rate of blood flow was calculated by using "laser Doppler imager". The result shown that blood flow was increased both local and globe heat therapy. Blood flow was increased two times in the local heat therapy on the sides and centre of the wound but large increment in the flow found in the global heat therapy. They have concluded that the global heat therapy was the best for healing diabetic ulcer but local heat has significant advantages than the other one.[134]

Group of researchers in 2005 in their secondary survey reported that infrared radiation enhances the cell proliferation collagen formation.[135]

In 2004 researchers in their mete analysis reviewed 34 articles related to laser therapy on diabetic foot ulcer and they have reported that laser therapy is effective and efficient treatment of choice for diabetic foot ulcer.[136]

2003 an interventional study evaluated the effectiveness of “far-infrared ray” on healing of full thickness wound in the rats. They wanted to know hyperthermic effect of far infrared radiation along with the biological outcome of the wound.[137]

They have compared between those wound exposed to far infrared radiation and not exposed in terms of wound healing. They had assessed wound size, blood flow and temperature of the skin during radiation therapy. The cellular finding shown wound healing was improved significantly those exposed to infrared radiation than those who were not.[138]

A researchers 2003 in their article stated that low intensity laser irradiation increases the endothelial cell proliferation, enhances angiogenesis and micro vascularization and augment the wound healing.[139]

In 1999 an investigator in his article reported that Monochromatic Infrared energy topically raise the Nitric oxide level it results in increases the level of blood circulation in the wound site.[140]

CHAPTER – III

RESEARCH METHODOLOGY

Research is the systematic enquiry to answer the question. It is the scientific and orderly process. Research in every field and more so in the field of nursing is demand of the day. The aim of the research is to develop, refine and to expand the body of knowledge. Clinical nursing research is a guide to nursing service to improve the quality of care and health of the client with efficient and effective manner. In nursing research broad support for evidence based practice, research has heightened for nurses. Nursing research is a way to identify new knowledge and improve professional education in the nursing field.

Research methodology is the overall plan to obtain answer to a research question or the general plan to solve the problem. This chapter deals with the methodology adapted in this study it includes research design, variables, setting, population, sample, criteria for selection of samples, sample size, sampling technique, development and description of the tool, content validity, pilot study, reliability, data collection procedure and plan for statistical analysis.[141]

3.1 RESEARCH APPROACH AND DESIGN

Research design provides an expicts blue print of research activities will be carried out. The researcher can identify best design for a study and should create which require making decision regarding specific problem.

In this study evaluative approach, quasi-experimental pretest-post test design was utilized.[142]

Quasi experiment involves experimental manipulation of independent variable to observe the effect on the dependent variable but it lacks either randomization or control group as like true experiment. In this study the investigator manipulated the independent variable and had control group to compare the effectiveness but were lacking to randomize the subjects.

In this study experimental manipulation were application of infrared radiation, insulin dressing and metronidazole dressing. These three groups were acted as comparison as well as control group each one another.[141]

Group	**O_1**	×	**O_2**
Diabetic foot ulcer clients 25years age and above were divided in to three groups.	Diabetic ulcer foot assessed by modified Bates Jensen wound assessment tool	Group-I, Infrared radiation application Group-II, Insulin dressing Group-III Metronidazole dressing	Posttest assessment by modified Bates Jensen wound assessment tool

O_1- Observation before the treatment

×- Treatment

O_2 – Observation after the treatment

3.2 VARIABLES

Variable is a concept which can take different value at different situation.[144]

3.2.1 Independent Variable

The variables that can be manipulated by the investigator are called independent variable.[146]

In this study independent variables are Infrared radiation, insulin dressing and metronidazole dressing.

3.2.2 Dependent Variable

The changes or outcome due manipulation of independent variable are called dependent variable.[146]

In this study dependent variable was healing of Diabetic ulcer foot

3.2.3 Demographic Variables

The variables of the clients which may have an influence on the wound healing score there are of age, sex, religion, education, occupation, monthly income of the family, marital status, sources of information on diabetes, duration of Illness, dietary pattern, residential area, family history of diabetes mellitus and foot ulcer duration.[147]

3.3 SETTING OF THE STUDY

Setting is overall location or the place where the actual research takes place or relevant information gathered.[143]

The study was conducted in Melmaruvathur Adhiparasakthi Institute of Medical Sciences and Research Hospital (MAPIMS), Melmaruvathur, Kancheepuram district, Tamilnadu.

3.4 POPULATION

Population is the set of people or all the units or collection of individuals which the researcher is interested. They are divided in to target and accessible population.

The study population comprises of all clients with diabetic foot ulcer.[143]

3.4.1 Target population

Target population is the one that total numbers of unit or people which are meet the specific characteristic decided by the researcher.

In this study target population comprises of all the clients with diabetic foot ulcer in Tamil Nadu.[140]

3.4.2 Accessible population

Accessible population aggregate of units that is accessible to hand pick of subject to the researcher.

In this study accessible population comprises of all the diabetic clients with foot ulcer attended in outpatient department and admitted in surgery ward at MAPIMS.[142]

3.5 SAMPLE

Samples are the part or subset of population who meet the designated criteria and which is followed by investigator during the study.

In this study samples are the clients who fulfilled the sampling criteria.

3.6 SAMPLE SIZE

The sample size estimated was 225 using the power analysis and the researcher had included 225 samples for the study. Insulin dressing group for75 samples, Metronidazole dressing group for75 samples, Infrared radiation group for75 samples.[144] Sample size was calculated by using power analysis formula.

$4pq/d^2$

p = prevalence rate

q =100-p

d = allowable error (4%).

The point prevalence of the diabetic foot ulcer was around 10. Based on power analysis total predicted sample size were 240 per year with allowable error 4%.

p=10

q=100-d

Therefore

$4\times10\times96/16=240$

3.7 SAMPLING TECHNIQUE

Sampling is the process of selecting a portion of population from the target population. It should be systematically organized and specific criteria during selection of sample.

Consecutive sampling technique was used to select the samples. Consecutive sampling technique is one of the nonprobability sampling techniques. This technique is

hand pick of all available samples as they available successively. This technique used for convenient and less time consuming.[145]

3.8 CRITERIA FOR SAMPLE SELECTION

Sampling criteria are set of designated characteristics that the sample or should not posses.[142]

3.8.1 Inclusion Criteria

Set of designated characteristic that the sample must possess, are called inclusion criteria.

1. Client should have diabetic foot ulcer and ulceration in subcutaneous tissue
2. Client who is willing to participate in the study.
3. Client who is able to speak or understand Tamil
4. Client should be attended in surgical outpatient department and admitted in female and male surgical ward with foot ulcer.

3.8.2 Exclusion Criteria

The characteristic that the sample must not possess is called exclusion criteria.[145]

1. Client with mental disturbances
2. Client with allergic history and other complications.
3. Client should have diabetic foot ulcer with involvement of bone and arteries

3.9 DEVELOPMENT AND DESCRIPTION OF THE TOOL

The structured questionnaire and modified wound assessment tool was used for this study.

Section A: Demographic Variables.

It consists of age, sex, religion, education, occupation, monthly income of the family, marital status, sources of information on diabetes, duration of Illness, dietary pattern, residential area, family history of diabetes mellitus and foot ulcer duration.

Section B: modified Bates-Jensen wound assessment tool.

It consists of size, depth, edges, undermining, slough color type, percentage of slough tissue, type of wound discharge, exudates amount, skin color surrounding wound, peripheral tissue edema, peripheral tissue induration, granulation tissue and epithelization.[2]

Score 60-15 wound degeneration

< 14 wound regeneration

The wound healing score was 13 out of 65

Data collection instruments

Development of the tools

The investigator used the following steps for preparation of the tools for the study

Extensive review of literature

The investigator did an extensive review of related literature from books, journals, manuals; reports published researches, newspapers and internet to develop study instruments.[145]

Preparation of the blue print for the tools

It includes questionnaire for collecting demographic variables and diabetic wound assessed by modified wound assessment tool.

- Consultation with experts from the field of study
- Preparation of the final draft of the tools
- Editing of the tools
- Review of literature
- Preparation of blue print

DESCRIPTION OF THE TOOL

Section A: Demographic Variables like age, sex, religion, education, occupation, monthly income of the family, marital status, sources of information on diabetes, duration of Illness, dietary pattern, residential area, family history of diabetes mellitus and foot ulcer duration.

Section B: Modified Bates-Jensen wound assessment tool.

It consists of size, depth, edges, undermining, slough color type, percentage of slough tissue, type of wound discharge, exudates amount, skin color surrounding wound, peripheral tissue edema, peripheral tissue induration, granulation tissue and epithelization.[2]

Score 60-15 wound degeneration,

< 14 wound regeneration

The wound healing score was 13 out of 65

3.10 CONTENT VALIDITY OF TOOL

The tool was validated by various experts from nursing, Diabetologist, surgeon and physician. Modified Bates-Jensen wound assessment tool to assess the wound.

Content validity is the degree to which the items in the instruments adequately represent the content for the concept being measured.

Content validity of tool was established by the panel of experts comprising from the fields of, Medical surgical nursing, Diabetologist, surgeon, plastic surgeon and nursing research department experts and. The expert's suggestion were incorporated in designing the final tool for the study in consultation with Guide, Co-guide, Advisory Committee members and Statistician for its appropriateness.[144]

3.11 RELIABILITY

The reliability of the tool was determined by using split half technique and the tool was found to be highly reliable(r=0.88).hence the "r" value was 0.88 the tool was considered highly reliable for proceeding with the study.

3.12 ETHICAL CONSIDERATION

The investigator had considered and followed the ethical principle for preceding the study. The investigator adhered to the following measures in order to protect the rights of the client of diabetic foot ulcer.[147]

3.12.1 Human Rights

1. Ethical committee approval was obtained from the Institutional Ethical Committee, Melmaruvathur Adhiparasakthi Institute of Medical Sciences and Research.
2. Formal written permission was obtained from the Medical Superintendent of MAPIMS.

3.12.2 Beneficence & Non-Maleficience

3. Potential benefit and risk was explained to the subjects.

3.12.3Dignity

4. Informed consent was obtained from the clients after explaining the study purpose, type of data, nature of commitments, participations and procedure.
5. Pilot study was executed to check the feasibility and time requirement of the study.
6. Subjects' right to withdraw from the participation from the study was explained before data collection.
7. Investigator's contact information was disseminated to all the subjects who participated in the study.

3.12.4Confidentiality

8. Confidentiality and anonymity pledge was ensured.

3.12.5 Justice

Intervention was given to all the diabetic clients irrespective of their cast, community, race etc

3.13 PILOT STUDY

Pilot study is the trial run of the main study to test the feasibility, convenience and practicability before entering in to the actual major study. Pilot study helps to know interventional safety, appropriateness of the intervention, instrument's quality, potential problems, need for training and personnel, forecast the attrition rate, number of sample required, materials required and so on.

The investigator obtained ethical clearance from ethical committee of MAPIMS and also obtained formal permission from the principal, Adhiparasakthi College of Nursing and the Medical Superintendent Melmaruvathur Adhiparasakthi Institute of Medical Sciences and Research. The pilot study was conducted at Melmaruvathur Adhiparasakthi Institute of Medical Sciences and Research from 1.1.2013 to 30.5.2013

After explaining the nature, purposes, investigator and participant's role, risk and benefits of the study, informed consent was obtained from the study participants. Confidentiality also assured. The investigator had selected total of 30 clients by using consecutive sampling technique based on sampling criteria. Pre test was done by using modified Bates-Jensen wound assessment tool. First 10 days 10 patients underwent infra-red radiation, successively next 10 days 10 patients received insulin dressing and next 10days 10 patients with metronidazole dressing. Post test was conducted on 7^{th}day and10^{th}day using the same tool. The" F" Value was 22.746 which was more than the table value3.35.which shows a statistically significant at 0.5 level It depicts that the mean differences13.40, 8.80 significant at the 0.05 level, which shown that infrared radiation is more effective than insulin dressing and metronidazole dressing.

Result of the pilot study revealed that the study was feasible and practicable to proceed with the main study. The pilot study also revealed the client's co-operations, tools adequacy and availability supply and equipments.

3.14 PROCEDURE FOR DATA COLLECTION

The investigator obtained ethical clearance from ethical committee of MAPIMS and also obtained formal permission from the principal, Adhiparasakthi College of

Nursing and the Medical Superintendent Melmaruvathur Adhiparasakthi Institute of Medical Sciences and Research.

Total of 225 diabetic ulcer foot clients were utilized by using consecutive sampling technique those fulfilled the sampling criteria. Nature of the study, purposes, investigator and participant's role, risk and benefits of the study, alternatives were explained, anonymity and confidentiality also assured. After explaining the above aspects informed consent was obtained from the study participants. Pre test was done by using modified Bates-Jensen wound assessment tool. Each assessment took around 30 minutes; Intervention was started on the same day. The study has started on July 2013 and it was completed on January 2015.

3.14.1 INFRA RED RADIATION APPLICATION

After wound assessment, wound was cleansed and exudates were removed Clients were kept in comfortable position and infra red lamp was placed 18 inches away from the foot ulcer, foot ulcer was exposed by infrared radiation for the 15 minutes then saline dressing was done. Infra red radiation application was done for 10 samples for ten days. Post assessment was done on 7^{th} and tenth day by using the same tool.[149]

3.14.2 INSULIN DRESSING

After wound assessment, wound was cleansed and exudates were removed. 10 units of regular insulin diluted in 10 ml of normal saline solution were soaked with sterile gauze applied over the wound then dressing was done. Insulin dressing was done for 10 samples for ten days. Post assessment was done by using same tool on seventh and tenth day.[117]

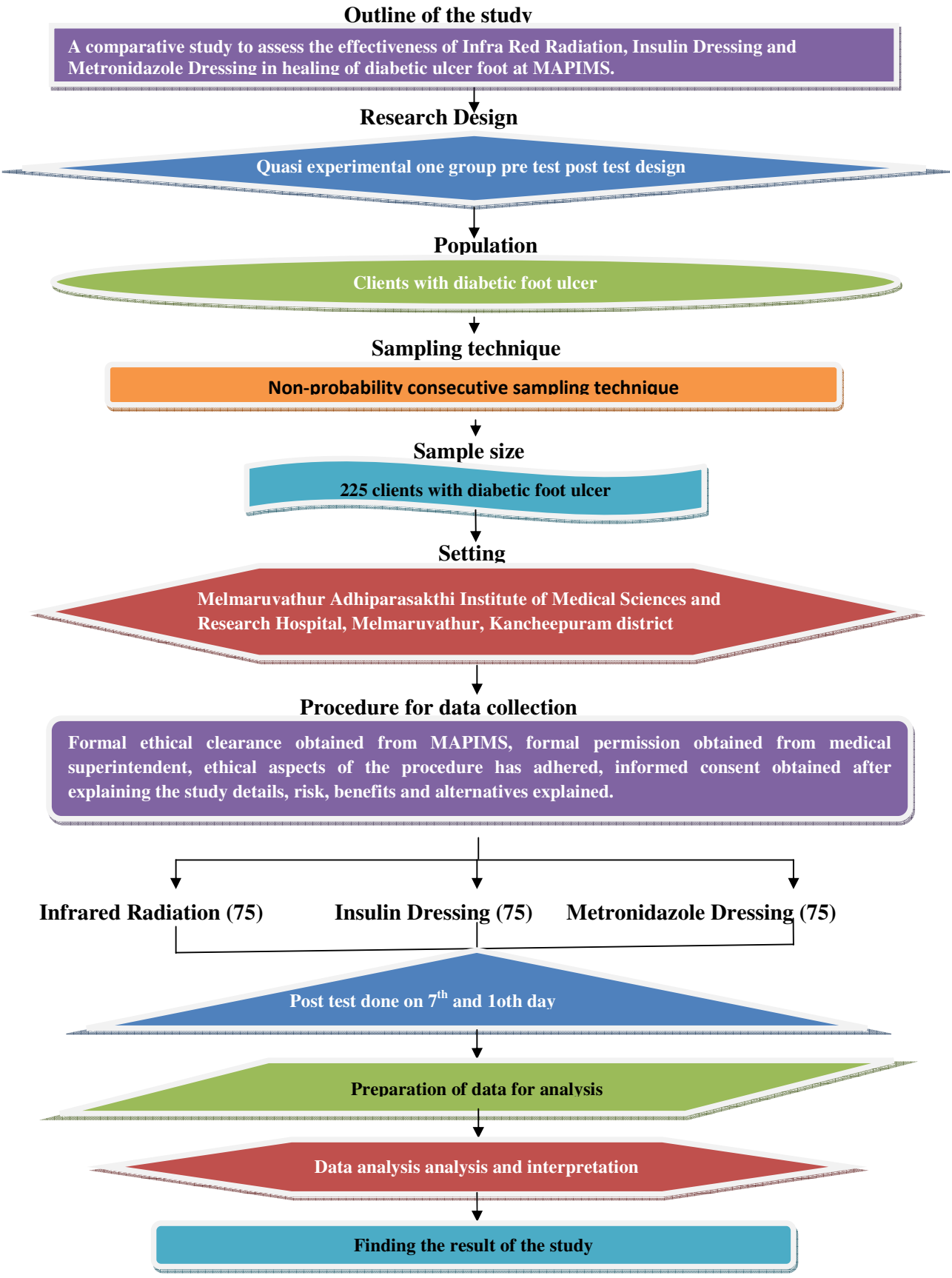
3.14.3 METRONIDAZOLE DRESSING

After wound assessment, wound was cleansed and exudates were removed.100 mg of metronidazole diluted in 100 ml of normal saline, solution was used to clean the wound and also metronidazole solution was soaked with sterile gauze and applied over the wound then dressing was done. Metronidazole dressing was done for 10 samples for ten days. Post assessment was done on seventh and tenth day by using same tool.[105]

3.15 PLAN FOR DATA ANALYSIS

Both descriptive and inferential statistics were used to analysis the data.

S.No.	Statistical Method	Statistical Analysis	Description
1	Descriptive	Number and percentage Mean and standard deviation	To analyze the demographic variables To analyze the wound size
2	inferential	Chi-square test ANOVA Post -hoc test Turkey	To find the association of demographic variables on wound healing To compare the wound size before and after the intervention Multiple comparison between three groups


Outline of the study
A comparative study to assess the effectiveness of Infra Red Radiation, Insulin Dressing and Metronidazole Dressing in healing of diabetic ulcer foot at MAPIMS.
Research Design
Quasi experimental one group pre test post test design
Population
Clients with diabetic foot ulcer
Sampling technique
Non-probability consecutive sampling technique
Sample size
225 clients with diabetic foot ulcer
Setting
Melmaruvathur Adhiparasakthi Institute of Medical Sciences and Research Hospital, Melmaruvathur, Kancheepuram district
Procedure for data collection
Formal ethical clearance obtained from MAPIMS, formal permission obtained from medical superintendent, ethical aspects of the procedure has adhered, informed consent obtained after explaining the study details, risk, benefits and alternatives explained.
Infrared Radiation (75)
Insulin Dressing (75)
Metronidazole Dressing (75)
Post test done on 7th and 1oth day
Preparation of data for analysis
Data analysis analysis and interpretation
Finding the result of the study

CHAPTER – IV

DATA ANALYSIS AND INTEPRETATION

This chapter deals with analysis and interpretation of data collected from samples on diabetic ulcer foot clients. Data are observable and gather information from samples. Data collection based on study objectives and operational definition. Data collected from primary and secondary sources.

The collected data were organized, computer coded, calculated and analyzed based on objectives. Data analysis was used both descriptive and inferential statistics.

Descriptive Statistics

- Frequency and percentage distribution was used to analyze the demographic variables.
- Mean and standard deviation, used for pretest and post analysis of wound size

Inferential Statistics:

- Chi-square test used to find the association of demographic variables on wound healing
- ANOVA used to compare the wound size before and after the intervention
- Post -hoc test Turkey method used to Multiple comparison between three groups.[144]

ORGANIZATION OF DATA

SECTION 4.1: Demographic variables of the diabetic foot ulcer clients

SECTION 4.2: Assessment of pre test score of diabetic foot ulcer clients.

SECTION 4.3: Assessment of the effectiveness of infrared radiation, insulin dressing and metronidazole dressing in healing of diabetic ulcer foot

SECTION 4.4: Comparison of pre test and post-test score of infrared radiation, insulin dressing and metronidazole dressing in healing of diabetic foot ulcer.

SECTION 4.5: Comparison of pre test and post test score of diabetic foot ulcer clients.

SECTION 4.6: Multiple comparisons between three groups

SECTION 4.7: Association of post test score in healing of diabetic foot ulcer with the selected demographic variables

SECTION 4.1: DEMOGRAPHIC VARIABLES OF THE DIABETIC FOOT ULCER CLIENTS

Table: 4.1.1(a): Frequency and Percentage Distribution of Clients with Diabetic Ulcer Foot in the infrared radiation group N=75

Sl.No	Demographic variables	Infrared Group	
		Number	Percentage
1	**Age in years**		
	a. 25-35	04	05.30
	b. 36-45	26	34.70
	c. 46-55	26	34.70
	d. 56 -65	16	21.30
	e. 66 and above	03	04.00
2	**Sex**		
	a. Male	44	58.70
	b. Female	31	41.30
3	**Religion**		
	a. Hindu	41	54.70
	b. Muslim	07	9.30
	c. Christian	20	26.70
	d. Others	07	9.30
4	**Education**		
	a. Uneducated	14	18.70
	b. Primary school	05	06.70
	c. High school	18	24.00
	d. Higher secondary	20	26.70
	e. Graduate and above	18	24.00
5	**Occupation**		
	a. Unemployed	18	24.00
	b. Daily labor	08	10.00
	c. Private Employee	22	29.30
	d. Government Employee	09	12.00
	e. Professionals	18	24.00
6	**Family income per month**		
	a. Up to 5000	15	20.00
	b. 5001-10000	35	46.70
	c. 10001-20000	18	24.00
	d. Above 20000	07	09.30

The above table reveals the frequency and percentage distribution of 75 diabetic foot ulcer clients in the infrared radiation group.

Pertaining to age majority 34.7% clients were aged between 36 and 45, 34.7% were aged between 46 and 55 years in age, 21.3% clients were aged between 56 and 65 years and 5.3 % were aged between 25 and35 years in age.

Considering the sex of the diabetic clients most of 58.7% were male and 41.3% were females.

Considering the religion almost 54.7% were Hindus, 26.7% were Christians and 9.3% and 9.3%were Muslims and other religion respectively.

With regard to educational qualification 26.7% were educated up to higher secondary level, 24.% were completed high school and 24 % graduate and above and 18.7% were uneducated.

Based on the employment 29.3% were private employees, 24% were professionals, 24 % were unemployed and 12% were government employees.

Pertaining to the income of the clients 46.7% had monthly income between 5000 and10000, 24% earning 10001 to 20000 and 20% clients had the monthly income of up to 5000 per month.

Table 4.1.1(b): Frequency and Percentage Distribution of Clients with Diabetic Ulcer Foot in the infrared radiation group N=75

Sl.No.	Demographic variables	Infrared Group	
		Number	Percentage
7	**Marital status**		
	a. Married	15	20.00
	b. Unmarried	07	09.30
	c. Widowed/ Widower	33	44.00
	d. Divorced/Separated	20	26.70
8	**Sources of information on DM**		
	a. Health personnel	30	36.00
	b. Mass media	18	30.70
	c. Friends	21	21.30
	d. Relatives	06	10.70
	e. others	00	01.30
9	**Duration of Illness**		
	a. < 1 year	13	17.30
	b. 1-2 years	22	29.30
	c. 3-4 years	21	28.00
	d. 5-6 years	19	25.30
	e. >6 years	00	00.00
10	**Dietary Pattern**		
	a. Vegetarian	31	41.30
	b. Non-vegetarian	44	58.70
11	**Residential Area**		
	a. Rural	47	62.70
	b. Urban	21	28.00
	c. Sub-urban	07	09.30
12	**Family History of Diabetes**		
	a. Yes	29	38.70
	b. No	26	34.70
	c. Unknown	20	26.70
13	**Duration of Foot Ulcer**		
	a. < one year	52	69.30
	b. One year	23	30.70
	c. Two year	00	00.00
	d. >Two year	00	00.00

The above table reveals the frequency and percentage distribution of 75 diabetic foot ulcer clients in the infrared radiation group.

Regarding the marital status 34% were widowed, 20% were married, 26.7% were divorced and separated and 9.3% were widowers.

Out of 75 clients 40% of the clients obtained diabetes related information from health personnel, 28% were obtained information from friends 24% from obtained mass media, and 8% from relatives.

Considering the duration of illness 29.3% had been suffering from diabetes around 1-2years, 28% were suffering 3-4 years and 25.3% were diabetic around 5-6 years.

Pertaining to the dietary pattern 58.7% belonged to non-vegetarians and 41.3 were vegetarians.

Regarding the family history of diabetes 38.7% were know about the diabetic history, 34.7% were not having the family history of diabetes and 26.7% were not aware of family history of diabetes.

Among 75 clients 62.7% were residing in rural area, 28% were residing in urban area and 9.3% were from sub-urban area.

Regarding the duration of diabetic foot ulcer 69.3% of the clients had foot ulcer less than one year, 30.7% had one year duration of ulcer foot.

Table 4.1.2(a): Frequency and Percentage Distribution of Clients with Diabetic Ulcer Foot in the insulin dressing group N=75

Sl.No.	Demographic variables	Insulin dressing Group	
		Number	Percentage
1	**Age in years**		
	a. 25-35	00	00.00
	b. 36-45	23	30.70
	c. 46-55	22	29.30
	d. 56 -65	11	14.70
	e. 66 and above	19	25.30
2	**Sex**		
	a. Male	44	58.70
	b. Female	31	41.30
3	**Religion**		
	a. Hindu	53	70.00
	b. Muslim	10	13.30
	c. Christian	09	12.00
	d. Others	03	04.00
4	**Education**		
	a. Uneducated	32	42.70
	b. Primary school	13	17.30
	c. High school	20	26.70
	d. Higher secondary	05	06.70
	e. Graduate and above	05	06.70
5	**Occupation**		
	a. Unemployed	01	01.30
	b. Daily labor	09	12.00
	c. Private Employee	17	22.70
	d. Government Employee	43	57.30
	e. Professionals	05	06.70
6	**Family income per month**		
	a. Up to 5000	22	29.30
	b. 5001-10000	21	28.00
	c. 10001-20000	29	38.70
	d. Above 20000	03	04.00

The above table reveals the frequency and percentage distribution of 75 diabetic foot ulcer clients in the insulin dressing group.

Pertaining to age majority 30.7% clients were aged between 36 and 45, 29.3% were aged between 46 and 55 years in age, 25.3% clients were aged around 66 years and above and 14.7 % were aged between 56 and65 years in age.

Considering the sex of the diabetic clients most 58.7% were male and 41.3% were females.

Considering the religion almost 70% were Hindus, 13.3% were Muslims, 12% were Christians and 4% were other religion.

With regard to educational qualification 42% were uneducated, 26.7% were educated up to high school level, 17.3. % was completed primary schooling and 6.7 % higher secondary and graduate.

Based on the employment 57% were government employees, 22.7% were private employees, 12% were daily labor 6.7% were professionals, and 1.2 % were unemployed.

Pertaining to the income of the clients 38.7% had monthly income between 10001 and 20000, 29.3% clients had the monthly income of up to 5000 per month, 28% client earned 5000 to 10000 per month and only 4% clients were earned more than 20000 per month.

Table 4.1.2(b): Frequency and Percentage Distribution of Clients with Diabetic Ulcer Foot in the insulin dressing group

N=75

Sl.No.	Demographic Variables	Insulin dressing Group	
		Number	Percentage
7	**Marital status**		
	a. Married	07	09.30
	b. Unmarried	11	14.70
	c. Widowed/ Widower	37	62.70
	d. Divorced/Separated	10	13.30
8	**Sources of information on DM**		
	a. Health personnel	26	34.70
	b. Mass media	21	28.00
	c. Friends	20	26.70
	d. Relatives	08	10.70
	e. Others	00	00.00
9	**Duration of Illness**		
	a. < 1 year	35	46.70
	b. 1-2 years	30	40.00
	c. 3-4 years	10	13.30
	d. 5-6 years	00	00.00
	e. >6 years	00	00.00
10	**Dietary Pattern**		
	a. Vegetarian	20	26.70
	b. Non-vegetarian	55	73.30
11	**Residential Area**		
	a. Rural	34	45.30
	b. Urban	28	37.30
	c. Sub-urban	13	17.30
12	**Family History of Diabetes**		
	a. Yes	27	36.00
	b. No	26	34.70
	c. Unknown	22	29.30
13	**Duration of Foot Ulcer**		
	a. < one year	57	76.00
	b. One year	18	24.00
	c. Two year	00	00.00
	d. >Two year	00	00.00

The above table reveals the frequency and percentage distribution of 75 diabetic foot ulcer clients in the insulin dressing group.

Regarding the marital status 36% were widowed, 26.7% were widowers 14.7% were unmarried, 13.3% were divorced and separated and9.3% was married.

Out of 75 clients 34.7% of the clients obtained diabetes related information from health personnel, 28% obtained from mass media, 26.7% were obtained information from friends, and 10.7% from relatives.

Considering the duration of illness 46.7% clients were diabetic less than one year, 40% client had diabetes between 1 and 2 years and 13.3% had been suffering from diabetes around 3-4years.

Pertaining to the dietary pattern 73.3% belonged to non-vegetarians and 26.7 were vegetarians.

Regarding the family history of diabetes 36% were know about the diabetic history, 34.7% were not having the family history of diabetes and 29.3% were not aware of family history of diabetes.

Among 75 clients 45.3% were residing in rural area, 37.3% were residing in urban area and 17.3% were from sub-urban area.

Regarding the duration of diabetic foot ulcer 76% of the clients had foot ulcer less than one year and 24% had one year duration of ulcer foot.

Table 4.1.3(a): Frequency and Percentage Distribution of Clients with Diabetic Ulcer Foot in the Metronidazole dressing group

N=75

Sl.No.	Demographic variables	Metronidazole dressing	
		Number	Percentage
1	**Age in years**		
	a. 25-35	00	00.00
	b. 36-45	06	08.00
	c. 46-55	31	41.30
	d. 56 -65	13	17.30
	e. 66 and above	25	33.30
2	**Sex**		
	a. Male	32	42.70
	b. Female	43	57.30
3	**Religion**		
	a. Hindu	41	54.70
	b. Muslim	11	14.70
	c. Christian	10	13.30
	d. Others	13	17.30
4	**Education**		
	a. Uneducated	42	56.00
	b. Primary school	10	13.30
	c. High school	12	24.00
	d. Higher secondary	05	06.70
	e. Graduate and above	06	08.00
5	**Occupation**		
	a. Unemployed	00	00.00
	b. Daily labor	21	28.00
	c. Private Employee	17	22.70
	d. Government Employee	31	41.30
	e. Professionals	06	08.00
6	**Family income per month**		
	a. Up to 5000	16	21.30
	b. 5001-10000	41	54.70
	c. 10001-20000	15	20.00
	d. Above 20000	03	04.00

The above table reveals the frequency and percentage distribution of 75 diabetic foot ulcer clients in the Metronidazole dressing group.

Pertaining to age majority 8% clients were aged between 36 and 45, 41.3% were aged between 46 and 55 years in age, 33.3 were aged 66 and above and 17.3% clients were aged between 56 and 65 years.

Considering the sex of the diabetic clients most 42.7% were male and 57.3 % were females.

Considering the religion almost 54.7% were Hindus, 13.3 % were Christians and 14.7%and 17.3% were Muslims and other religion respectively.

With regard to educational qualification 6.7% were educated up to higher secondary level, 24.% were completed high school 13.3 were studied up to primary school and 8 % graduate and above and 56% were uneducated.

Based on the employment 22.7% were private employees, 8% were professionals, 28% were daily labor and 41.3% were government employees.

Pertaining to the income of the clients 54.7% had monthly income between 5000 and10000, 20% earning 10001 to 20000, 21.3% clients had the monthly income of up to 5000 per month and 4% were earning more than 20000 per month.

Table 4.1.3(b): Frequency and Percentage Distribution of Clients with Diabetic Ulcer Foot in the Metronidazole dressing group N=75

Sl.No.	Demographic variables	Metronidazole dressing Group	
		Number	Percentage
7	**Marital status**		
	a. Married	07	09.70
	b. Unmarried	19	25.33
	c. Widowed/ Widower	29	38.70
	d. Divorced/Separated	20	26.30
8	**Sources of information on DM**		
	a. Health personnel	27	36.00
	b. Mass media	23	30.70
	c. Friends	16	21.30
	d. Relatives	08	10.70
	e. Others	01	01.30
9	**Duration of Illness**		
	a. < 1 year	24	32.00
	b. 1-2 years	23	30.70
	c. 3-4 years	16	21.30
	d. 5-6 years	11	14.70
	e. >6 years	01	01.30
10	**Dietary Pattern**		
	a. Vegetarian	30	40.00
	b. Non-vegetarian	45	60.00
11	**Residential Area**		
	a. Rural	41	54.70
	b. Urban	23	30.702
12	**Family History of Diabetes**		
	a. Yes	19	25.70
	b. No	21	28.40
13	**Duration of Foot Ulcer**		
	a. < one year	49	65.30
	b. One year	25	33.30
	c. Two year	01	01.30
	d. >Two year	00	00.00

The above table reveals the frequency and percentage distribution of 75 diabetic foot ulcer clients in the metronidazole dressing group.

Regarding the marital status 28% were widowed, 10.7% were widowers 25.33% were unmarried, 26.3% were divorced and separated and9.7% was married.

Out of 75 clients 36% of the clients obtained diabetes related information from health personnel, 30.7% obtained from mass media, 21.3% were obtained information from friends, and 10.7% from relatives.

Considering the duration of illness 32% clients were diabetic less than one year, 30.7% client had diabetes between 1 and 2 years and 31.3% had been suffering from diabetes around 3-4years.

Pertaining to the dietary pattern 60% belonged to non-vegetarians and 40 were vegetarians.

Regarding the family history of diabetes 25.7% were know about the diabetic history, 28.4% were not having the family history of diabetes and 45.9% were not aware of family history of diabetes.

Among 75 clients 54.7% were residing in rural area, 30.7% were residing in urban area and 14.7% were from sub-urban area.

Regarding the duration of diabetic foot ulcer 65.3% of the clients had foot ulcer less than one year and 33.3% had one year duration of ulcer foot.

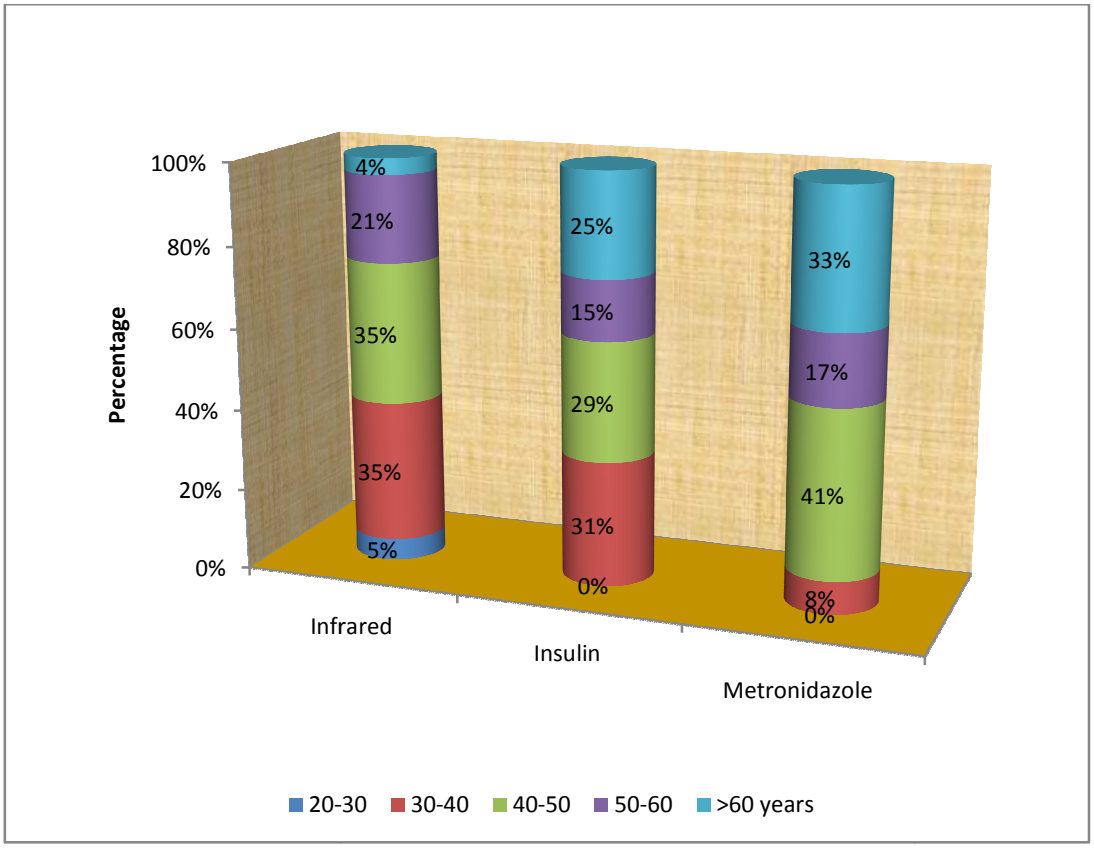


Fig.4.1.1: Percentage Distribution of Demographic variables for diabetic ulcer foot clients - Age

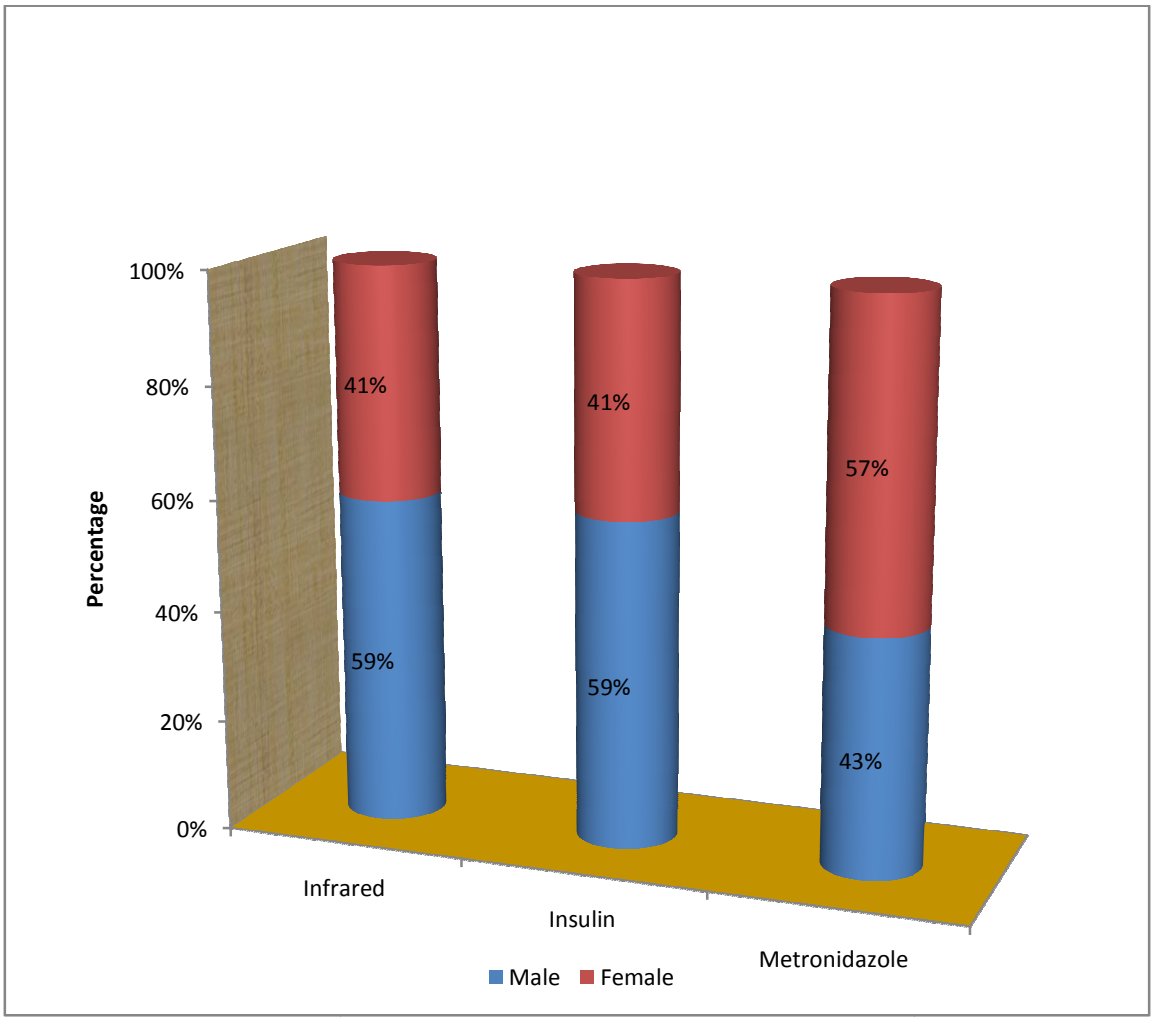


Fig.4.1.2: Percentage Distribution of Demographic variables for diabetic ulcer foot Patients - Sex

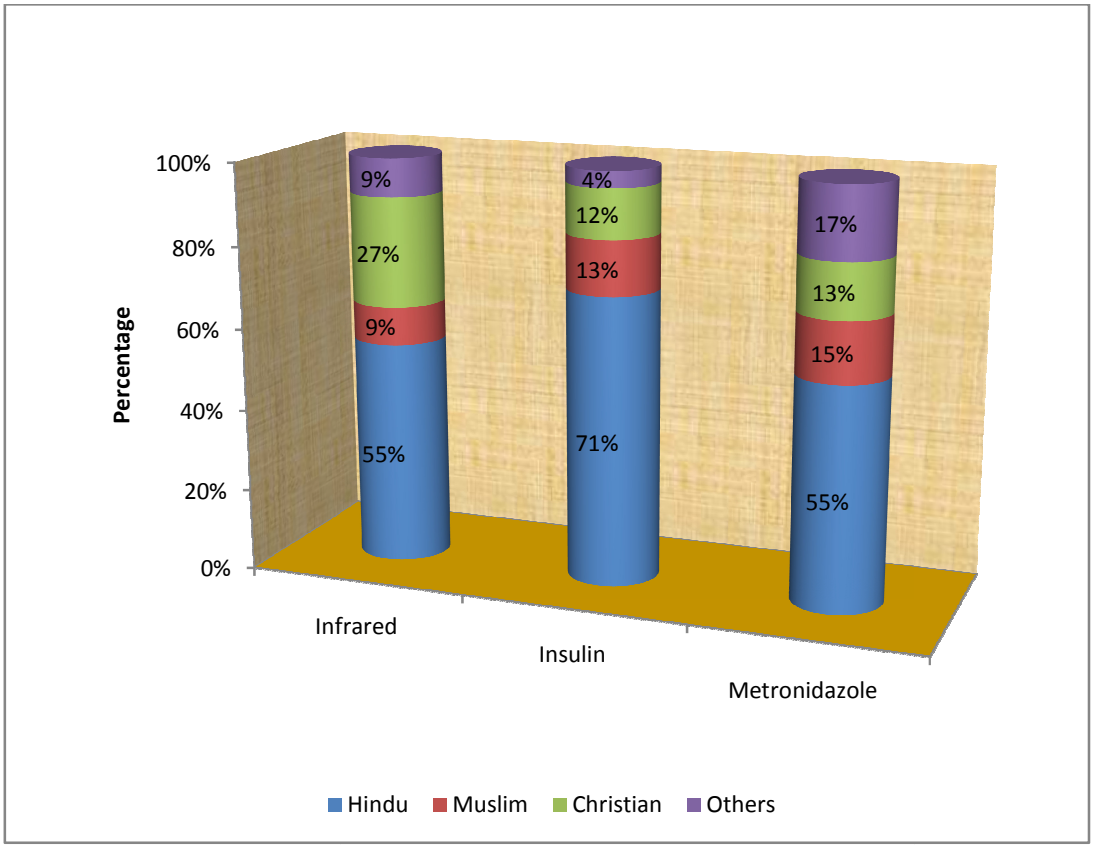


Fig.4.1.3: Percentage Distribution of Demographic variables for diabetic ulcer foot clients - religion

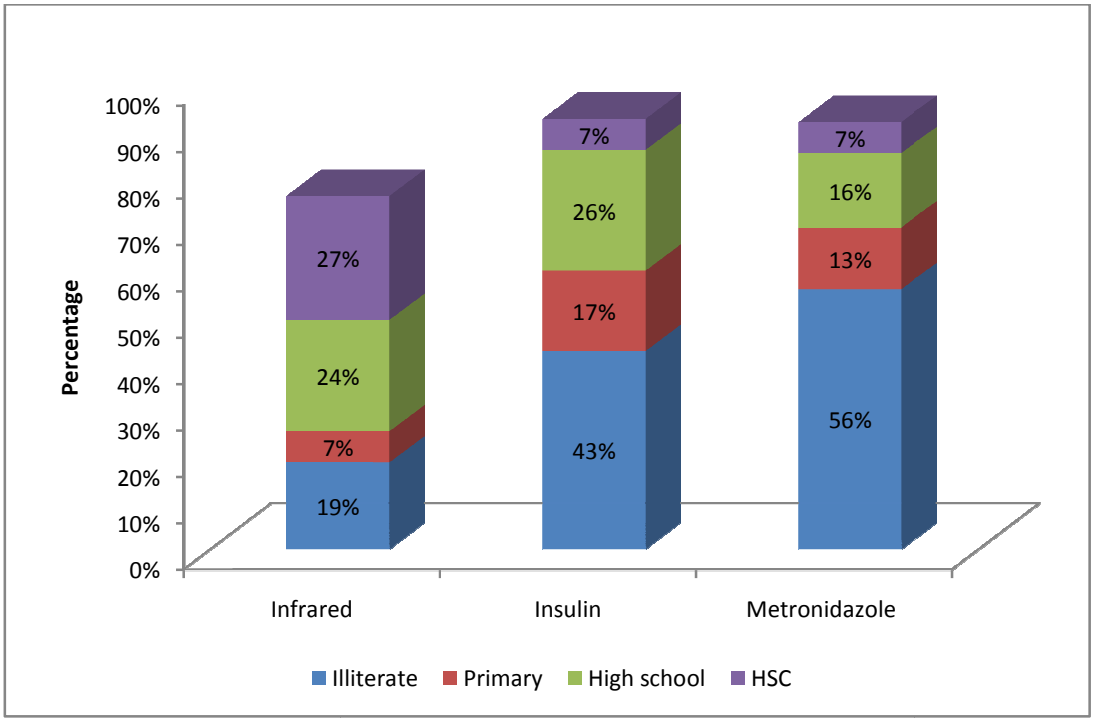


Fig.4.1.4: Percentage Distribution of Demographic variables for diabetic ulcer foot clients - Education

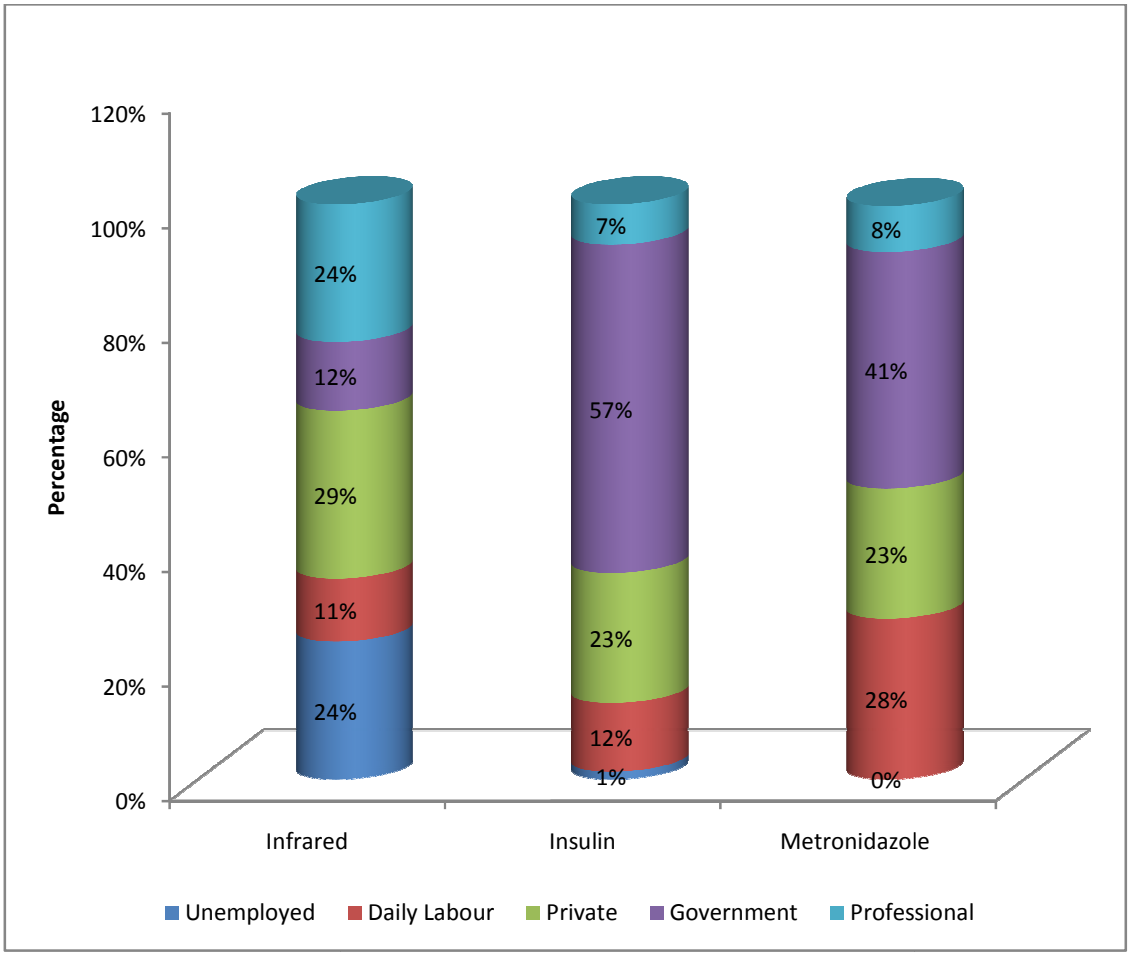


Fig.4.1.5: Percentage Distribution of Demographic variables for diabetic ulcer foot clients -Occupation

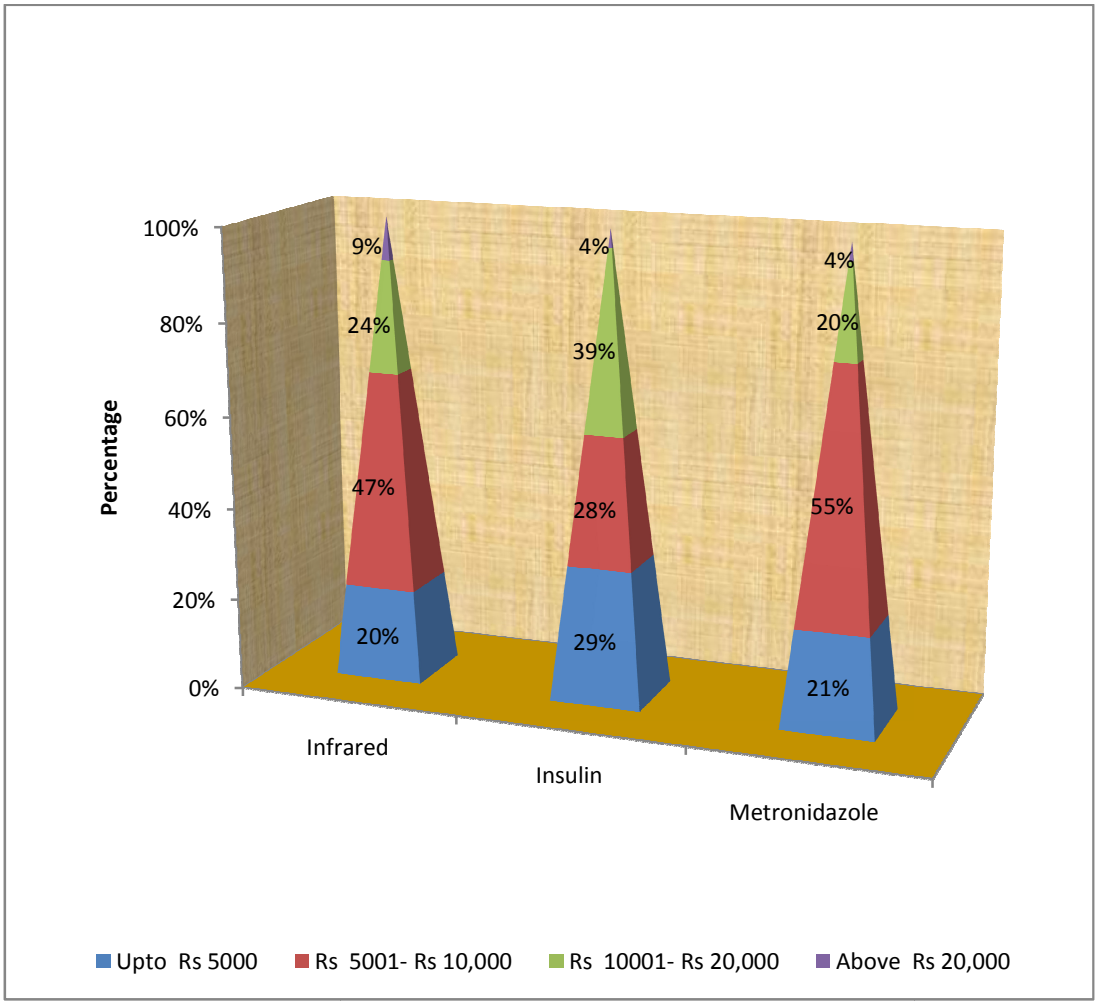


Fig.4.1.6: Percentage Distribution of Demographic variables for diabetic ulcer foot clients - Income

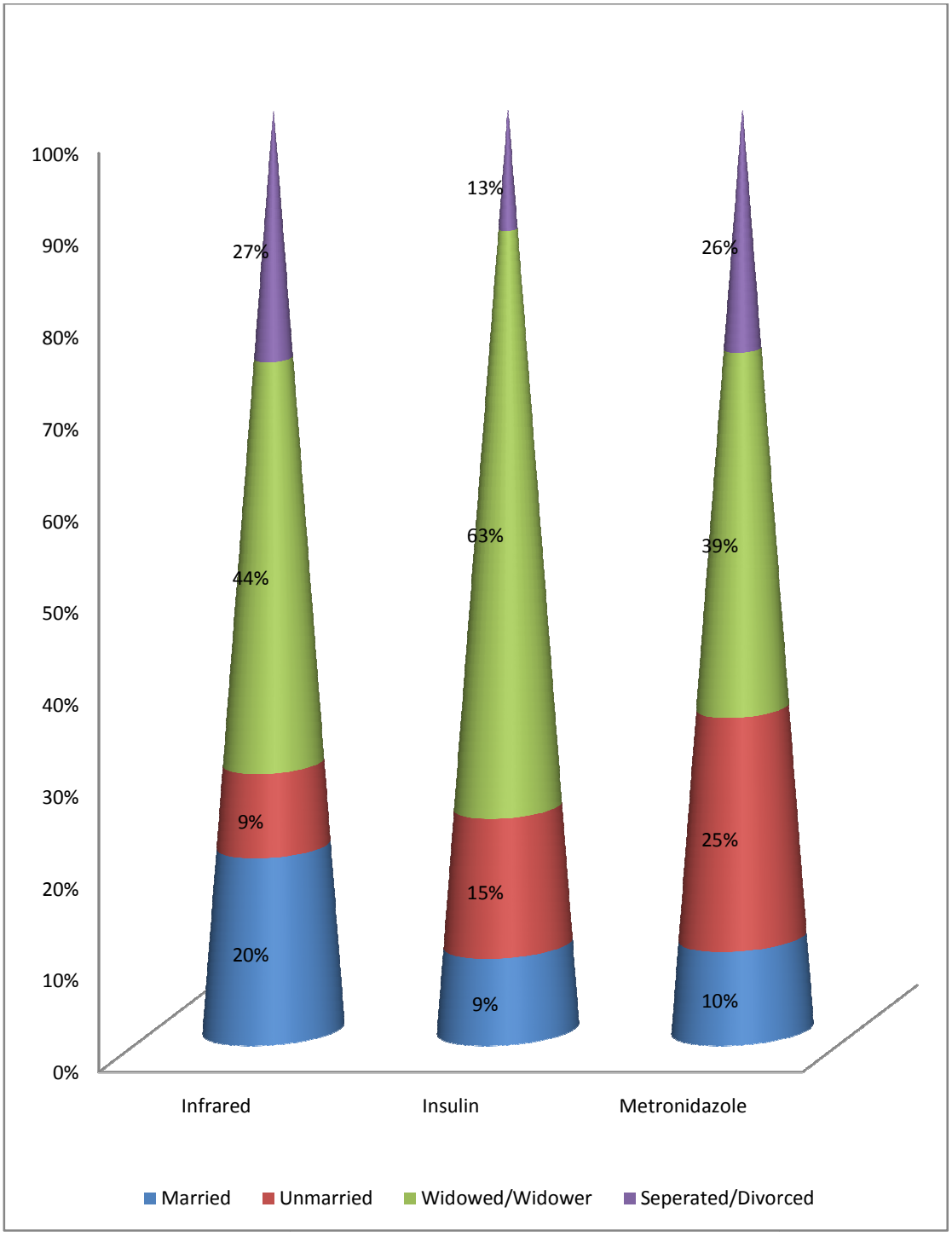


Fig.4.1.7: Percentage Distribution of Demographic variables for diabetic ulcer foot clients – Marital Status

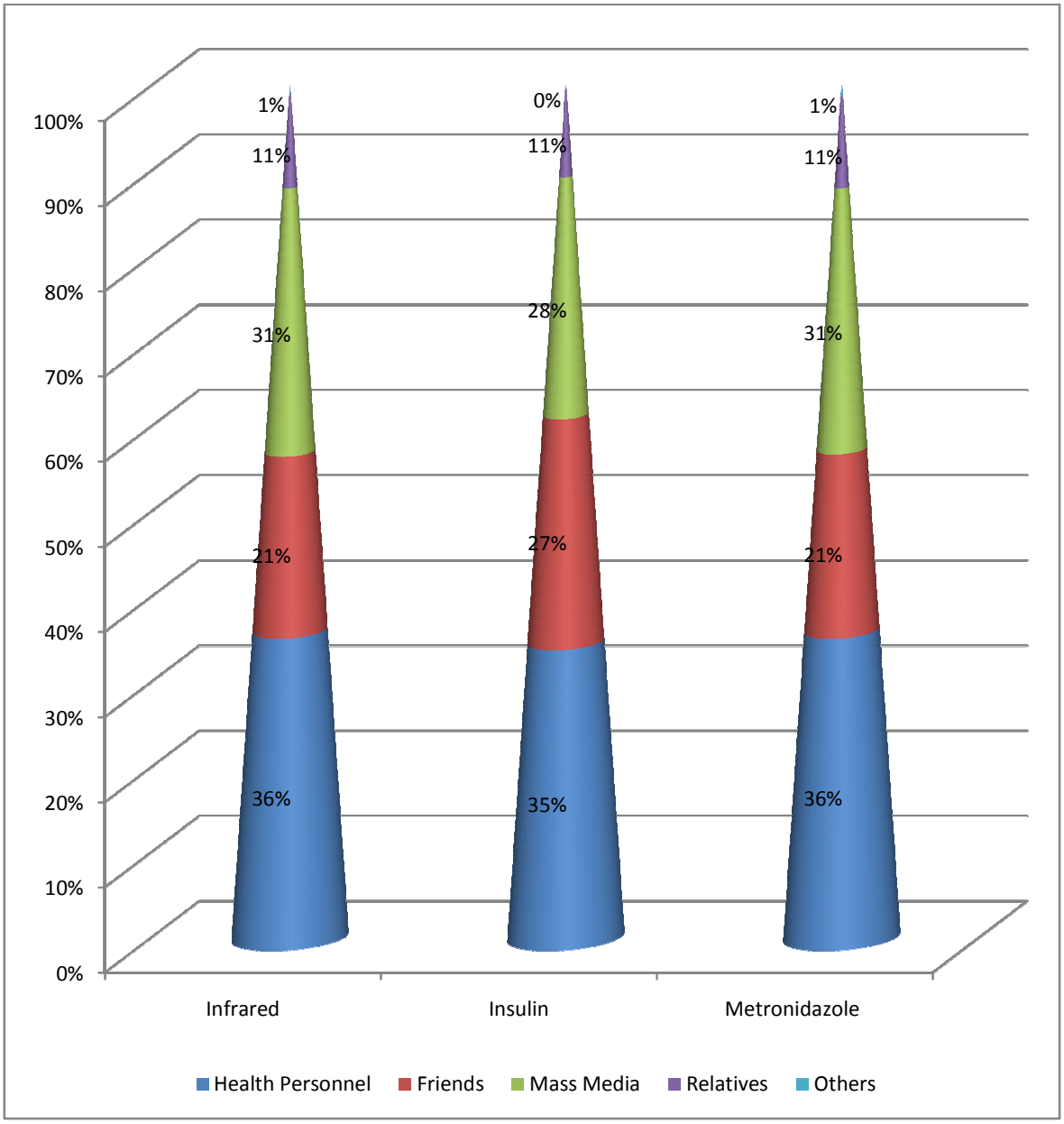


Fig.4.1.8: Percentage distribution of demographic variables of diabetic foot ulcer clients – Sources of information

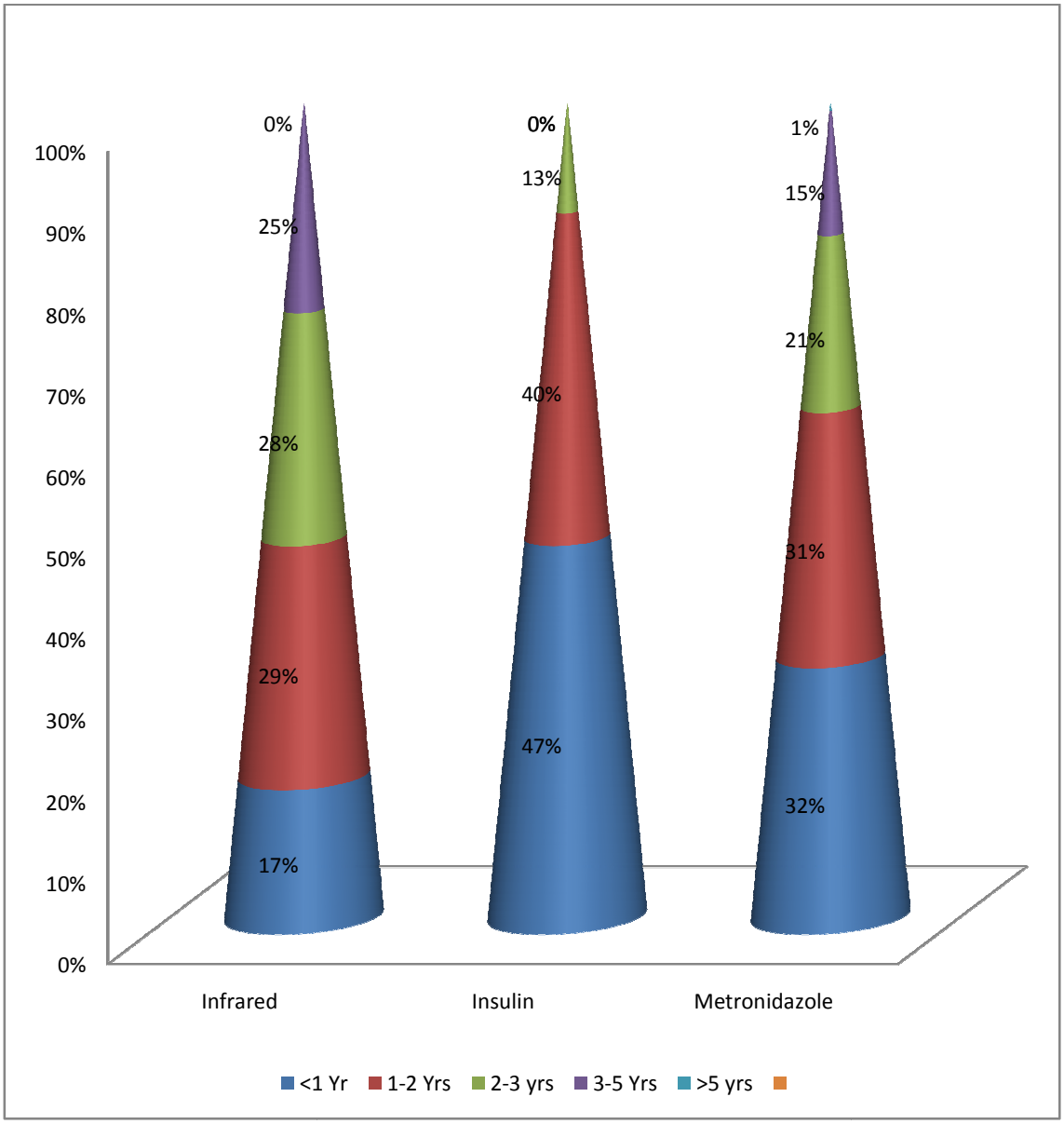
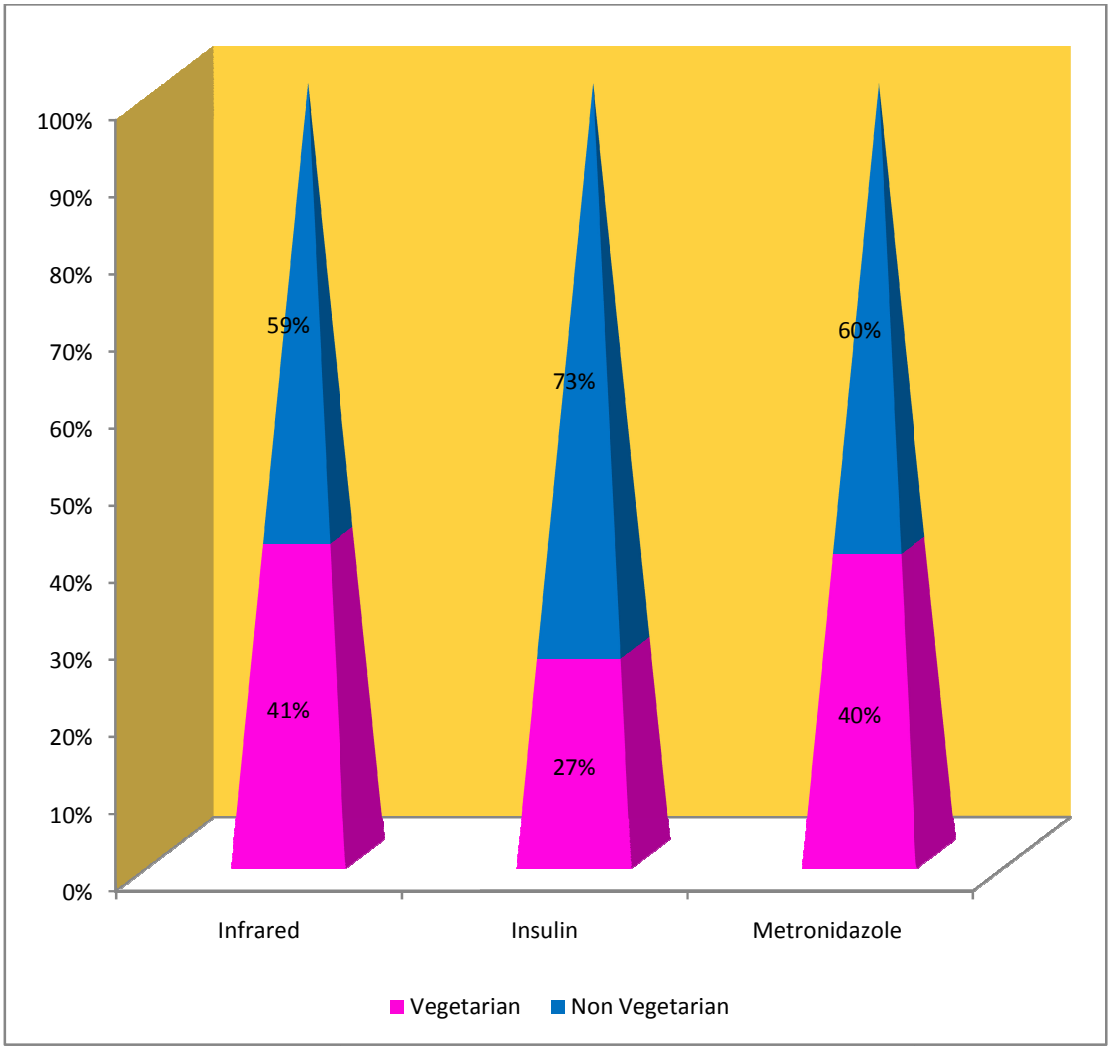


Fig.4.1.9: Percentage distribution of demographic variables of diabetic foot ulcer clients – Duration of Illness



4.1.10: Percentage distribution of demographic variables of diabetic foot ulcer clients - Dietary Pattern

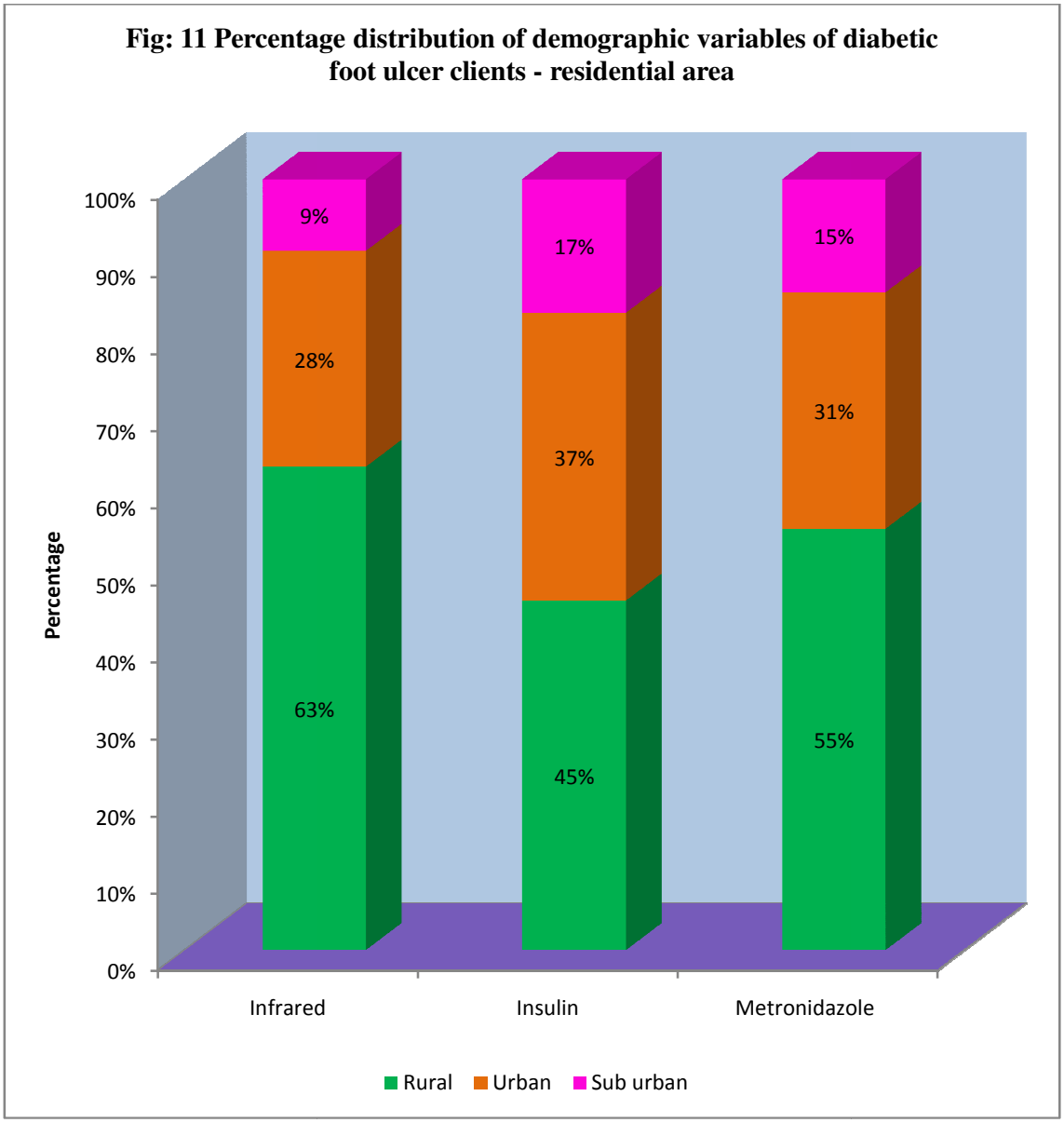


Fig.4.1.11: Percentage distribution of demographic variables of diabetic foot ulcer clients – Residential Area

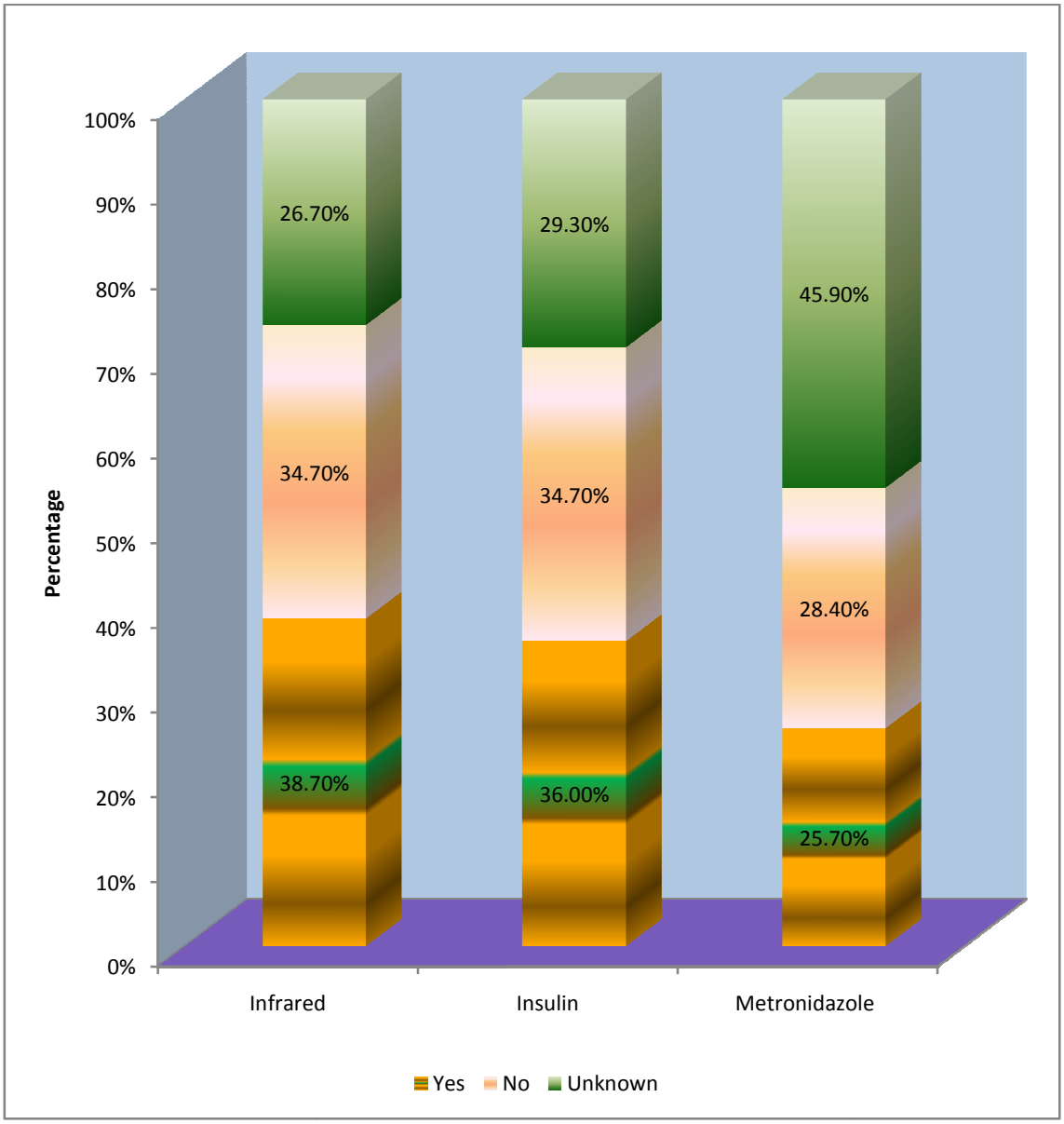


Fig.4.1.12: Percentage distribution of demographic variables of diabetic foot ulcer clients - Family history of DM

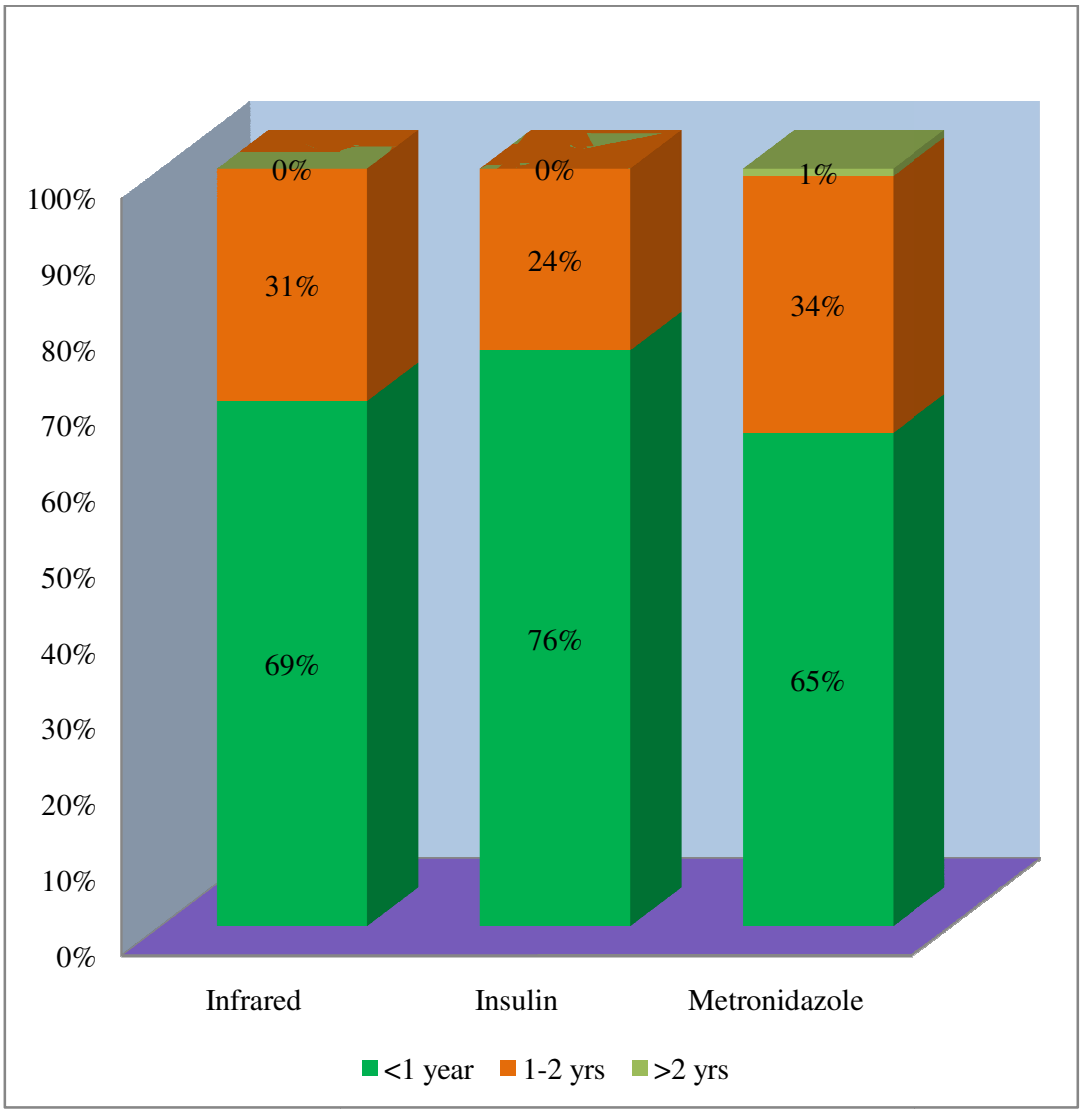


Fig.4.1.13: Percentage distribution of demographic variables of diabetic foot ulcer clients – Duration of foot ulcer

SECTION 4.2: ASSESSMENT OF PRE TEST SCORE OF DIABETIC FOOT ULCER CLIENTS.

Table 4.2.1: Pre Test Score of Diabetic Foot Ulcer Clients

N=225

Sl. No.	Groups	Number	Mean	Standard Deviation	F-value
1	Infrared Radiation	75	51.5067	4.21828	
2	Insulin Dressing	75	50.2400	5.74419	1.678
3	Metronidazole Dressing	75	50.3333	4.00113	N S
	Total	**225**	**50.6933**	**4.73298**	

The above table depict that the pre test score of the diabetic clients in all three group.

Infra red radiation group pre test score mean was 51.5 and standard deviation 4.21828. Insulin dressing group, pre test mean was 50.24 and standard deviation 5.74419 and in the Metronidazole dressing group pre test mean was 50.69, and the standard deviation 4.0.The total of three groups mean was 50.69, standard deviation 4.73and the overall" F" value was 1.678.

Fig.4.2.1(a): Pre Test Score of Diabetic Foot Ulcer Clients in all three groups

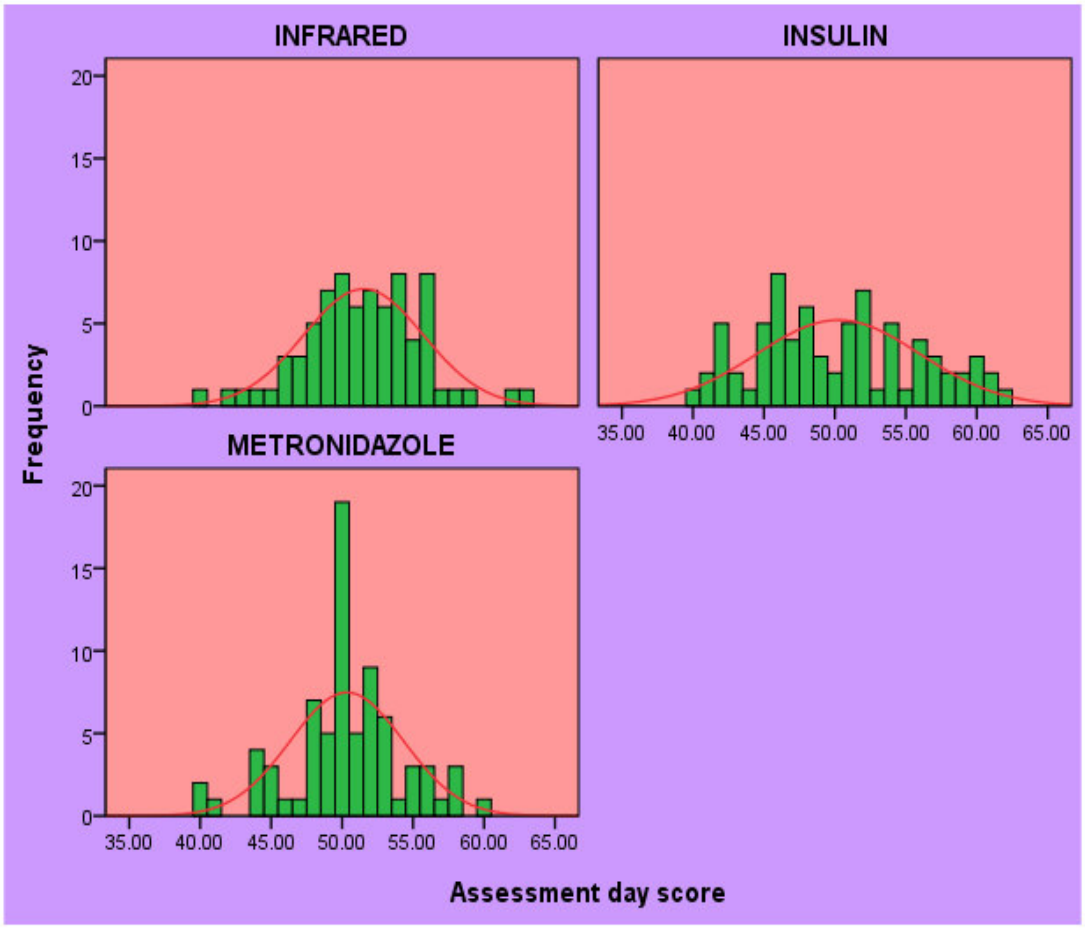
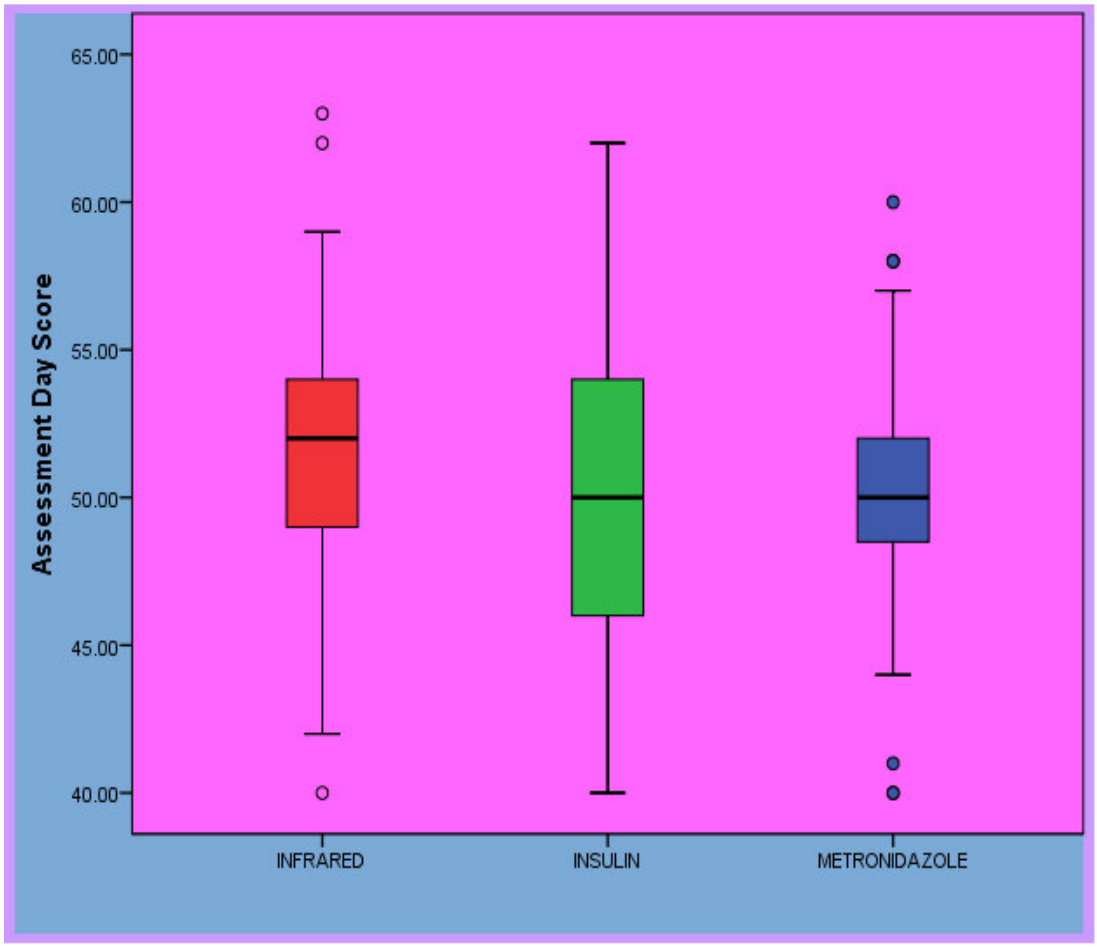


Fig.4.2.1(b): Pre Test Score of Diabetic Foot Ulcer Clients in all three groups



SECTION 4.3: ASSESSMENT OF THE EFFECTIVENESS OF INFRARED RADIATION, INSULIN DRESSING AND METRONIDAZOLE DRESSING IN HEALING OF DIABETIC ULCER FOOT

Table 4.3.1: Effectiveness of infrared radiation, insulin dressing and metronidazole dressing in healing of diabetic ulcer foot

N=225

Sl. No.	Groups	Number	Mean	Standard Deviation	F-value
1	Infrared Radiation	75	20.33	3.60	
2	Insulin Dressing	75	24.51	4.01	60.70
3	Metronidazole Dressing	75	27.13	3.62	**S******
	Total	**225**	**23.88**	**4.66**	

The above table depict that the post test score of the diabetic clients in all three group.

Infra red radiation group post test score mean was 20.33 and standard deviation 3.60. Insulin dressing group, post test mean was 24.51 and standard deviation 4.01 and in the Metronidazole dressing group post test mean was 27.13, and the standard deviation 3.62.The total of three groups mean was 23.88, standard deviation 4.66 and the overall" F" value was 60.7.

SECTION 4.4: COMPARISON OF PRE TEST AND POST-TEST SCORE OF INFRARED RADIATION, INSULIN DRESSING AND METRONIDAZOLE DRESSING IN HEALING OF DIABETIC FOOT ULCER.

Table 4.4.1: Comparison of pre test and post-test score of infrared radiation in healing of diabetic foot ulcer

N=75

Sl. No.	Infrared radiation	No	Mean	Standard Deviation
2	Pre-Test	75	51.5067	4.2183
	Post-Test	75	20.3200	3.6729

P< 0.001

The above table depicts that the pre test and post scores of the Infra red radiation group. At the pre test mean and standard deviation were respectively 51.5067 and 4.21828. At the post test mean and standard deviation were respectively 20.32 and 3.673. The" t" value was 68.352 it is more than table value. It shows a high level of significance statistically at p<0.001 level.

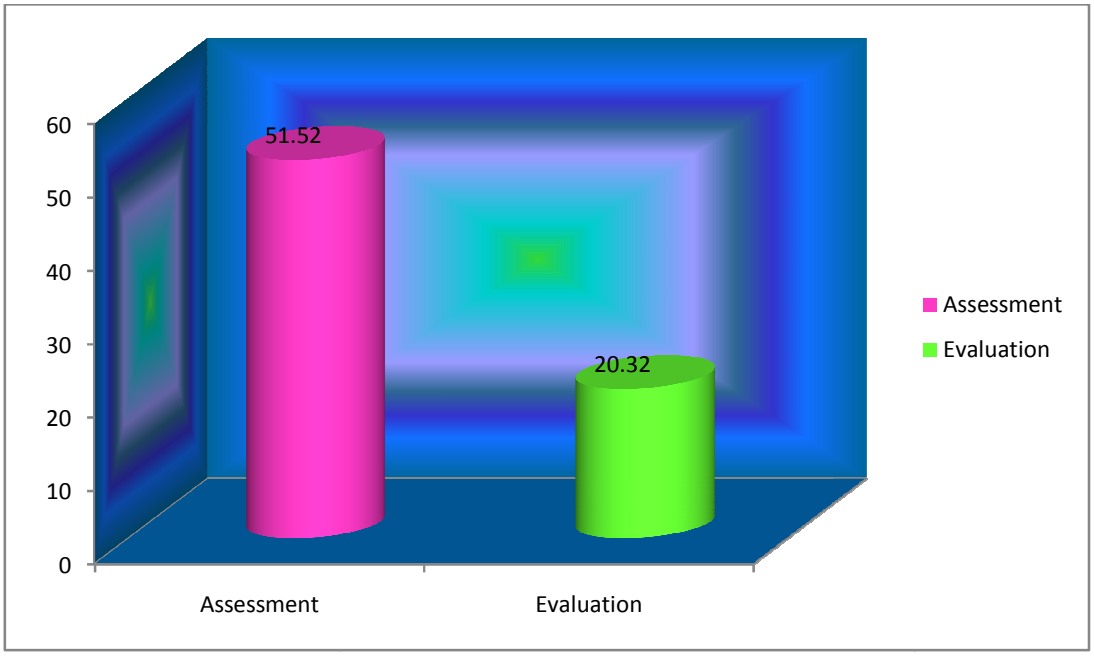


Fig.4.4.1: Comparative between assessment and Evaluation day for Infrared treatment for diabetic foot ulcer clients

Table 4.4.2: Comparison of mean score between pre test and post-test in the infrared Radiation group

N=75

Infrared group assessment and evaluation		Paired Differences					t	df
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference			
					Lower	Upper		
Pair 1	assessment - evaluation	31.187	3.951	.456	30.278	32.096	68.352***	74

***P<0.001

The above table 4.4.2 compares the mean score between assessment and evaluation in the infrared group. The mean score was 31.187 and the standard deviation 3.95 and the “t” value were 68.35.This shows that there is significance improvement in infrared radiation.

Table 4.4.3: Comparison of pre test and Post-test score of Insulin Dressing in healing of diabetic foot ulcer

N=75

Sl. No.	Insulin Dressing	No.	Mean	Standard Deviation	t-value
1	Pre-Test	75	50.2400	5.74419	45.268
2	Post-Test	75	24.2533	4.02725	S***

***P< 0.001

The above table Compare the pre test and Post-test score of Insulin Dressing in healing of diabetic foot ulcer that Insulin dressing pre test mean score is 50.24 and standard deviation 5.74, post mean score 24.25, standard deviation 4.02 and the " t" value 45.27 which is greater than table value. It shows a high level of significance statistically at p<0.001 level.

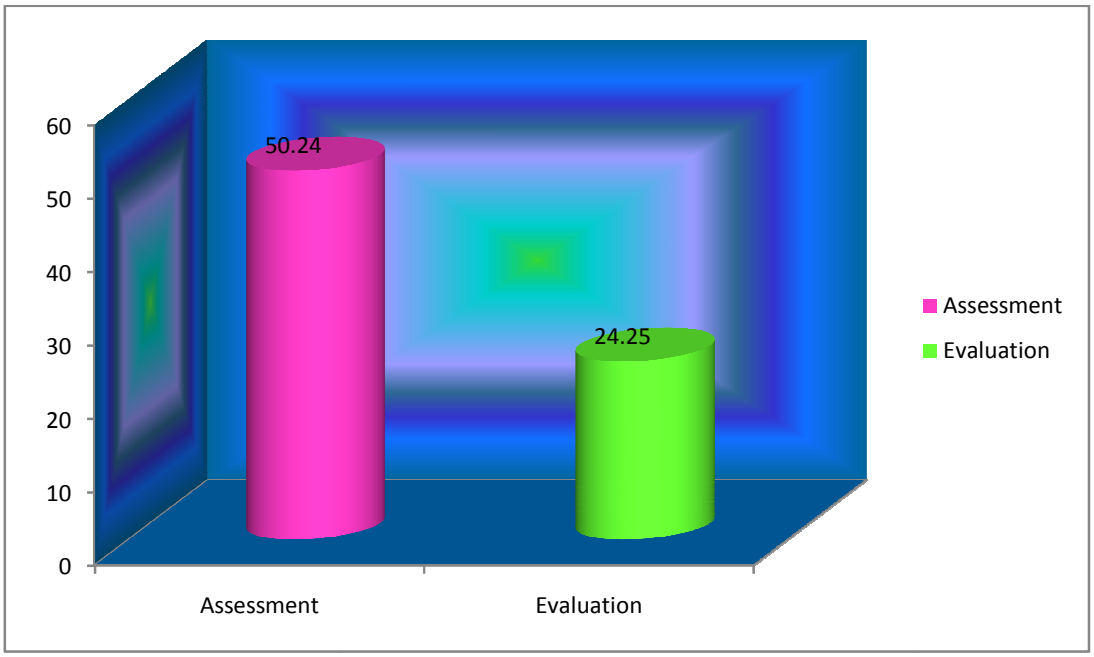


Fig.4.4.3: Comparative between assessment and Evaluation day for Insulin treatment for diabetic foot ulcer clients

Table 4.4.4: Comparison of mean score between pre test and post-test in the insulin dressing group

N=75

Insulin dressing group assessment and evaluation		Paired Differences					t	df
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference			
					Lower	Upper		
Pair 1	assessment – evaluation	25.987	4.972	.574	24.843	27.131	45.268***	74

***P<0.001

The above table 4.4.4 compares the mean score between assessment and evaluation in the insulin dressing group. The mean score was 25.97 and the standard deviation 4.97 and the “t” value were 45.27. This shows that there is significance improvement in insulin dressing.

Table 4.4.5: Comparison of pre test and Post-test score of Metronidazole Dressing in healing of diabetic foot ulcer

N=75

Sl. No.	Metronidazole Dressing	No	Mean	Standard Deviation
1	Pre-Test	75	50.3333	4.00113
2	Post-Test	75	27.0667	3.58425

P< 0.001

The above table compares the pre test and Post-test score of Metronidazole Dressing in healing of diabetic foot ulcer. It reveals that in Metronidazole dressing, pre test and post test mean scores were respectively 50.3 and 27.06 and the standard deviation were 4.0 and 3.58 respectively It shows a high level of significance statistically at $p<0.001$ level.

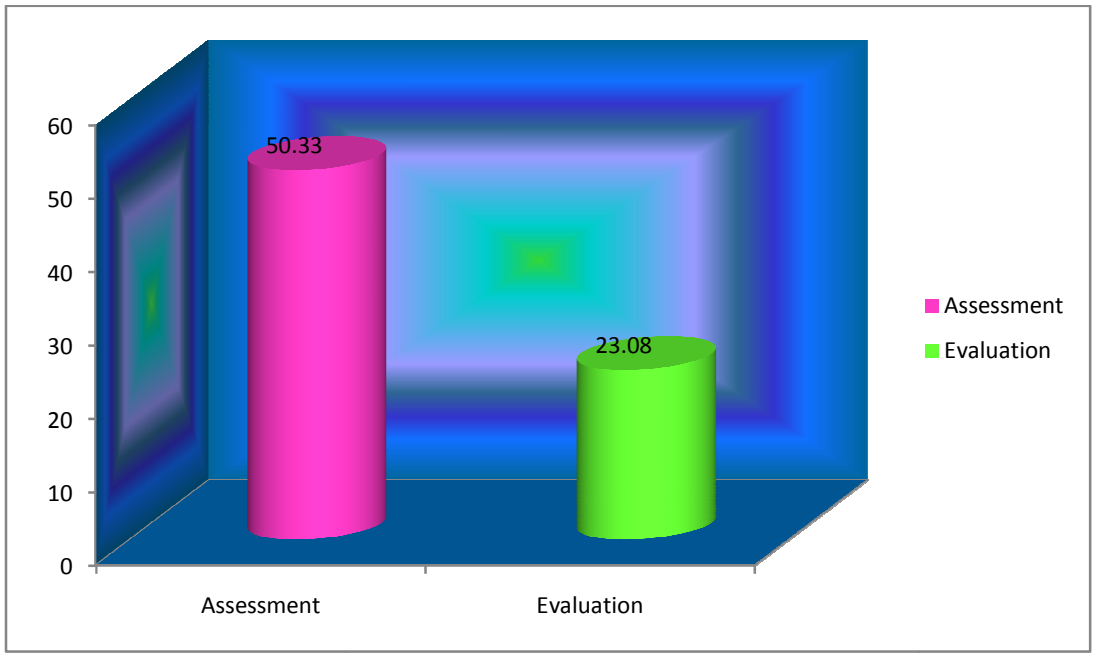


Fig.4.4.5: Comparative between assessment and Evaluation day for Metronidazole treatment for diabetic foot ulcer patients

Table 4.4.6: Comparison of mean score between pre test and post-test in the metronidazole dressing group

N=225

Metronidazole dressing group assessment and evaluation		Paired Differences					t	df
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference			
					Lower	Upper		
Pair 1	assessment - evaluation	23.267	3.814	.441	22.389	24.144	52.825***	74

***P<0.001

The above table 4.4.6 compares the mean score between assessment and evaluation in the metronidazole dressing group. The mean score was 23.26 and the standard deviation 3.81 and the “t” value were 52.8. This shows that there is significance improvement in metronidazole dressing.

SECTION 4.5: COMPARISON OF PRE TEST AND POST TEST SCORE OF DIABETIC FOOT ULCER

Table 4.5.1: Comparison of pre test and post test score of diabetic foot ulcer in all three groups

N=225

Sl.No.	Domain	No	Pretest			Post test		
			Mean	S D	F - Value	Mean	S D	F - Value
1	Infrared radiation	75	51.5	4.2		20.3	3.6	
2	Insulin Dressing	75	50.2	5.7	1.67	24.5	4.0	60.7
3	Metronidazole Dressing	75	50.3	4.0	N S	27.1	3.6	S**
4	Total	225	50.69	4.73		23.88	4.66	

**p<0.01

Table 4.5.1 compares the pre test and post test scores of diabetic foot ulcer in all 225 clients total pre test mean score was 50.69 and post test score was 23.88. pre test mean of standard deviation 4.733 post test mean of standard deviation was 4.66 and the F value at pre test was 1.678 and post test 60.7, it has statistically significant different at P<0.01 level. This shows that all the three interventions were effective in healing of diabetic ulcer but infrared radiation was the most effective method when comparing to other two interventions.

SECTION 4.6: MULTIPLE COMPARISONS BETWEEN THREE GROUPS

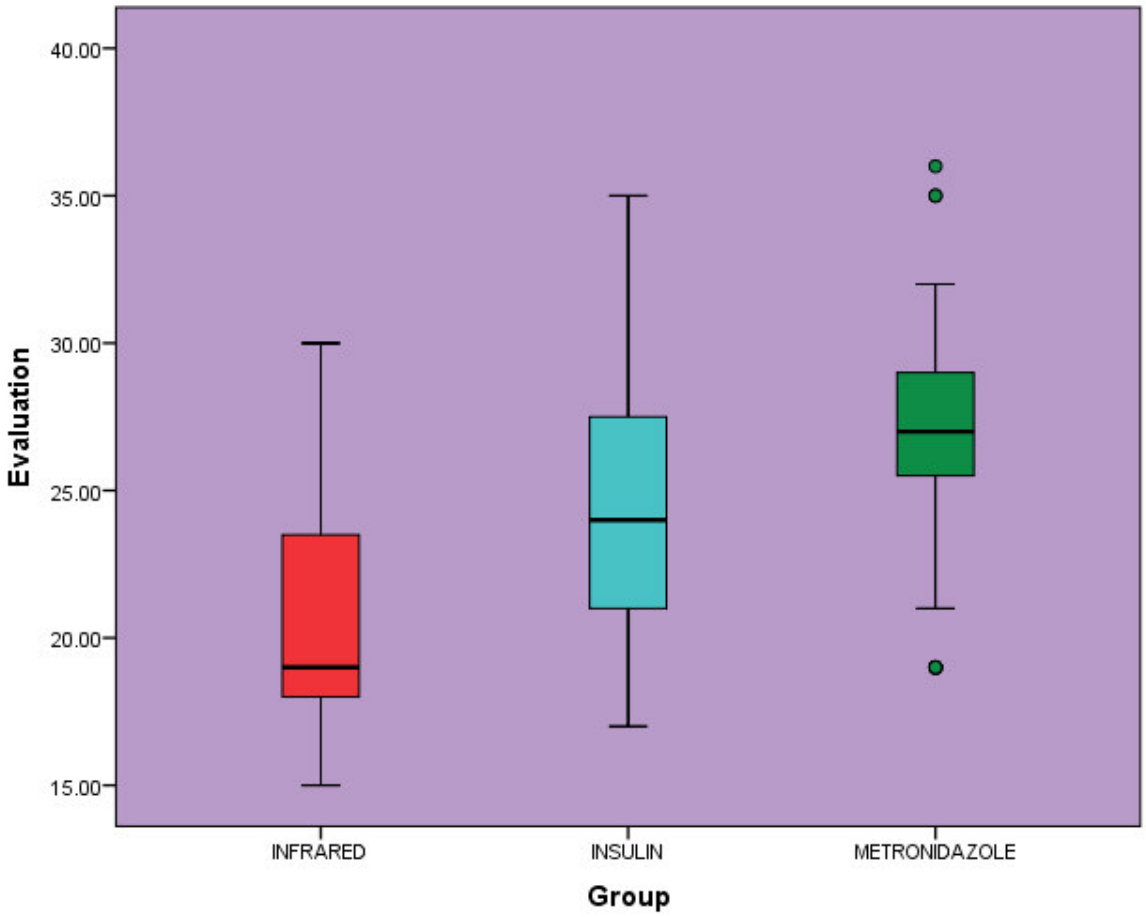
Table 4.6.1: Multiple comparisons between three groups

N=225

Multiple Comparisons						
Dependent Variable: evaluation						
	(I) group	**(J) group**	**Mean Difference (I-J)**	**Std. Error**	**95% Confidence Interval**	
					Lower Bound	**Upper Bound**
Tukey HSD	Infrared	Insulin	-3.93333*	.61504	-5.3846	-2.4821
		Metronidazole	-6.74667*	.61504	-8.1979	-5.2954
	Insulin	Infrared	3.93333*	.61504	2.4821	5.3846
		Metronidazole	-2.81333*	.61504	-4.2646	-1.3621
	Metronidazole	Infrared	6.74667*	.61504	5.2954	8.1979
		Insulin	2.81333*	.61504	1.3621	4.2646
*. The mean difference is significant at the 0.05 level.						

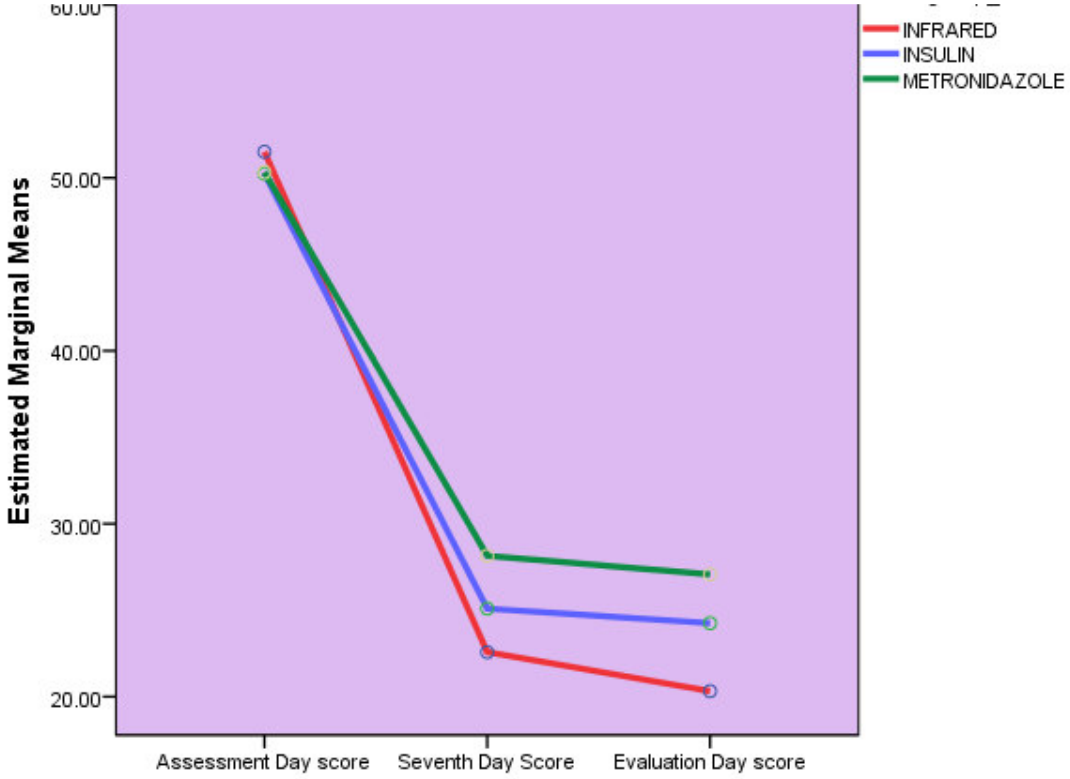
The above table 4.6. compares three groups among them.

Fig.4.6.1(a): Comparison of Post test score of the three groups



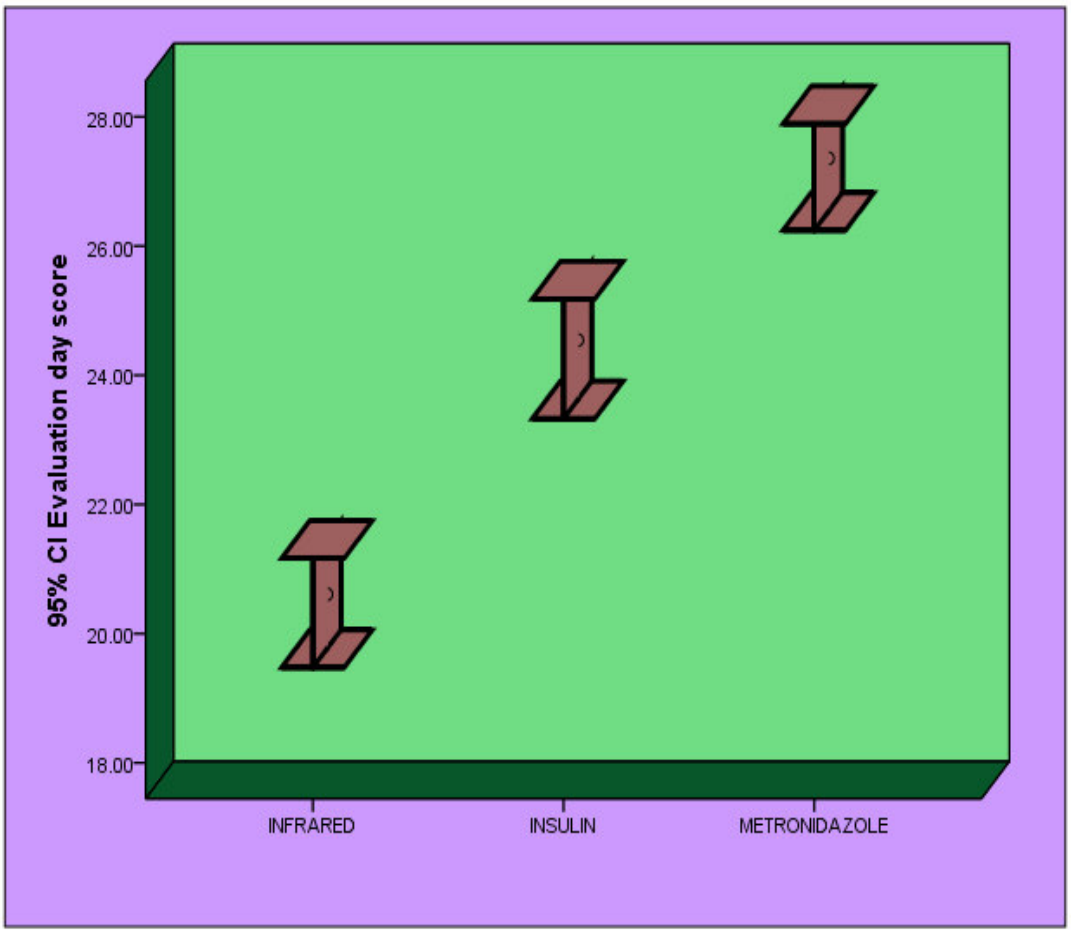
The above picture shows that infrared radiation was most effective when comparing to the other two intervention groups.

Fig.4.6.1(b): Comparison of three treatment score for foot ulcer



The above picture compares the post test score of all three groups on seventh day and tenth day of intervention. Foot ulcer in the infrared radiation group started healing earlier than the other two intervention groups both on seventh and tenth day.

Fig.4.6.1(c): Evaluation day score



SECTION 4.7: ASSOCIATION OF POST-TEST SCORE WITH THE SELECTED DEMOGRAPHIC VARIABLES

Table 4.7.1: Association of post test score of infrared radiation in healing of diabetic foot ulcer with the selected demographic variables

N=75

Sl.No.	Demographic variables		Evaluation classification				Chi Square	P value
			Below Average		Above Average			
			No.	%	No.	%		
1	Age in years	a.25 -35	03	04.0	01	01.3	1.428	0.839
		b.36-45	13	17.3	13	17.3		
		c.46-55	14	18.7	12	16.0		
		d.56-65	10	13.3	06	08.0		
		e.>65	02	02.7	01	01.3		
2	Sex	a. Male	25	33.3	19	25.3	0.029	0.865
		b. Female	17	22.7	14	18.		
3	Religion	a. Hindu	22	29.3	19	25.3	2.664	0.446
		b. Muslim	03	04.0	04	05.3		
		c. Christian	14	18.7	06	08.0		
		d. Others	03	04.0	04	05.3		
4	Education	a. Uneducated	10	13.3	04	05.3	10.667*	0.031
		b. Primary	05	06.7	00	00.0		
		c. High school	08	10.7	10	13.3		
		d. HSC	07	09.3	13	17.3		
		e. UG and Above	12	16.0	06	08.0		
5	Occupation	a. Unemployed	11	14.7	07	09.3	7.831*	0.05
		b. Daily Labor	06	08.0	02	20.7		
		c. Private employee	07	09.3	15	20.0		
		d. Government employee	18	24.0	09	12.0		
		e. Professionals	00	00.0	00	00.0		

Sl.No.	Demographic variables		Evaluation classification				Chi Square	P value
			Below Average		Above Average			
			No.	%	No.	%		
6	Family Income/month (Rs)	a. Up to 5000	09	12.0	06	80.0	1.304	0.728
		b. 5001- 10,000	21	28.0	14	18.7		
		c. 10001-20,000	08	10.7	10	13.3		
		d. Above 20,000	04	05.3	03	40.0		
7	Marital status	a. Married	06	08.0	09	12.0	3.861	0.277
		b. Unmarried	18	24.0	09	12.0		
		c. Widowed	13	17.3	13	17.3		
		d. Widower	05	06.7	02	02.7		
		e. Separated/ Divorced	00	00.0 %	00	00.0		
8	Source of information	a. Health Personnel	19	25.3	11	14.7	.1.793	0.616
		b. Mass Media	09	12.0	09	12.0		
		c. Friends	10	13.3	11	14.7		
		d. Relatives	04	05.3	02	02.7		
		Others	00	00.0	00	00.0		
9	Duration of illness	a.<1 Yr	08	10.7	05	06.7	2.66	0.447
		b. 1-2 Yrs	15	20.0	07	09.3		
		c. 2-3 yrs	10	13.3	11	14.7		
		d. 3-4 Yrs	09	12.0	10	13.3		
		e. 4-5 yrs	00	0.0	00	00.0		
		e. >5 Yrs	00	0.0	00	00.0		
10	Dietary pattern	a. Vegetarian	19	25.3	12	16.0	0.6	0.439
		b. Non Vegetarian	23	30.7	21	28.0		
11	Residential	a. Rural	27	36.0	20	26.7	0.155	0.925
		b. Urban	11	14.7	10	13.3		
		c. Sub urban	04	05.3	03	04.0		

Sl.No.	Demographic variables		Evaluation classification				Chi Square	P value
			Below Average		Above Average			
			No.	%	No.	%		
12	Family history of dm	a. Yes	14	18.7	15	20.0	1.39	0.499
		b. No	15	20.0	11	14.7		
		c. Unknown	13	17.3	07	09.3		
13	Foot ulcer	a.<1 year	29	38.7	23	30.7	0.004	0.952
		b. 1 yr	13	17.3	10	13.3		
		c. 1-2 yrs	00	00.0	00	00.0		
		d. >2yrs	00	00.0	00	00.0		
*. The Chi-square statistic is significant at the .05 level.								

Table 4.7.1 reveals the association of post test score of infrared radiation in healing of diabetic foot ulcer with the selected demographic variables. The table score shows that the clients' education and occupation had statistically significant association at P<0.05 level.

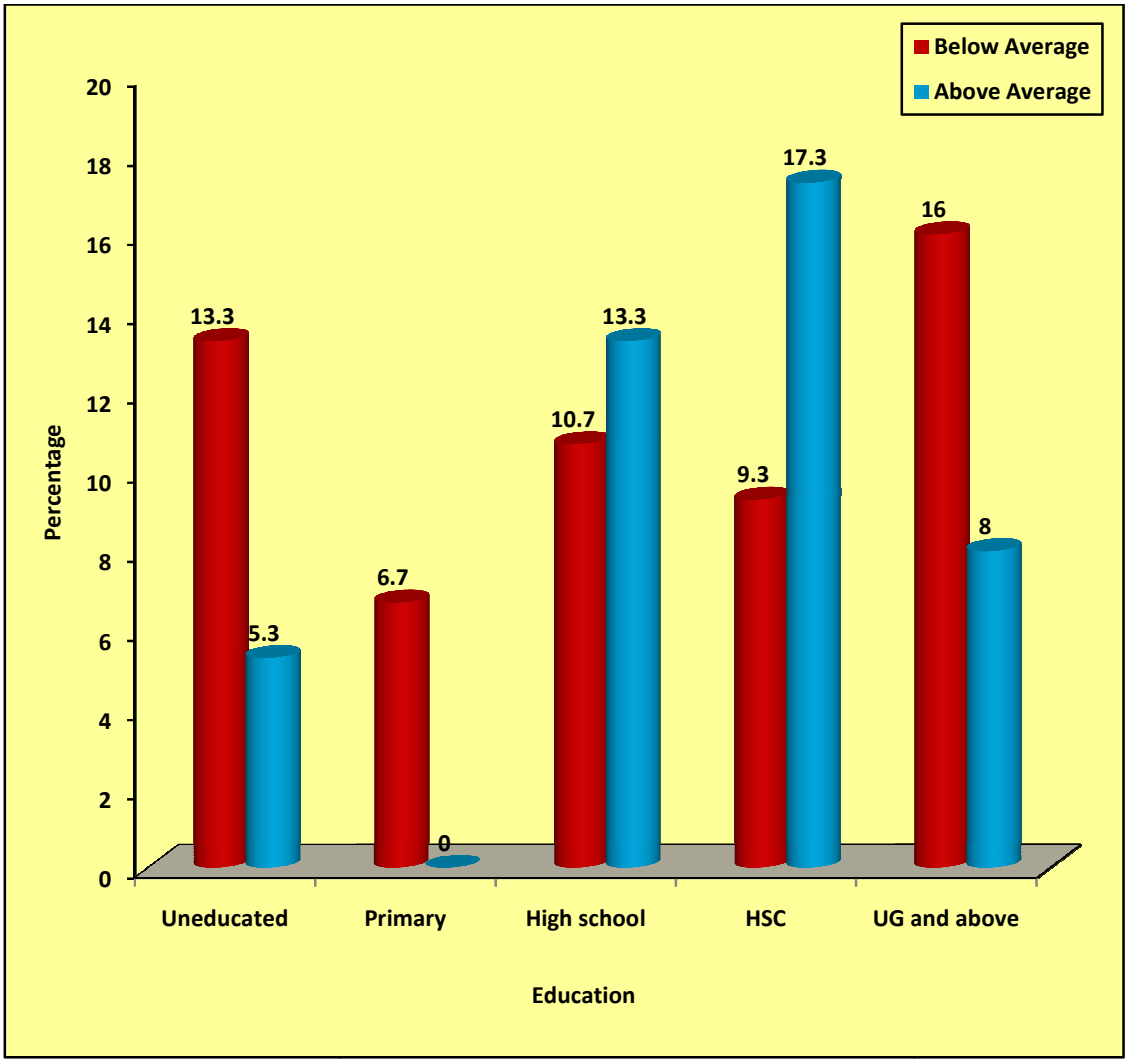


Fig.4.7.1(a): Association of education with post test score of infrared radiation in healing of diabetic foot ulcer

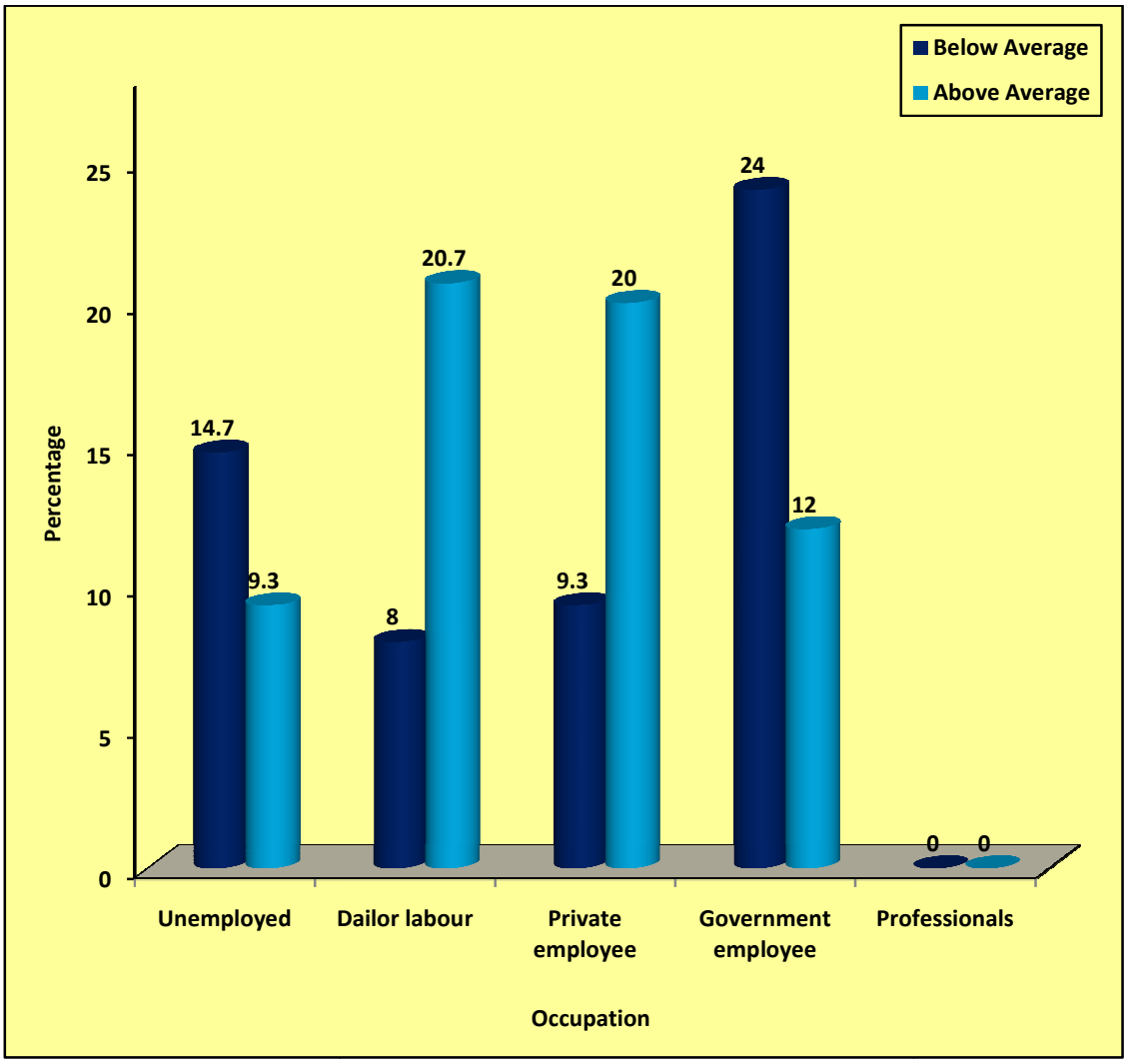


Fig.4.7.1(b): Association of occupation with post test score of infrared radiation in healing of diabetic foot ulcer

Table 4.7.2: Association of post test score of insulin dressing in healing of diabetic foot ulcer with the selected demographic variables

N=75

Sl. No.	Demographic Variables		Evaluation classification				Chi square	P value
			Below Average		Above Average			
			No.	%	No.	%		
1	Age	b.36-45	14	18.7	09	12.0	9.71*	0.021
		c.46-55	10	13.3	12	16.0		
		d.56-65	11	14.7	00	00.0		
		e.>65	10	13.3	09	12.0		
2	Sex	a. Male	28	37.3	16	21.3	0.587	0.444
		b. Female	17	22.7	14	18.7		
3	Religion	a. Hindu	31	41.3	22	29.3	0.597	0.897
		b. Muslim	07	09.3	03	04.0		
		c. Christian	25	06.7	04	05.3		
		d. Others	22	02.7	01	01.3		
4	Education	a. Uneducated	20	26.7	12	16.0	0.263	0.967
		b. Primary	28	10.7	05	06.7		
		c. High school	14	18.7	11	14.7		
		d. HSC	23	04.0	02	02.7		
		e. UG and Above	02	00.0	00	00.0		
5	Occupation	a. Unemployed	21	01.3	00	00.0	6.565	0.161
		b. Daily Labor	02	02.7	01	01.3		
		c. Private employee	12	16.0	05	06.7		
		d. Government emp	27	36.0	16	21.3		
		e. Professionals	03	04.0	08	10.7		
6	Income	a. Up to 5000	12	16.0	10	13.3	1.753	0.625
		b. 5001- 10,000	15	20.0	06	08.0		
		c. 10001- 20,000	16	21.3	13	17.3		
		d. Above 20,000	02	02.7	01	01.3		

Sl.	Demographic Variables		Evaluation classification				Chi	P
7	Marital status	a. Married	05	06.7	02	02.7	0.424	0.809
		b. Unmarried	24	32.	17	22.7		
		c. Widowed	16	21.3	11	14.7		
		d. Widower	00	00.0	00	00.0		
		e. Separated/ Divorced	00	00.0	00	00.0		
8	Source of information	a. Health Personnel	18	24.0	08	10.7	5.619	0.132
		b. Mass Media	10	13.3	11	14.7		
		c. Friends	10	13.3	10	13.3		
		d. Relatives	07	09.3	01	01.3		
		Others	00	00.0	00	00.0		
9	Duration of illness	a.<1 Yr	24	32.0	11	14.7	2.877	0.237
		b. 1-2 Yrs	17	22.7	13	17.3		
		c. 2-3 yrs	04	05.3	06	08.0		
		d. 3-4 Yrs	00	00.0	00	00.0		
		e. 4-5 yrs	00	00.0	00	00.0		
		e. >5 Yrs	00	00.0	00	00.0		
10	Dietary pattern	a. Vegetarian	12	16.0	08	10.7	0	1
		b. Non Vegetarian	33	44.0	22	29.3		
11	Residential	a. Rural	15	20.0	19	25.3	6.649*	0.036
		b. Urban	20	26.7	08	10.7		
		c. Sub urban	10	13.3	03	04.0		
12	Family history of dm	a. Yes	18	24.0	09	12.0	7.474*	0.024
		b. No	19	25.3	07	09.3		
		c. Unknown	08	10.7	14	18.7		
13	Foot ulcer	a.<1 year	34	45.3	23	30.7	0.012	0.912
		b. 1 yr	11	14.7	07	09.3		
		c. 1-2 yrs	00	00.0	00	00.0		
		d. >2yrs	00	00.0	00	00.0		
*. The Chi-square statistic is significant at the .05 level.								

Table 4.7.2 reveals the association of post test score of insulin dressing in healing of diabetic foot ulcer with the selected demographic variables. The table score shows that the clients' sex, area of residence and family history of diabetes had statistically significant association at $P<0.05$ level.

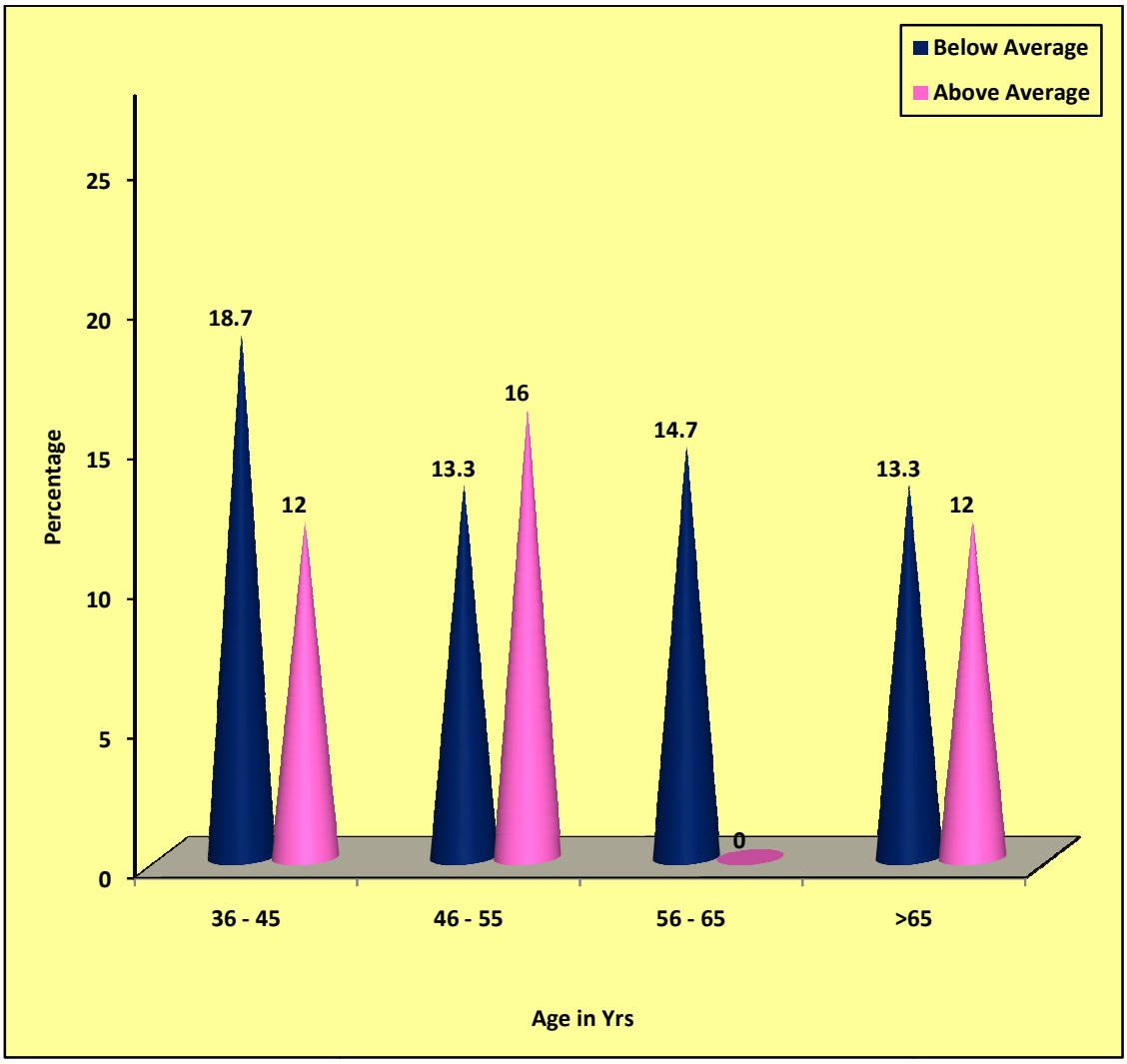


Fig.4.7.2(a): Association of age in years with post test score of insulin dressing in healing of diabetic foot ulcer

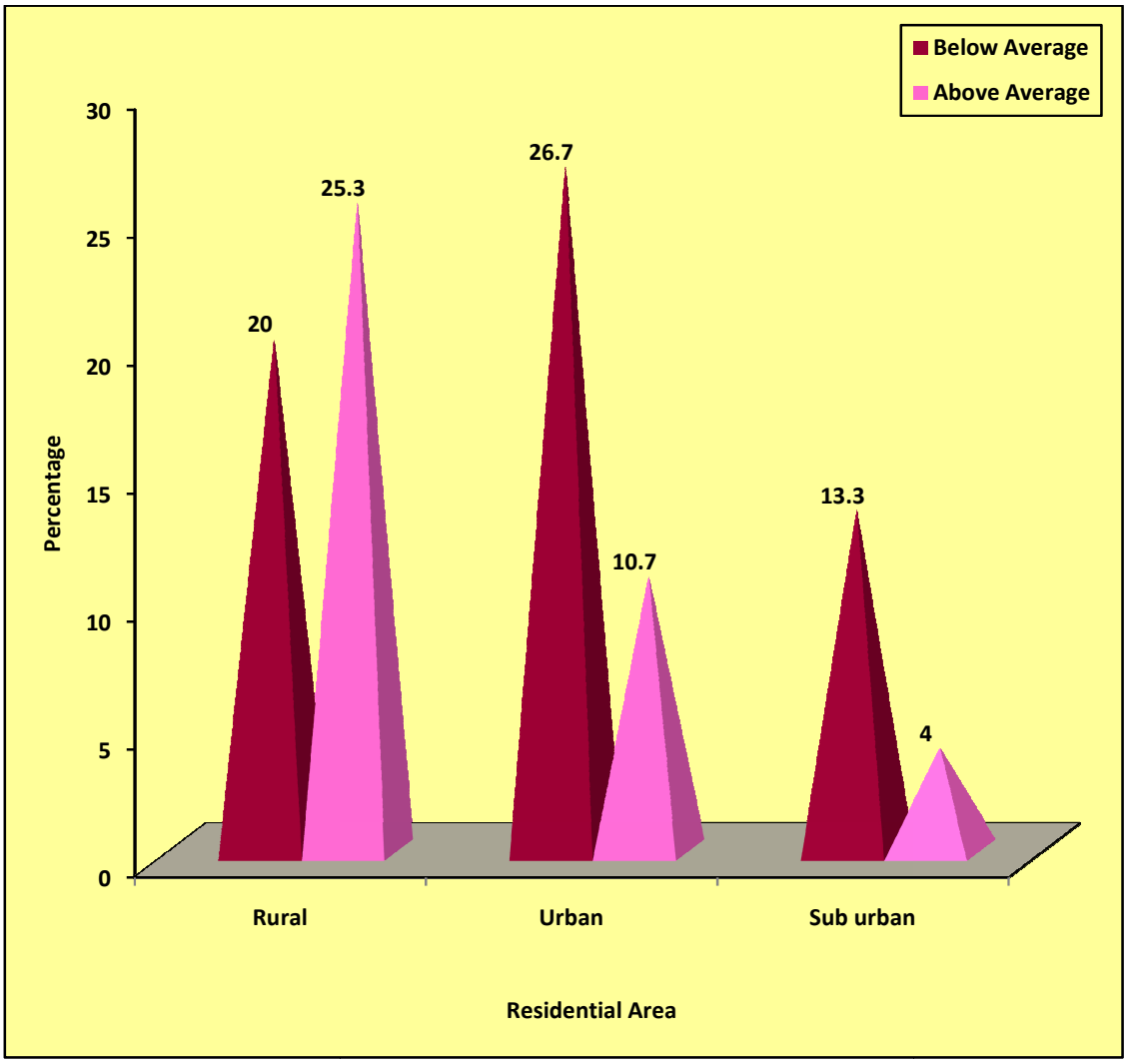


Fig.4.7.2(b): Association of residential area with post test score of insulin dressing in healing of diabetic foot ulcer

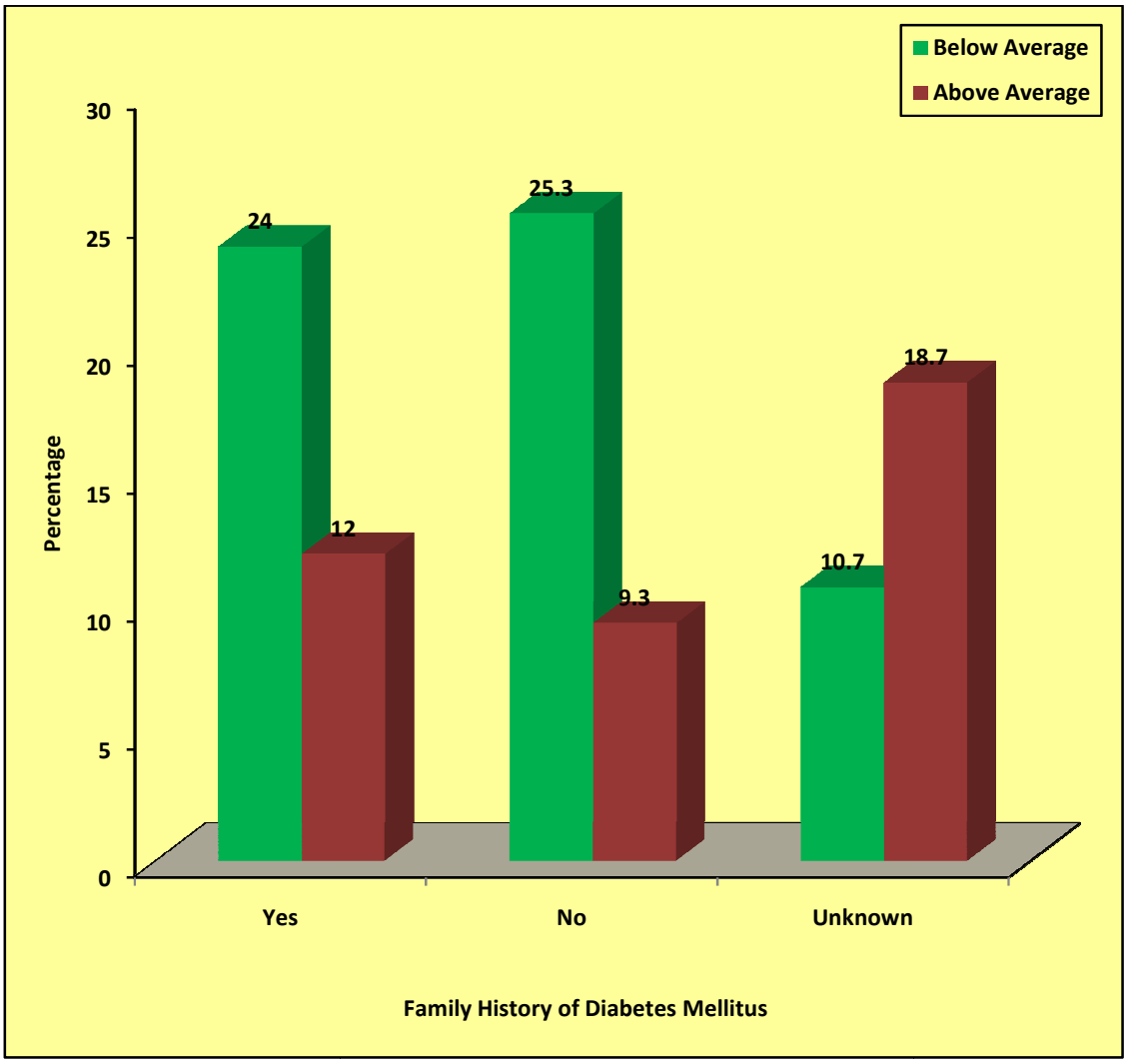


Fig.4.7.2(c): Association of family history of diabetes mellitus with post test score of insulin dressing in healing of diabetic foot ulcer

Table 4.7.3: Association of post test score of metronidazole dressing in healing of diabetic foot ulcer with the selected demographic variables N=75

Sl. No.	Demographic Variable		Evaluation classification				Chi square	P value
			Below Average		Above Average			
			No.	%	No.	%		
1	Age	b.36-45	00	00.0	06	08.0	14.881 ***	0.002
		c.46-55	24	32.0	07	09.3		
		d.56-65	09	12.0	04	05.3		
		e.>65	12	16.0	13	17.3		
2	Sex	a. Male	20	26.7	12	16.0	0.145	0.703
		b. Female	25	33.3	18	24.0		
3	Religion	a. Hindu	23	30.7	18	24.0	0.782	0.854
		b. Muslim	07	09.3	04	05.3		
		c. Christian	06	08.0	04	05.3		
		d. Others	09	12.0	04	05.3		
4	Education	a. Uneducated	25	33.3	17	22.7	2.421	0.49
		b. Primary	08	10.7	02	02.7		
		c. High school	09	12.0	09	12.0		
		d. HSC	03	04.0	02	02.7		
		e. UG and Above	00	00.0	00	00.0		
5	Occupation	a. Unemployed	00	00.0	00	00.0	4.378	0.223
		b. Daily Labor	06	08.0	03	04.0		
		c. Private employee	07	09.3	10	13.3		
		d. Government emp	22	29.3	09	12.0		
		e. Professionals	10	13.3	08	10.7		
6	Income	a. Up to 5000	07	09.3	09	12.0	4.908	0.179
		b. 5001- 10,000	24	32.0	17	22.7		
		c. 10001- 20,000	11	14.7	04	05.3		
		d. Above 20,000	03	04.0	00	00.0		
7	Marital status	a. Married	03	04.0	04	05.3	3.604	0.308
		b. Unmarried	27	36.0	12	16.0		
		c. Widowed	10	13.3	11	14.7		
		d. Widower	05	06.7	03	04.0		
		e. Separated/ Divorced	00	00.0	00	00.0		
8	Source of information	a. Health Personnel	18	24.0	09	12.0	.4.518	0.34
		b. Mass Media	14	18.7	9	12.0		
		c. Friends	7	9.3	9	12.0		
		d. Relatives	6	8.0	2	2.7		
		e. Others	0	0.0	1	1.3		
9	Duration of illness	a.<1 Yr	13	17.3	11	14.7	3.863	0.425
		b. 1-2 Yrs	14	18.7	9	12.0		
		c. 2-3 yrs	8	10.7	8	10.7		
		d. 3-4 Yrs	9	12.0	2	2.7		
		e. 4-5 yrs	1	1.3	0	0.0		
		f. >5 Yrs	0	0.0	0	0.0		

Sl. No.	Demographic Variable		Evaluation classification				Chi square	P value
			Below Average		Above Average			
			No.	%	No.	%		
10	Dietary pattern	a. Vegetarian	19	25.3	11	14.7	0.231	0.63
		b. Non Vegetarian	26	34.7	19	25.3		
11	Residential	a. Rural	30	40.0	11	14.7	8.459*	0.015
		b. Urban	12	16.0	11	14.7		
		c. Sub urban	3	4.0	8	10.7		
12	Family history of dm	a. Yes	11	14.9	8	10.8	1.361	0.506
		b. No	11	14.9	10	13.5		
		c. Unknown	23	31.1	11	14.9		
13	Foot ulcer	a.<1 year	30	40.0	19	25.3	0.864	0.649
		b. 1 yr	14	18.7	11	14.7		
		c. 1-2 yrs	1	1.3	0	0.0		
		d. >2yrs	0	0.0	0	0.0		
* The Chi-square statistic is significant at the .05 level. *** The Chi-square statistic is significant at the .001 level.								

Table 4.7.3 reveals the association of post test score of metronidazole dressing in healing of diabetic foot ulcer with the selected demographic variables. The table score shows that the clients' age and area of residence had statistically significant association at P<0.001 and P<0.05 level respectively.

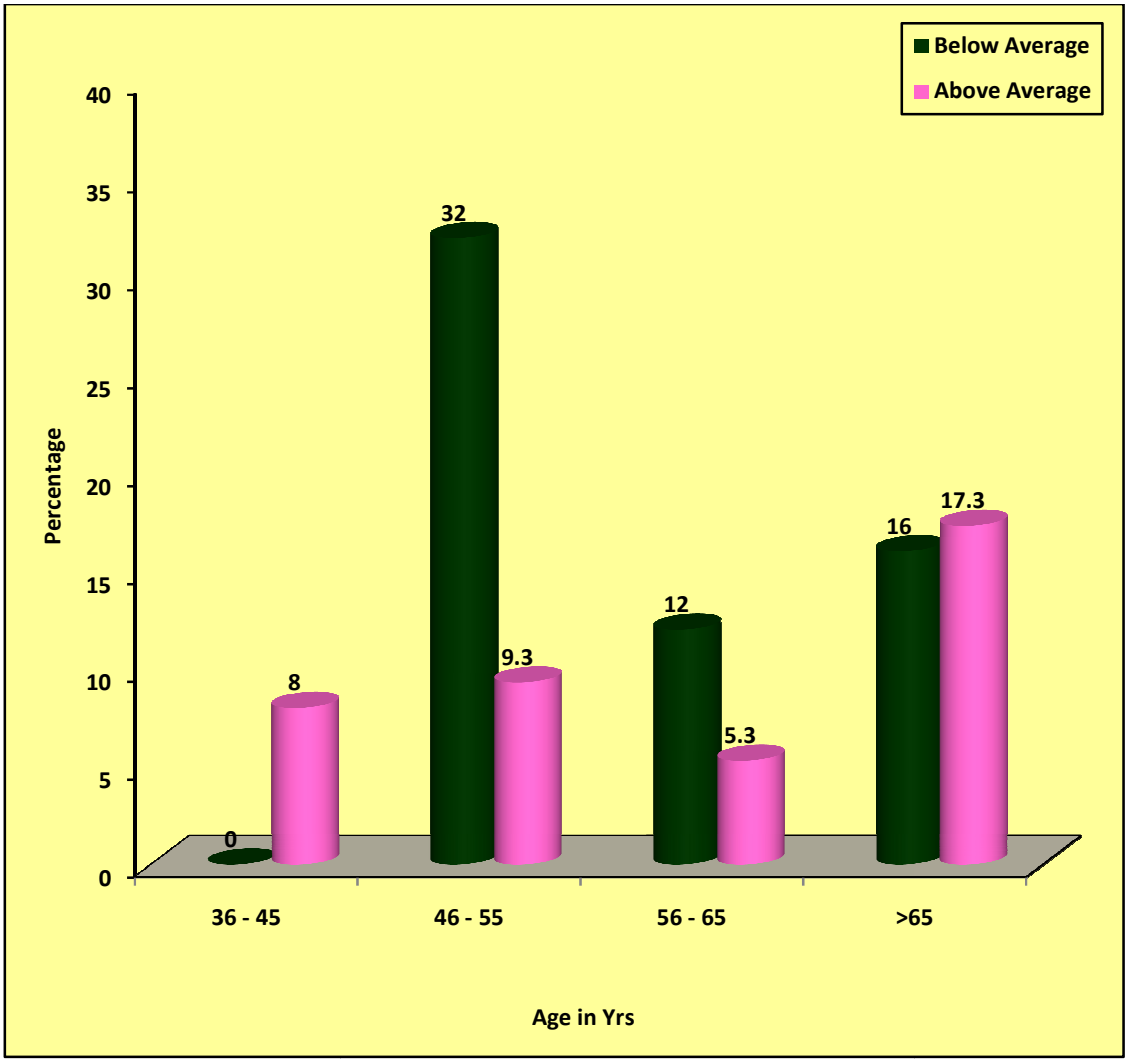


Fig.4.7.3(a): Association of age in years with post test score of metronidazole in healing of diabetic foot ulcer

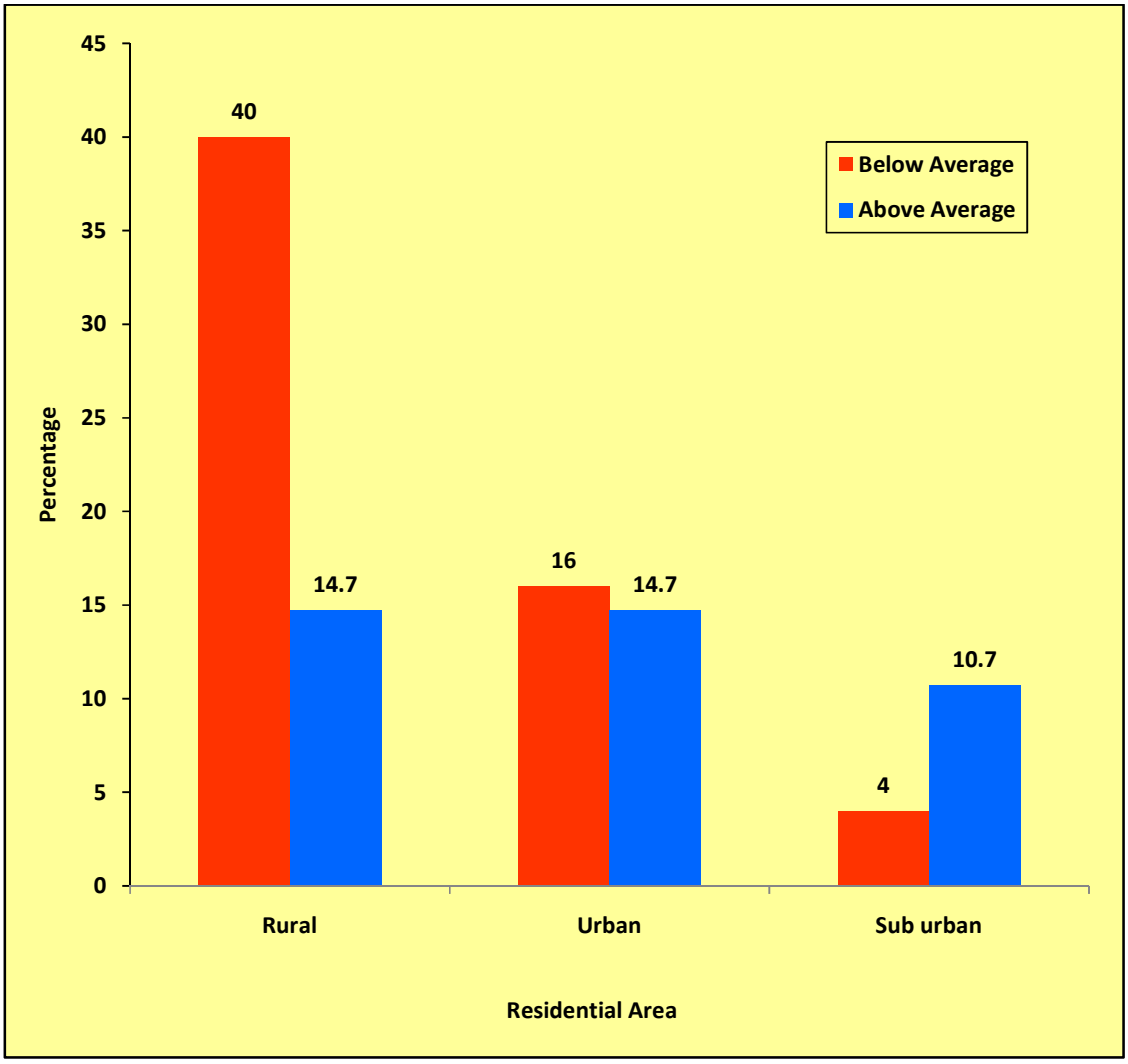


Fig.4.7.3 (b): Association of residential area with post test score of metronidazole in healing of diabetic foot ulcer

CHAPTER – V

DISCUSSION

This chapter concentrates on the finding of the study derived from statistical analysis and its pertinence to the objectives of the study. The present study was executed a comparative study to assess the effectiveness of Infra Red Radiation, Insulin Dressing and Metronidazole Dressing in healing of diabetic ulcer foot at a selected setting.

Quasi experimental pretest post test design was utilized for this study. Non probability consecutive sampling technique was used to select the samples.[146]

The objectives of the study were

1. To assess the pretest condition of diabetic ulcer foot among patients with Diabetes mellitus
2. To evaluate the effectiveness of infra red radiation application, insulin dressing and metronidazole dressing in healing of diabetic ulcer foot among patients with Diabetes mellitus.
3. To compare the effectiveness of infra red radiation with insulin dressing and metronidazole dressing in healing of diabetic ulcer foot among patients with Diabetes mellitus.
4. To associate the effectiveness of intervention in healing of diabetic ulcer foot with the selected demographic variables.

Total of 225 subjects were utilized for this study. The samples were selected from surgery outpatient and inpatient department of Melmaruvathur Adhiparasakthi

Institute of Medical Sciences and Research Hospital. Out of this 75 were treated with infrared radiation, 75 were treated with insulin dressing and remaining were treated by metronidazole dressing.

Pretest and post test were done by using modified Bates Jensen's wound assessment tool. The finding of the study had shown that all the three type of treatments were effective for the treatment of diabetic foot ulcer but infrared radiation was more effective and efficient in healing of diabetic ulcer when comparing to the remaining two treatments.

The conceptual frame work based on Wiedenbach helping art clinical setting system model was used for this study. Kerlinger views theory as a set of interrelated concepts that gives systematic view of a phenomenon that is explanatory and predictive in nature. According to Wiedenbach, the practice of nursing comprises a wide variety of services, each directed towards the attainment of one of its three components.[52]

Assessment of demographic variables of the diabetic foot ulcer clients

In the infrared radiation group majority 34.7% clients were aged between 36 to 45 and also34.7% were aged between 46-55 years in age. Most 58.7% were male, almost 54.7% were Hindu, and 26.7% were educated up to higher secondary level. Majority 29.3% were private employee, most of 46.7% had monthly income between 5000 and10000, 34% were widowed, 40% of the clients obtained diabetes related information from health personnel, and 29.3% had been suffering from diabetes around 1-2years. Pertaining to the dietary pattern 58.7% belonged to non-vegetarians, 62.7% were

residing in rural area, 38.7% had family history of diabetes and 69.3% of the clients had foot ulcer less than one year duration.

In the insulin dressing group most of 30.7% of clients aged between 36 and 45, 57.7% were males, 70% were Hindu and 42.7% were uneducated. Majority 51.3% were government employees, 38.7% had monthly family income between10000 and 20000, 36.7% were widowed, 34.7% of the clients obtained diabetes related information from health personnel, and 46.73% had been suffering from diabetes less than one year duration. Pertaining to the dietary pattern 73.3% belonged to non-vegetarians, 45.3% were residing in rural area, 36% had family history of diabetes and 76% of the clients had foot ulcer less than one year duration.

In the Metronidazole dressing group majority 41.3% clients were aged between 46 and 55. Most 57.3% were female, almost 54.7% were Hindus, and 56% were uneducated. Majority 41.3% were government employees, most of 54.7% had monthly income between 5000 and10000, 28% were widowed, 36% of the clients obtained diabetes related information from health personnel, and 32% had been suffering from diabetes less than one year duration. Pertaining to the dietary pattern 60% belonged to non-vegetarians, 54.7% were residing in rural area, 45.9% did not know about the family history of diabetes and 65.3% of the clients had foot ulcer less than one year duration.

5.1 The first objective of the study was to assess the pretest condition of diabetic ulcer foot among clients with Diabetes mellitus

Assessment of pre test condition of diabetic foot ulcer clients, Infra red radiation pre test mean score was 51.5067, standard deviation 4.21828 and Insulin dressing pre

test mean 50.2400 standard deviation 5.74419 and Metronidazole dressing pre test mean was 50.6933, standard deviation 4.00113. Total mean of three groups mean was 50.6933, standard deviation 4.73298and the overall " F" value was 1.678.

This finding is supported by the study conducted by **Sinharay.K et al (2012)** in their cross section survey studied the recently diagnosed diabetic people regarding diabetic ulcer. With one year duration total of 1674 subjects were utilized for this study. They found that 4.54 percentage were having diabetic foot ulcer out of this 52.5 percent and 38.88 percent were male and female respectively. 19.4 percent client had ischemic foot ulcer, 34.2 had Neuroischaemic foot ulcer and 46.06 percent client had neuropathic foot ulcer.[89]

Also this study has supported by the study conducted by **Shailesh K et al (2012)** in prospective survey studied the prevalence of diabetic ulcer foot and its relevant risk factors among diabetic clients in north India. Total of 678 diabetic clients were studied and they found 97 had diabetic ulcer foot. The prevalence rate was 14.3. 70.1 percent clients were from villages, the risk increased over the age of fifty years and diabetic duration more than eight years.[70]

5.2 The second objective was to evaluate the effectiveness of infra red radiation application, insulin dressing and metronidazole dressing in healing of diabetic ulcer foot among clients with Diabetes mellitus. .

Infrared Radiation

At the pre test clients in the infrared radiation group mean were 51.5067 and the standard deviation was 4.21828. At the post test mean and standard deviation were

respectively 20.32 and 3.673. The" t" value was 68.35 it is more than table value. It shows a high level of significance statistically at $p<0.001$ level. The calculated value was greater than the table value shows that the infrared radiation was much effective on healing of diabetic foot ulcer.

This finding is supported by the study conducted by **Lupart R et al (2011)** in their randomized double blind study evaluated the effectiveness of broad band light device on healing of diabetes foot ulcer. Total of 16 subjects, 10 were kept in the treatment group and remaining were in the control group received placebo. They proved that nine out of ten client's wound were healed in the treatment group. In the placebo group two out of six wound were healed. 89 and 54 percent wound size was reduced in treatment and control group respectively.[128]

This finding is also supported by the study conducted by **Weingarten et al (2012)** in their interventional study evaluated the effectiveness of Diffuse Near Infrared Spectroscopy on healing of diabetic foot ulcer among diabetic clients. 46 subjects were included for this study. Out of that 16 wound were healing wound and nine were non healing wounds. Wound healing started at a point of fourth week and continued further healing with time advance.[125]

This finding is also supported by the study conducted by **Heba A. bahey EL-den et al (2010)** in their randomized control trial evaluated the effectiveness local application of Light emitting Diode on healing of diabetic foot ulcer with fifty diabetic clients. Twenty five clients exposed to LED and remaining treated with regular treatment. Treatment was given 30 minutes duration for the period of two weeks. The study result

revealed that sixteen percent of the wounds were healed fairly, 76 percent and eight percent wound healed moderately and neat respectively.[130]

Also this finding supported by the study conducted by **Ahed Kaviani et al (2011)** in their double blind randomized control trial evaluated the effectiveness of low level Laser therapy on healing of diabetic foot ulcer with twenty three diabetic foot ulcer clients. Ten clients with foot ulcer treated with low level Laser therapy and remaining were treated placebo. After twenty weeks of treatment the result shown that in the treatment group out of ten foot ulcer eight were healed and in placebo group only three wounds were healed. So that the investigator concluded that low level Laser therapy is efficient, effective and cost effective for the treatment of diabetic foot ulcer.[129]

Insulin Dressing

Insulin is a hormone where it secreted in beta cells of pancreas. 0.1 ml of Regular Insulin diluted with 10ml normal saline and it applied over foot ulcer for the period of 10 days.

In the Insulin dressing group pre test mean score of foot ulcer was 50.24 and standard deviation 5.74. Post test mean score was 24.25, standard deviation 4.02 and the" t" value 45.268 which was greater than table value. It shows a high level of significance statistically at $p<0.001$ level. The calculated value was greater than the table value depict that insulin dressing was effective on healing of diabetic foot ulcer.

This finding is supported by the study conducted by **Martinez et al (2013)** in their interventional study evaluated the effectiveness topical insulin therapy on healing of

diabetic foot ulcer. Total of eight clients with full thickness diabetic wound were utilized for this study. From the above four clients were treated with regular insulin wash and the remaining had regular treatment. After fourteen days of treatment in both the group surface biopsy was obtained and ruled out for formulation of new vessels and fibrosis. The result shown that wounds in the insulin group vessels developed 96 plus or minus 47 and there was a significant difference in mean temperature in the insulin treated group (1.27 plus or minus 1.12 degree Celsius) vs.non insulin treatment group (0.13 plus or minus 1.22 degree Celsius). They have concluded that topical insulin significantly improves the wound healing.[112]

The study findings also supported by the study conducted **Gaurav Goenka et al, (2014)** in their randomized control trial studied the effectiveness of topically applied insulin in wound healing in terms of wound healing, safety and duration of hospital stay with 50 clients. They were compared both saline and insulin dressing on diabetic and non diabetic clients. After 12 week of treatment the result revealed that wound healing was better and faster in topical insulin group also significantly reduces the duration stay with reduced economic burden.[111]

Also this finding supported by the study conducted by **Rezvani, O et al, (2006)** in their interventional study evaluated the efficacy of local use insulin on wound healing. Total of forty five clients with acute and chronic wound were included for this study. Twenty nine clients in the experimental group were applied with ten unite regular insulin diluted with one ml saline and sprayed two times a day. The average wound healing score was 46.09 mille meter square treatment group. Control group those received regular treatment wound healing score was 32.24 mille meter square. The study

concluded that there was no side effect by local insulin therapy and also effectively improves the wound healing.[120]

Metronidazole Dressing

Metronidazole dressing was done for the period of ten days, Metronidazole is a drug which is reduces the infection caused by aerobic bacteria. 10ml of metronidazole diluted with 100ml of normal saline and it applied was used to clean the wound and also soaked with sterile applied over the foot ulcer following that wound was dressed.

Metronidazole dressing group pre test mean score was 50.33 and the standard deviation 4.0. At the post test mean score was 27.06 and the standard deviation was 3.58. The" t" value 52.8 which was greater than table value. It shows a high level of significance statistically at $p<0.001$ level. The calculated value was more than the table value predicts that the Metronidazole dressing was effective on healing of diabetic foot ulcer.

This finding is supported by the study conducted by **Anurag Ambroz singh et al (2015)** in their prospective comparative study evaluated topical application of coloagenase and metronidazole dressing. Total of 82 clients were included in this study. 42 clients were in treatment group and their wounds were dressed with coloagenase and metronidazole and remaining 40 underwent traditional treatment with wound debridement. The result indicated that client's wound in the treatment group granulated faster than the control group. In the experimental group granulation started 3rd. 4th, 5th, 6th and 7th week than the control.[102]

This finding also supported by the report given by **Tom Wynn et al (2004)** in their scientific reported that Phenytoin, mesoprostol and metronidazole combined these three drugs is most effective for the treatment of diabetic ulcer. Phenytoin enhances the granulation and reduces the inflammation. Mesoprostol and metronidazole increases the wound healing.[110]

Also this finding by the report published by **Karakkattu Vijayan Kavitha et al (2014)** in their scientific article on "a practical approach to choice of wound care on diabetic foot ulcer" stated that metronidazole gel has better anaerobic coverage and helps in maintain moist environment and promotes wound healing. Topical metronidazole gel is easy to apply topically once in a day. Alternatively metronidazole tablets crushed and applied over the wound, this helps for wound healing and reduces the bad odor.[104]

The "t" value was 68.35 which is greater than the table value. Based on the "t" test result the hypothesis H_1, which stated earlier that H_1 – There will be significant improvement in healing of diabetic ulcer foot at the post test was retained.

5.3 The third objective was to compare the effectiveness of infra red radiation with insulin dressing and metronidazole dressing in healing of diabetic ulcer foot among clients with Diabetes mellitus.

This objective compares effectiveness of infra red radiation with insulin dressing and metronidazole dressing in healing of diabetic ulcer foot among clients with Diabetes mellitus. At the post test mean score of infrared radiation group was 20.32 and standard deviation 4.04. Insulin dressing group mean and standard deviation were 24.25 and 3.58 respectively. At the post test mean and standard deviation on metronidazole dressing

group were 27.06 and 3.58. Comparing all three groups mean score of the diabetic ulcer foot, the infrared radiation group's wound mean score was less than the insulin dressing and metronidazole dressing groups. This shows that infrared radiation was more effective on healing of diabetic foot ulcer than other two intervention groups.

The hypothesis **H_2** stated earlier that there will be significant differences between infrared radiation, insulin dressing and metronidazole dressing on healing of diabetic ulcer foot among diabetic ulcer foot clients were retained.

Till date no one as compared the three of intervention on healing of diabetic foot ulcer or any other wound management so that the researcher could not find any support to strengthen the finding of the study. Instead the investigator recommends conducting more comparative interventions in future to make the intervention efficient, effective and cost effective manner.

5.4 The fourth objective was to associate the effectiveness of intervention in healing of diabetic ulcer foot among diabetes mellitus clients with the selected demographic variables.

The fourth objective associate the post test score of infrared radiation in healing of diabetic foot ulcer with the demographic variables of diabetic foot ulcer clients like age, sex, religion, education, occupation, monthly income of the family, marital status, sources of information on diabetes, duration of Illness, dietary pattern, residential area, family history of diabetes mellitus and foot ulcer duration.

Infrared Radiation group

In the infrared radiation group among all demographic variables the client like age, sex, religion, education, occupation, monthly income of the family, marital status, sources of information on diabetes, duration of Illness, dietary pattern, residential area, family history of diabetes mellitus and foot ulcer duration only education and occupation had statistically significant association on healing of diabetic ulcer foot at $P<0.05$ level.

This finding is supported by the study conducted by **Salami M et al (2011)** in their randomized clinical trial evaluated the effectiveness of low level laser therapy on healing of diabetic foot ulcer. 23 clients included in the random basis, out 23 clients, thirteen client exposed low level laser therapy and ten clients underwent placebo treatment. The result shown that after twenty weeks eight clients have wound were completely healed those received low level laser therapy and three clients wound incompletely healed in placebo group. In their study education and the duration of foot ulcer had moderate association on healing of diabetic foot ulcer.[127]

Also the study finding supported by the study conducted by **Said GM et al, (2011)** in their prospective study evaluated the efficacy of low intensity lasers therapy on improvement in skin perfusion and prevention of potential complications with 30 diabetic clients. The result shown that, there was significant improvement in perfusion to skin and subcutaneous tissues. In their study diabetic client's duration of hospital stay and education had a significant association on healing of diabetic ulcer foot.[125]

Insulin Dressing Group

In the insulin dressing group among all demographic variables the diabetic client like age, sex, religion, education, occupation, monthly income of the family, marital status, sources of information on diabetes, duration of Illness, dietary pattern, residential area, family history of diabetes mellitus and foot ulcer duration only clients' sex, area of residence and family history of diabetes had statistically significant association at $P<0.05$ level.

This finding is supported by the study conducted **Petreceam et al, (2009)** proved that topically applied insulin over the skin incision and or chronic wounds, accelerate re-epithelialization and stimulate maturation of the tissue healing. Also they stated that these effect s are depends on insulin receptor. This may be the powerful therapy without any major side effects. In their study client's area of residence and the duration of illness had a significant association on healing of wound.[116]

The finding also supported by **Nursing Essay,** in their comparative study compared the effectiveness of topical application of povidone iodine and topical insulin on healing of diabetic ulcer foot. Total of 46 clients were included for this study. 23 diabetic foot ulcer were treated with topical insulin and remaining was treated with topical povidone iodine. Wound was assessed with Bates Jensen wound assessment tool. Wound size of 26 clients was ranges between four and sixteen square centimeter and three client's wounds between 36 and 80 square centimeter. Most of the clients aged between 55 and 70 years. Around 31 clients were male and also 31 clients belong to IDDM. Most of the clients (33) hospitalized around 15 to 30 days. The finding revealed that client in the topical insulin group wound was granulated faster and better than the

povidone iodine group. In their study client's sex and duration of diabetic ulcer had significant influence on healing of diabetic ulcer foot.[117]

Metronidazole Dressing Group

In the insulin dressing group among all demographic variables the diabetic client like age, sex, religion, education, occupation, monthly income of the family, marital status, sources of information, duration of Illness, dietary pattern, residential area, family history of diabetes mellitus and foot ulcer duration. Only clients' age and area of residence had statistically significant association at $P<0.001$ and $P<0.05$ level respectively.

Unnikrishnan AG et al (2014) in their scientific article on "a practical approach to choice of wound care on diabetic foot ulcer" stated that metronidazole gel has better anaerobic coverage and helps in maintain moist environment and promotes wound healing. Topical metronidazole gel is easy to apply topically once in a day. Alternatively metronidazole tablets crushed and applied over the wound, this helps for wound healing and reduces the bad odor. In their study diabetic client's demographic variables like sex, foot ulcer duration and educational qualification had significant association on healing of foot ulcer.[147]

The hypothesis $\mathbf{H_3}$ stated earlier that there will be significant association of post test score on healing of diabetic ulcer foot with the selected demographic variables among diabetic foot ulcer clients was retained.

CHAPTER –VI

SUMMARY, CONCLUSION, RECOMMENDATIONS AND LIMITATION

6.1 SUMARRY

Diabetes is a worldwide health problem. It may start at the age around twenty and become more prevalence when age gets advance. Diabetes has been detected more in urban population but undiagnosed diabetes is most common in the rural people. Diabetic foot ulcer is one of the serious complications of diabetes mellitus. In India, one in two out of population has diabetes mellitus and they do not aware that they have diabetes. Approximately ninety two million of Indian people may get diabetes in the year 2035. Eighty four percent people get lower leg amputation because of diabetes. Peripheral arterial disease and neuropathy are the common causes for foot amputation. Peripheral arterial disease and neuropathy develop loss of pain sensitivity in lower arms and foot. It results infection enter the feet and ulcer develops. In diabetic ulcer foot clients had lack of wound healing process caused by inadequate insulin in blood. The care of chronic non healing ulcer foot is challenging for health team. Statistics shows that twenty five percent diabetic people develop diabetic ulcer foot in the later stage. Fifty percent diabetic population develops infection and need hospitalization in their lifetime. One out five diabetic people is prone to get amputation.

The present study was comparative to the effectiveness of Infra Red Radiation, Insulin Dressing and Metronidazole Dressing in healing of diabetic ulcer foot.

6.1.1 The objectives of the study

1. To assess the pretest condition of diabetic ulcer foot among patients with Diabetes mellitus
2. To evaluate the effectiveness of infra red radiation application, insulin dressing and metronidazole dressing in healing of diabetic ulcer foot among patients with Diabetes mellitus.
3. To compare the effectiveness of infra red radiation with insulin dressing and metronidazole dressing in healing of diabetic ulcer foot among patients with Diabetes mellitus.
4. To associate the effectiveness of intervention in healing of diabetic ulcer foot with the selected demographic variables.

6.1.2 Hypotheses

H_1 – There will be significant improvement in healing of diabetic ulcer foot at the post test.

H_2 – There will be significant differences between infrared radiation, insulin dressing and metronidazole dressing on healing of diabetic ulcer foot.

H_3- There will be significant association of post test score on healing of diabetic ulcer foot with the selected demographic variables among diabetic foot ulcer clients.

6.1.3 Assumptions

1. Insulin dressing, metronidazole dressing infrared radiation may improve the healing of diabetic foot ulcer. The rate of healing may vary with different intervention.
2. Insulin dressing, metronidazole dressing infrared radiation may prevent the complications of diabetic foot ulcer.

6.1.4 Delimitation

The study was delimited to client with diabetic foot ulcer only.

6.1.5 Research methodology

Quasi experimental pretest post test design was adopted for this study and Non probability consecutive sampling technique was used to select the samples. Based on the sampling criteria totally 225 samples selected for this study, out of this seventy five subjects were treated with infra red radiation, seventy five treated by insulin dressing and remaining seventy five were treated metronidazole dressing. First day, three interventional group was assessed by using modified Bates Jensen's wound assessment tool and same day treatment started, post test was done on seventh day and tenth day by modified Bates Jensen's wound assessment tool.[146]

6.1.6 Major findings of the study

Demographic variables of infra red group

Pertaining to age, out of 75 majority 34.7% clients were aged between 36 and 45, 34.7% were aged between 46 and 55 years in age, 21.3% clients were aged between 56 and 65 years and 5.3 % were aged between 25 and35 years in age. Considering the sex of the diabetic clients most 58.7% were male and 41.3% were females.

Considering the religion almost 54.7% were Hindus, 26.7% were Christians and 9.3% and 9.3%were Muslims and other religion respectively. With regards to educational qualification 26.7% were educated up to higher secondary level, 24.% were completed high school and 24 % graduate and above and 18.7% were uneducated.

Based on the employment 29.3% were private employees, 24% were professionals, 24 % were unemployed and 12% were government employees. Pertaining to the income of the clients 46.7% had monthly income between 5000 and10000, 24% earning 10001 to 20000 and 20% clients had the monthly income of up to 5000 per month. Regarding the marital status 34% were widowed, 20% were married, 26.7% were divorced and separated and 9.3% were widowers. Out of 75 clients 40% of the clients obtained diabetes related information from health personnel, 28% were obtained information from friends 24% from obtained mass media, and 8% from relatives.

Considering the duration of illness 29.3% had been suffering from diabetes around 1-2years, 28% were suffering 3-4 years and 25.3% were diabetic around 5-6 years Pertaining to the dietary pattern 58.7% belonged to non-vegetarians and 41.3 were vegetarians. Regarding the family history of diabetes 38.7% were know about the diabetic history, 34.7% were not having the family history of diabetes and 26.7% were not aware of family history of diabetes.

Among 75 clients 62.7% were residing in rural area, 28% were residing in urban area and 9.3% were from sub-urban area. Regarding the duration of diabetic foot ulcer 69.3% of the clients had foot ulcer less than one year, 30.7% had one year duration of ulcer foot.

Demographic variables of insulin dressing group

Pertaining to age majority 30.7% clients were aged between 36 and 45, 29.3% were aged between 46 and 55 years in age, 25.3% clients were aged around 66 years and

above and 14.7 % were aged between 56 and65 years in age. Considering the sex of the diabetic clients most 58.7% were male and 41.3% were females.

Considering the religion almost 70% were Hindus, 13.3% were Muslims, 12% were Christians and 4% were other religion. With regards to educational qualification 42% were uneducated, 26.7% were educated up to high school level, 17.3. % was completed primary schooling and 6.7 % higher secondary and graduate.

Based on the employment 57% were government employees, 22.7% were private employees, 12% were daily labor 6.7% were professionals, and 1.2 % were unemployed. Pertaining to the income of the clients 38.7% had monthly income between 10001 and 20000, 29.3% clients had the monthly income of up to 5000 per month, 28% client earned 5000 to 10000 per month and only 4% clients were earned more than 20000 per month. Regarding the marital status 36% were widowed, 26.7% were widowers 14.7% were unmarried, 13.3% were divorced and separated and9.3% was married.

Out of 75 clients 34.7% of the clients obtained diabetes related information from health personnel, 28% obtained from mass media, 26.7% were obtained information from friends, and 10.7% from relatives. Considering the duration of illness 46.7% clients were diabetic less than one year, 40% client had diabetes between 1 and 2 years and 13.3% had been suffering from diabetes around 3-4years. Pertaining to the dietary pattern 73.3% belonged to non-vegetarians and 26.7 were vegetarians.

Regarding the family history of diabetes 36% were know about the diabetic history, 34.7% were not having the family history of diabetes and 29.3% were not aware

of family history of diabetes. Among 75 clients 45.3% were residing in rural area, 37.3% were residing in urban area and 17.3% were from sub-urban area. Regarding the duration of diabetic foot ulcer 76% of the clients had foot ulcer less than one year and 24% had one year duration of ulcer foot.

Demographic variables of metronidazole dressing group

Pertaining to age majority 8% clients were aged between 36 and 45, 41.3% were aged between 46 and 55 years in age, 33.3 were aged 66 and above and 17.3% clients were aged between 56 and 65 years. Considering the sex of the diabetic clients most 42.7% were male and 57.3 % were females. Considering the religion almost 54.7% were Hindus, 13.3 % were Christians and 14.7%and 17.3% were Muslims and other religion respectively.

With regards to educational qualification 6.7% were educated up to higher secondary level, 24.% were completed high school 13.3 were studied up to primary school and 8 % graduate and above and 56% were uneducated. Based on the employment 22.7% were private employees, 8% were professionals, 28% were daily labor and 41.3% were government employees.

Pertaining to the income of the clients 54.7% had monthly income between 5000 and10000, 20% earning 10001 to 20000, 21.3% clients had the monthly income of up to 5000 per month and 4% were earning more than 20000 per month. Regarding the marital status 28% were widowed, 10.7% were widowers 25.33% were unmarried, 26.3% were divorced and separated and9.7% was married.

Out of 75 clients 36% of the clients obtained diabetes related information from health personnel, 30.7% obtained from mass media, 21.3% were obtained information from friends, and 10.7% from relatives. Considering the duration of illness 32% clients were diabetic less than one year, 30.7% client had diabetes between 1 and 2 years and 31.3% had been suffering from diabetes around 3-4years.Pertaining to the dietary pattern 60% belonged to non-vegetarians and 40 were vegetarians.

Regarding the family history of diabetes 25.7% were know about the diabetic history, 28.4% were not having the family history of diabetes and 45.9% were not aware of family history of diabetes. Among 75 clients 54.7% were residing in rural area, 30.7% were residing in urban area and 14.7% were from sub-urban area. Regarding the duration of diabetic foot ulcer 65.3% of the clients had foot ulcer less than one year and 33.3% had one year duration of ulcer foot.

6.1.7 STUDY RESULTS

Infrared Radiation Group

The pre test and post scores of the Infra red radiation group, at the pre test mean and standard deviation were respectively 51.5067 and 4.21828. At the post test mean and standard deviation were respectively 20.32 and 3.673. The" t" value was 68.352 it is more than table value. The results shows a high level of significance statistically at $p<0.001$ level.

Insulin Dressing Group

The pre test and Post-test score of Insulin Dressing in healing of diabetic foot ulcer that Insulin dressing pre test mean score is 50.24 and standard deviation 5.74, post

mean score 24.25, standard deviation 4.02 and the " t" value 45.27 which is greater than table value. The results shows a high level of significance statistically at p<0.001 level.

Metronidazole Dressing Group

The pre test and Post-test score of Metronidazole Dressing in healing of diabetic foot ulcer. It reveals that in Metronidazole dressing, pre test and post test mean scores were respectively 50.3 and 27.06 and the standard deviation were 4.0 and 3.58 respectively and the "t" value was 52.825which is more than table value. The result shows a high level of significance statistically at p<0.001 level.

6.2 CONCLUSION

The Study was a comparative study to assess the effectiveness of Infra Red Radiation, Insulin Dressing and Metronidazole Dressing in healing of diabetic ulcer foot at MAPIMS. The three interventions compare each one another and the pre test and post test scores of diabetic foot ulcer in all 225 clients. Total pre test mean score was 50.69 and post test score was 23.88. pre test mean of standard deviation 4.733 post test mean of standard deviation was 4.66 and the F value at pre test was 1.678 and post test 60.7, it has statistically significant difference at P<0.01 level. This shows that all the three interventions were effective in healing of diabetic ulcer but infrared radiation was the most effective method when comparing to other two interventions.

The study concluded that infrared radiation application healing the diabetic ulcer foot in a fast manner than the insulin dressing, metronidazole dressing

6.3 NURSING IMPLICATIONS

The findings of the study have several implications for medical surgical nursing, community health nursing, nursing education, nursing administration and nursing research to develop wound dressing regarding healing of diabetic ulcer.

6.3.1 Medical Surgical Nursing[152]

- The study findings help to reduce the complications of diabetic foot ulcer and increase the granulation status of wound.
- The specialized nurse, conduct awareness medical camp regarding diabetic ulcer foot and its dressing from this research results and reduce the rate of amputation.
- Clinical nurse motivate the students and health personnel to perform education regarding, blood glucose monitoring, diet, exercise, drug regimen and foot care.
- The nurse can update the knowledge through seminars, symposium, conferences and diabetic day celebration about diabetes and its complications.
- The medical surgical nurses identify the warning signs of foot ulcer and teach about self foot care with prompt audio visual aids.
- Planned specialized care and formulate pamphlets regarding dressing of ulcer foot and self foot care.
- New groups of health team members should be given proper training to give nursing services to population at all levels.

6.3.2 Community Health Nursing[3]

- Primary health nurse can plan diabetes education and develop awareness programme regarding risk factors of diabetes and diabetic foot complications.

- Community health nurse should train the students to identify diabetic complications and apply the proper dressing in home care.
- This study emphasis to prevent diabetic limp amputation and do any one dressing to minimize the infection.
- The community nurse motivates the population to do physical activity and increase the knowledge regarding diabetic foot ulcer. Prepare lot of diabetic health camps and organize more awareness health programme to reduce diabetic amputation.
- The community nurse practicener can give ambulatory care to diabetic clients' outpatient clinics and tertiary care settings.

6.3.3 Nursing Practice

- Nursing service emphasis, nursing role focused three essential components, human rights and needs promoted, maintain healthy life style and create awareness of risk factors of disease, maximize the impairment of individual and society. Provide rehabilitation of chronic ill patient.
- Nurse Practicener make together contributes to identify the needs and problems and refer appropriate care center.
- Nurses are vital role in professional health team member. They play an important role in disease prevention and health maintenance.
- Nursing practice provides a prompt patient care. They will act as a essential role in control of diabetes and care of foot.[2]
- This study enhances diabetic ulcer healing and improves the tissue granulation. The current challenge to prepare professional nurses to provide comprehensive multifactorial care and activate the extended role of nursing.

- Nurse Practitioner should do proper wound assessment and give wound dressing for clients. They should get special training regarding diabetic foot dressing.
- Clinical nurse should provides health education about diabetic foot care self care in home and prevention of complications. They acquire information from experts in diabetology field. They follow the empirical data gathered directly or indirectly new knowledge.
- The clinical nurse who work in an acute surgical care settings the most diabetic critical care areas and should have essential responsibility to give foot hygienic care and dressing the wound.[148]
- The Nurse Concentrate client through examination, delivery of complex care, individualized care and coordination of others.
- Active co-operation with other health team member may prevent many issues and nurse success prompt care.
- The clinical advance nurse practicener is in position to provide cost effective and resource efficient care. Community health nurse focused the care effective to reduce the diabetic complications and amputation.
- The specialty nurse practicener and advance nurse practicener have to follow this research study findings in nursing service.
- Clinical nurse practicener should fill the gap between the theory and practice. They utilize the evidence based practice in nursing service.
- Clinical nurse should follow the findings of the study to heal the diabetic ulcer foot care. Nurse can publish the case study report clients with diabetic foot ulcer. This way we upgrade our profession in nursing field.
- Community based practice can help decrease the primarily risk factors of access of diabetes care.

- The major responsibility of primary health care team provides diabetes education about diet, healthy life style, and foot care and compliance evaluation.
- Multicultural competence care essential for all members of rural areas and create awareness regarding prevalence of diabetic ulcer foot and its care.
- Nurses should follow universal access care and provide care expectations of the patient and family.[1]
- The economic trends the larger diabetic population in rural areas at the low income level. It results they need government based diabetic health care service.
- Nursing services are virtually each patient seeking care promptly, primary, secondary, tertiary and restorative care. Because nursing service essential part in health care's system.
- Clinical nurse should understand the needs of health system and deliver the effective, efficient quality care.
- Nowadays health care is a business in private sectors increases the cost and fashion of the health care services. The health care system should reduces the financial pressure and control costs and provide quality health care services.
- Nurse should maintain safe environment for diabetes client and prevent injury and save the patient from side effects of investigation or collaborative care measures.[5]

6.3.4 Nursing Education[149]

- Nurse educators basically from clinical nursing which gives them, knowledge, skills and attitude of theory. Nurse educators are responsible for teaching current trends in nursing practice in clinical setting.

- Nurse educators formulate the educational programme about diabetic foot ulcer, causes, complications and its management for nurses within institution. These programmes include orientation of new trends, critical care nursing courses and issues.
- The nurse educators should explains concepts and facts regarding diabetes, demonstrate procedures, self care activities, explain and understand the client learning process or behavior changes and new treatment regarding diabetic ulcer foot.
- The primary aim of the nurse educator in all areas of client education about dressing of ulcer foot care towards patients and families.
- Nurse educators should protect the patient's legal rights and provide additional message for a patient who is going to get treatment whether they accept or not.
- Nurse educator motivates the student nurse to provide diabetic foot care. Nurse educator teaches adequate information about pathological changes diabetic ulcer foot. Need to change curriculum basis of prevalence of disease and its prevention.
- Nurse educators communicate challenges and collaborative care of ulcer foot to students, patients, families and other heath personnel and society.
- The nurse educator motivates the students to make audio visual aids about warning signs of diabetic ulcer foot, effects of ulcer foot. The quality of health education is a critical factor in attaining the needs of patients and families. Nurse educator explains rehabilitative and restorative foot care activities, teach patients to walk with crutches and make confidence cope with life style changes with chronic foot ulcer.

- Nurse educator explains the advantages of infra red radiation, insulin dressing, and metronidazole dressing to student nurse and health personnel. Nurse educator able to establish collaborate with educator- patient relationship.
- Nurse educator should have theoretical body of knowledge and skills to identify acute and chronic complications of diabetes and diabetic ulcer foot. The update knowledge and take training about diabetic foot management.
- The current issues of standard of nursing education are important to practice quality care and respond technological advancement care.
- Nurse educator provides counseling to diabetic ulcer foot clients. Counseling services provide stress management for patients and family members during severe infection ulcer foot, assist extended care and minimize financial constrains.
- Contemporary nursing education and practice are a height the technological and political problems.
- Continue nursing education is a vital and indispensible element of health system.
- The nursing curriculum has to encourage importance of diabetic wound dressing; the learning experience should follow various teaching methods on collaborative care of diabetic ulcer foot
- Nurse educator should plan and formulate educational curriculum for our professional and students, to prepare and train the students to give comprehensive care. They should make interest of students to maintain interpersonal relationships with patients.
- Nurse educator should attend workshops, seminar, conference, and in-service education. They update the knowledge the knowledge from scientific articles, Magazines and journals.

6.3.5 Nursing Administration

- Nursing administrators should accountable to give staff nurses with substantive training and in-service education chances if they need to give quality care.
- Nurse Practioner and certified advance nurse skills and attitude should be making for diabetic care in any areas where the nurse's hospital and academic abilities are highly approachable.
- The administrator maintains the accountability through nursing audit and standards of care. They provide patient care and delivery of specific nursing care with in health care system.
- Nurse administrator should plan of programme and strategies about diabetes and diabetic ulcer foot.
- The administrator formulates the budget and schedule of staffing to implement diabetic foot care services.[150]
- The nurse manager need to find risk group to address, supervise the quality care in reduce statistics of diabetic ulcer foot amputation and provide comprehensive care with community nurse to emphasis the follow up care and obtain local diabetes resources and equipped the health team with knowledge of diabetic ulcer foot.
- The nurse educator is responsible for keeping legally and knowledge to technical skills.
- The nursing administrator should realize the value of diabetic foot care and its dressing practice should plan, organize and co-ordinate effective care approach regarding prevention of diabetic foot ulcer complications. This will aid in enhancing the community participation and their involvement in improving health of diabetic people and reduce risk factors.

- .The nurse administrator involves art of effective co-coordinating activities, vision or direction whereas the nurse improves quality care to reduce amputation because of severe diabetic ulcer foot.
- Nurse administrator will delegate the skill in nursing students need to observe and follow the practice to improve their attitude in diabetic care.
- The administrator gathers data from patients and gives the nurse opportunities to eradicate the client stress and collaborate with client responses.
- Nurse administrator create environment for students nurses to be aware of diabetes trends and opportunity to practice diabetic ulcer foot and maintain interpersonal skills and problem solving skills.
- The nurse administrator should take active role in policy making, formulate protocol, nursing procedures, standing orders related to diabetic foot care.
- The administrator should give concentration on the proper selection, placement of job and effective utilization of nurse practioner in all areas, providing importance for their interest and update knowledge, quality care in health care delivery system.
- Nurse executives have authority for all clinical facilities within the campus. This will aid support patient care, motivate the nurses to carry the interventions properly.[151]

6.3.6 Nursing Research

- This study findings help in nursing research in better development in improve nursing care protocols regarding diabetic ulcer foot management. Promotion of diabetic healthy life and prevent complications of ulcer foot.

- This research study implies the clinical nurse to regain the knowledge about diabetes and diabetic wound healing.
- Clinical nurse researcher has efficient care to render diabetic ulcer healing and reduce rate of amputation.[140]
- Nurse researcher expands body of professional knowledge through scope of nursing service.[152]
- The research study nursing interventions are to be schedule in clinic outpatient and inpatient set up particular time fixed clients and relives the stress of family.
- Nurse researcher should make basement for evidence based care in nursing. It helps extend the knowledge, which is need for nursing development.
- Nurse researcher solves the problems in all field of nursing. Nurses should be participating in research activities and they must control the cost and provide quality care.
- Nowadays in fast developed medical science and technology, the nurse researcher must do the research and learn efficacy of new technology. The proper utilization of information about prevention and care diabetic ulcer foot to reduce further complications.
- Clinical nurse work with diabetic clients and continue to improve their learning in the hospital setting and researcher directed to discover the skills and attitude towards diabetic ulcer foot more thoroughly.
- Acquisition and obtain of current information is the improvement of nursing practice. The expansion and changes in the health system, and geriatric population require clinical nurses to follow research results to find problems and issues.

- The researcher minimizes the external variables that influence the nursing services. Nursing research addresses the problems that are essential to the discipline of nursing.
- The nurse expertise investigates the problem and develops hi-tech care as well as understands all aspects of nursing and support patient care services.[152]

6.4 RECOMMENDATIONS

1. A similar study comparative study can be done in public and private sector.
2. Similar kind of study will be conducted in all states and regional areas.
3. A similar comparative study can be done in rural and urban population.
4. A same study conducted in all primary health centers and between it.
5. A study conducted in specified group people with associated disease condition.
6. A study will be correlate the blood glucose level with insulin dressing.
7. A study will be conducted in metronidazole various dosage with dressing.
8. A comparative study can be done in different age population.
9. An experimental study can be conducted any one intervention with placebo treatment.
10. An experimental study conducted it evaluate the video assisted teaching programme on care of diabetic foot ulcer and prevention of amputation.
11. A comparative study to assess the effectiveness of diabetic ulcer healing and quality of life.

6.5 LIMITATIONS

1. The investigator had constraints in three interventions during the study period although dressing time varied in three groups and solved the problems.
2. Wound dressing time was re-altered by the investigator as per the feasibility of the sample.
3. The study limited with diabetic ulcer foot only.

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7f. Ethical Committee Clearance Certificate

The Ethical Committee, functioning at **MELMARUVATHUR ADHIPARASAKTHI INSTITUTE OF MEDICAL SCIENCES AND RESEARCH ,MELMARUVATHUR** have studied the proposed research Subject/Project entitled "A comparative study to assess the effectiveness of infra red radiation, insulin dressing and metronidazole dressing in healing of diabetic ulcer foot at MAPIMS". By Mrs.P.TAMILSELVI a candidate applying for provisional registration and hereby gives the certificate of clearance of approval by this Ethical Committee held on its meeting on 08.06.2011 in the presence of its members and a copy of the minutes of the meeting is enclosed.

Station: Melmaruvathur
Date : 08.06.2011

8/6/11

Signature of the Vice Chairman on behalf of the Ethical Committee

DEAN
MELMARUVATHUR ADHIPARASAKTHI
INSTITUTE OF MEDICAL SCIENCES AND RESEARCH
MELMARUVATHUR - 603 319.

Name of the Institution:
Melmaruvathur Adhiparasakthi Institute Of Medical Sciences And Research, Melmaruvathur

Seal :

MINUTES OF THE MEETING OF THE INSTITUTIONAL ETHICAL COMMITTEE OF MAPIMS HELD ON 08TH JUNE 2011 AT COUNCIL HALL BY 12.00 NOON.

MEMBERS PRESENT		
1.	Dr. P. Parasakthi, M.D.,	Chair Person Vice Principal, Chengalpet Medical College.
2.	Dr. J. Mohana Sundaram, M.D.,	Vice Chair Person Dean, MAPIMS.
3.	Dr. S. Kannama,	Member Professor of Gen. Medicine, MAPIMS.
4.	Dr. D. Balajee,	Member Professor of Gen. Surgery, MAPIMS.
5.	Dr. B. Padmavathy,	Member Professor of Paediatrics, MAPIMS.
6.	Dr. Baginwar Ashish Srinath,	Member Professor of Community Medicine, MAPIMS.
7.	Dr. K. Sivan Kumar,	Member Professor & HOD Department of OBG, MAPIMS.
8.	Mr. Dinesh Kumar	Member Advocate.
OBSERVERS		
1.	Dr. Venkadadhri,	Professor & HOD, Department of Pharmacology.
2.	Dr. Thangapaneerselvam,	Professor & HOD Department of Bio-Chemistry, MAPIMS.
3.	Dr. Aravindan,	Professor & HOD Department of Anatomy, MAPIMS.
4.	Dr. Nagendiran,	Senior Resident, Department of ENT

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RESEARCH ARTICLE

A Study to assess the knowledge Regarding Diabetic foot Ulcer among Diabetic Clients in a selected Hospital, Kancheepuram District, Tamil Nadu.

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ABSTRACT:
A descriptive study to assess the knowledge regarding diabetic foot ulcer among diabetic clients in a selected hospital, Kancheepuram district, Tamil Nadu. Convenient sampling technique was used to select 100 diabetic patients who were in hospital. Data were gathered through structured knowledge questionnaire .The results mainly found that 56% patients had inadequate level of knowledge,38% had average level of knowledge,6%had an adequate level of knowledge. The Association between knowledge score and demographic variables was assessed by using chi-square. There was significant association between age, sex, marital status and family history of diabetes with knowledge score. The findings revealed that there is need planned teaching programme regarding diabetic ulcer foot.

INTRODUCTION:
People with diabetes have a number of potentially serious health problems that can be cause by the condition, including eye, heart, feet and kidney diseases. One of the most common is diabetes-related foot problems.

High glucose levels from diabetes can result in poor circulation to your lower legs and feet. Often, this causes nerve damage, called neuropathy, which can lead to a lack of sensation in the feet, foot ulcers, and in severe cases results in amputation. Fortunately, with conscious treatment of diabetes and good foot care, many of these problems can be avoided or at least treated.

Jeewantha M, et al., 2011. Their analytical survey studied the knowledge and practice of diabetic foot care among110 in patients with chronic diabetic ulcers. Results demonstrate a satisfactory knowledge on diabetic foot disease; however their practices of preventive techniques were unsatisfactory.

Sheule Begum, et al., 2010 studied the knowledge regarding diabetic foot ulcer among 120 diabetic patients in Bangladesh, the result reviled that around 80% of the patients had an average knowledge and 15 % had an adequate knowledge. The researchers recommended that there is the need of intensive teaching program regarding diabetic foot ulcer and its prevention

Son Yong Kim et al., 2008 in their descriptive cross sectional survey studied the knowledge, attitude and practice regarding diabetic foot ulcer among 300 diabetic patients in outpatient department of Metropolitan Administration (BMA) Health Center No. 48, Bangkok, Thailand, the result shown that 54% of the patients had moderately adequate knowledge and attitude. Monthly income, expenditure and family history of diabetes had significant association with knowledge, attitude and practice.

33% of the diabetic people are at the risk of developing foot Ulcer. 16% will definitely develop Foot Ulcer. The prevalence of amputation in Type 2 diabetic patients is 3%. 30% of the diabetics get admitted for diabetic foot. And number of days spent by these patients in hospitals, are more than the days spent due to all other complications. Of

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the total lower limb amputations, 85% are due to Diabetic Foot.

India will bet the capital of Diabetics in the 2025. Figure will jam 25 million to 57 millions 2025. In India most of the foot problems are associated with Neuropathy & Infective rather than Vascular. The prevalence of foot complications such as Neuropathy is 15%, Peripheral Vascular disease 5% & infections 7.6%. As per our studies Foot Pressure changes occur in 25% of diabetics. In India, 55% of Foot Ulcers are Neuropathic (nerve involvement), 35% are Neuroischaemic & 10% are Ischaemic (Blood Vessels Involvement)

Statement of the Problem:
A descriptive study to assess the knowledge regarding diabetic foot ulcer among diabetic clients in a selected hospital, Kancheepuram district, Tamil Nadu.

Objectives:
- To assess the knowledge regarding diabetic foot ulcer among diabetic clients
- To associate the knowledge score with the selected demographic variables of diabetic clients.

Research Design:
Descriptive design was used for this study

Setting:
The study was conducted in Melmaruvathur Adhiparasakthi Institute of Medical Sciences and Research, Melmaruvathur, Kancheepuram Dist. Tamil Nadu.

Population:
The study population comprises of all the Diabetic patients who are attending outpatient department and admitted in medical ward.

Sample Size:
100 patients were included as sample

Sampling Technique:
A convenient sampling technique was used to select the sample.

Criteria for Sample Selection:
Inclusion Criteria:
1. Patient should have diabetic
2. Patient who is willing to participate in the study.
3. Patient who is able to speak or understand Tamil

Exclusion Criteria:
1. Patient with mental disturbances
2. Patient with allergic history
3. Patient with depleted illness

Development and description of the tool:
Section A Demographic Variables
Section B structured knowledge questionnaire

Score Interpretation:
The knowledge was measured by multiple choice questions with four options. For best answer score was one and wrong answer score was zero.

$$\text{Score interpretation} = \frac{\text{Obtained score}}{\text{Total score}} \times 100$$

The score were interpreted as follows
Below 50% Inadequate Knowledge
50 -75% average Knowledge
Above 75% adequate knowledge

Data Collection:
Considering all the ethical aspects, the study was conducted in Melmaruvathur Adhi Parasakthi Medical College Hospital and Research Institute. Total of 100 samples were interviewed and data were collected.

Data Analysis:
Descriptive statistics such as frequency, percentage, mean and standard deviation was to assess the knowledge, inferential statistics (chi square) was used to associate the level of knowledge with selected demographic variables.

RESULT:

Table: 1-Diabetic Client's Knowledge Regarding Diabetic Foot Ulcer (No: 100)

Knowledge level score	No	Percentage	Mean	Standard Deviation
Inadequate	56	56		
Average	38	38	10.3	2.43
adequate	06	06		

The table shows that 56% patients have inadequate knowledge, 38% have average knowledge and 6% of the patients have an adequate knowledge. The findings reveal that there is need planned teaching programme.

Table:2-Frequency and percentage distribution of diabetic clientsN: 100

S. No	Variables	Total		Knowledge						Chi-square
				Inadequate		Average		Adequate		
		N	%	No	%	No	%	No	%	
1	**Age in Years**									
	a. <25	00	00	00	00	00	00	00	00	Chi square=
	b. 25 to 35	22	22	22	22	18	18	00	00	30.199
	c. 36 to 45	28	28	28	28	07	07	01	01	S
	d. 46 to 55	32	32	32	32	09	09	02	02	P**
	e. >55	18	18	18	18	02	02	03	03	
2	**Sex**	52	52	52	52	15	15	01	01	Chi
	a. Male	48	48	48	48	23	23	05	05	square=8.783
	b. Female									S, p**
3	**Marital Status**									
	a. Married	38	38	38	38	24	24	04	04	Chi
	b. Unmarried	20	20	20	20	04	04	00	00	square=23.94
	c. Widowed	00	00	00	00	00	00	00	00	S, p**
	d. Widower	30	30	30	30	08	08	02	02	
	d. Separated / divorced	12	12	12	12	02	02	00	00	
4	**Religion**									
	a. Hindu	61	61	61	61	23	23	03	03	Chi
	b. Muslim	17	17	17	17	10	10	01	01	square=5.643
	c. Christian	22	22	22	22	05	05	02	02	NS, p**
	d. Others	00	00	00	00	00	00	00	00	
5	**Occupation**									
	a. Unemployed	36	36	36	36	10	10	03	03	Chi
	b. Daily Labor	23	23	23	23	12	12	01	01	square=9.438
	c. Private employee	14	14	14	14	08	08	01	01	NS, p**
	d. Government employee	09	09	09	09	01	01	01	01	
	e. Professionals	18	18	18	18	07	07	00	00	
6	**Monthly income of the family (in Rupees)**									
	a. <5000/-	13	13	13	13	03	03	00	00	Chi
	b. 5001 /- to 10000/-	57	57	57	57	22	22	05	05	square=8.655
	c. 10001/- to 20,000/-	27	27	27	27	10	10	01	01	NS, p**
	d. >20,000	03	03	03	03	03	03	00	00	
7	**Duration of Illness**									
	a. Less than one year	06	06	06	06	00	00	01	01	Chi
	b. 1 -2 years	19	19	19	19	16	16	03	03	square=8.655
	c. 2 -3 years	29	29	29	29	00	00	02	02	NS, p**
	d. 3-4 years	18	18	18	18	00	00	00	00	
	e. 4-5 years	21	21	21	21	15	15	00	00	
	f. >5 years	07	07	07	07	07	07	00	00	
8	**Dietary Pattern.**	43	43	43	43	16	16	01	01	Chi
	a. Vegetarian	57	57	57	57	22	22	05	05	square=8.768
	b. Non- Vegetarian									NS, p**
9	**Domicile**	63	63	63	63	10	10	00	00	
	a. Rural	22	22	22	22	17	17	05	05	Chi
	b. Urban	15	15	15	15	11	11	01	01	square=8.726
	d. Sub- urban									NS, p**
10	**Family history of Diabetes Mellitus**									
	a. Yes	42	42	42	42	14	14	02	02	Chi
	b. No	46	46	46	46	22	22	04	04	square=9.523
	c. Unknown	12	12	12	12	02	02	00	00	S, p**

The above table shows that the sample distributions according to the demographic variables. Among 100 clients, 32% were between 46-55 years in age, 52% of males, 38% were married, 29% are on treatment, 63% were residing at rural area, 46% of clients were not having the family history of diabetic. The same table shows age, sex, marital status and family history of diabetes were highly significant at p 0.05 levels.

Recommendations:

- The similar study can be conducted between rural and urban diabetic clients
- The study can be replicated in different settings
- The study can be conducted with large sample in community setup.
- In order to improve the knowledge of the clients the study can be conducted as an interventional study

CONCLUSION:

Health education is an important aspect to prevent the disease and promote the health of the individual and society. Awareness can be given through diabetic camps along with implications to the diabetic clients.

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RESEARCH ARTICLE

A Study to Assess the Perceived Level of Stress among Diabetic Clients in a Selected Health Care Industry, Kancheepuram District, Tamil Nadu

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ABSTRACT:
Diabetes is the chronic and most complication producing disease, not only it affects the physical well being also affects the psychological wellbeing. Worldwide 371 million people are affected by diabetes and India alone 47 million. Diabetes is the stressor which may leads to stress among those affected with this disease. Assessment of the level of stress can help them to council and improve from stress. This study assessed the perceived level of stress in diabetic clients. Descriptive research design was adapted for this study. The study was conducted at Melmaruvathur Adhiparasakthi Institute of Medical Sciences with 50 diabetic clients. Cohen's perceived stress scale was used to assess the level of stress. The result revealed that 52% of the diabetic clients have high level of stress, the mean 29.2, SD 4.103. Age, occupation and dietary pattern had significant association with stress level.

KEY WORDS:

INTRODUCTION:
Health is considered as the actualization of inherent and acquired human potential through goal oriented behavior, competent self care and satisfying relationship with others. Health as a condition or quality of human organism expressing the adequate functioning of the organism.

"Diabetes is raise in blood glucose level it may be due to body does not make enough insulin or does not use it as it should".

"Stress is the non specific response of the body to any demand made on it".

WHO 2012 statistics reveals that, more than 371 million people have diabetes, the number of people with diabetes is increasing in every country, half of people with diabetes are undiagnosed, 4.8 million people dies due to diabetes.

India is home to the second highest number of people living with diabetes in the world after China. Today there are over 47 million people expected to be affected with this disease.

Everyone experiencing stress from time to time, and normally a person is able to adapt to long term stress or cope with short-term stress until it passes. Stress is any situation in which nonspecific demands requires an individual to respond or take action (Selye, 1976).it involves physiological and psychological responses.

Response model says stress is nonspecific response of the body to any demand made on it. Stimulus based model says that disturbing or disruptive characteristic within the environment. Transaction model says a person and environment in a dynamic, reciprocal, interactive relationship. This model views the stressor as an individual perceptual response rooted in psychological and cognitive process. The link between psychological stress and disease is frequently called the mind-body interaction.

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The level of stress is depends on the intensity, duration, number and nature of the stressors. Way a person normally perceive reality, solve problem, think in general, person's relationships and sense of belonging. In addition, stress can threaten a person's general outlook of life, attitude towards the loved one and health status.

An individual's experience of major changes initiates the stress response. The factors that preceding the change is called stressor. Internal stressor originates inside the person. Physiological indicators of stress include increase muscle tension, elevated vitals, fatigue, headache, high pitch voice, change in appetite and weight and restlessness so on.

Behavioral and emotional indicators are anxiety, depression, and changes in the eating habits, sleep and activity pattern, mental exhaustion, feeling of inadequacy, loss of self esteem and motivation, emotional outburst, forgetfulness and blocking, diminished attention and loss of interest so on.

Psychological patterns in diabetic patients may manifest themselves in specific ways: patients resist regimens because they want control over their daily activities and living patterns. Two variations in patients' interpretations of diabetes have been found: the extent to which patients primarily oriented themselves toward symptom control or prevention of complications, and their perception of the seriousness of the condition. From the few studies conducted, it has been found that diabetic patients believe diabetes to be a serious condition that could cause complications.

Diabetes and stress may influence each other directly or indirectly. For example, stress may interfere with regimen adherence and thereby undermine metabolic control. Alternatively, poor control might interfere with general functioning, exacerbating the effects of various stressors to the diabetes regimen.

The non-compliance by diabetic patients is a major problem faced by physicians and health care providers. As many as 50% of patients seeking treatments, drop out of care within a year. Only 7% adhere to all of the recommendations considered necessary for proper control of diabetes (Cerkoney and Hart, 1980:594). Noncompliance and adherence result in serious difficulties to treatment. Non-compliance can be understood in terms of reactance theory (Lutfey and Wishner, 1999:635): in response to perceived threats to their freedom, and acceptance of chronic disease, patients become motivated to recapture lost freedom by not following medical advice.

STATEMENT OF THE PROBLEM:

A study to assess the perceived level of stress among diabetic clients in a selected health care industry, Kancheepuram district, Tamil Nadu.

OBJECTIVES:

1. To assess the perceived level of stress among diabetic clients.
2. To associate the perceived level of stress with the selected demographic variables of diabetic clients.

VARIABLES:

Research variable:
Perceived level of Stress

Demographic Variable:
Age, sex, marital status, religion, occupation, income, sources of information, duration of illness, dietary pattern, domicile and family history of diabetes.

RESEARCH DESIGN:

Descriptive co relational design was adapted for this study

Setting:
The study was conducted in Melmaruvathur Adhiparasakthi Institute of Medical Sciences and Research, Melmaruvathur, Kancheepuram Dist. Tamil Nadu.

Population:
The study population comprises of the entire Diabetic clients who are attending outpatient department and admitted as an inpatients.

Sample Size
50 patients were included as sample

Sampling Technique:
A convenient sampling technique was used to select the sample.

Criteria for Sample Selection:
Inclusion Criteria:
1. Client who is diagnosed as diabetic by the physician
2. Client who is willing to participate in the study.
3. Client who is able to speak or understand Tamil

Exclusion Criteria:
1. Client with mental disturbance

Development and description of the tool:
Section A: Demographic Variables
Section B: 1.Cohen's perceived stress scale

Score Interpretation:
Cohen's perceived stress scale *each* item is rated on 5 point scale ranging from never (0) to almost always (4) for negatively worded.
0=4: Never
1=3: Almost never
2=2: Sometimes
3=1: Fairly often
4=0: Very often

For the positively worded question the score was reverted. The rating is summed with high score indicating more perceived stress. Total of 10 items and the maximum score is 40. Score around 13 are considered as average. Score of 20 or higher are considered high stress.

Data Collection:

Considering all the ethical aspects, the study was conducted in Melmaruvathur Adhi Parasakthi Medical College Hospital and Research Institute. Total of 50 samples were interviewed and data were collected.

Data Analysis:

Descriptive statistics such as frequency, percentage, mean and standard deviation was to assess the perceived level of stress, inferential statistics (chi square) was used to associate the perceived level of stress with selected demographic variables.

RESULT:

Table: 1-Perceived level of stress among diabetic clientsNo: 50

Stress	No	Percentage	Mean	Standard Deviation
No stress	00	00	29.2	4.103
Average stress	24	48		
High stress	26	52		

The table shows that 52% clients experience high stress, 48% clients experience average stress and none of the client is free from stress.

Table: 2 Frequency and percentage distribution of diabetic clients N: 50

S.no	Variables	Total		stress			Chi-Square
		No	%	No Stress	Average Stress	Heavy Stress	
1	**Age in Years**						Chi square=23.86
	a. <25	00	00	00	00	00	S p***
	b. 25 to 35	05	10	02	03	00	
	c. 36 to 45	09	18	00	07	02	
	d. 46 to 55	20	40	01	12	07	
	e. >55	16	32	00	14	02	
2	**Sex**	33	66	01	20	12	Chi square=3.43
	a. Male	17	34	01	14	02	NS
	b. Female						
3	**Marital Status**	32	64	02	26		Chi square= 5.32
	a. Married	00	00	00	00	04	NS
	b. Unmarried	04	08	00	04	00	
	c. Widowed	05	10	00	04	00	
	d. Widower	09	18	00	05	01	
	e. Separated / divorced					04	
4	**Religion**	29	58	00	25		Chi square=3.14
	a. Hindu	06	12	00	03	04	NS
	b. Muslim	15	30	00	12	03	
	c. Christian	00	00	00	00	03	
	d. Others					00	
5	**Occupation**	13	26	00	08		Chi square= 8.057
	a. Unemployed	26	52	00	24	04	S, p**
	b. Daily Labor	12	24	00	06	02	
	c. Private employee	00	00	00	00	06	
	d. Government	00	00	00	00	00	
	employee					00	
	e. Professionals						
6	**Monthly income of the**	07	14	00	05		Chi square=5.6
	family (in Rupees)	33	66	00	30		NS
	a. <5000/-	10	20	00	06	02	
	b. 5001 /- to 10000/-	00	00	00	00	03	
	c. 10001/- to 20,000/-					04	
	d. >20,001					00	
7	**Duration of Illness**	04	08	00	03		Chi square=10.05
	a. Less than one year	18	36	01	16		NS
	b. 1 -2 years	15	30	01	13	01	
	c. 2 -3 years	05	10	00	02	01	
	d. 3-4 years	08	16	00	06	01	
	e. 4-5 years					03	
	f. >5 years					02	
8	**Dietary Pattern.**	15	30	00	13		Chi square=8.14
	a. Vegetarian	35	70	03	20	02	S, P**
	b. Non- Vegetarian					12	

9	**Domicile**	22	44	02	18		Chi square=9.00
	a. Rural	09	18	00	05	02	NS
	b. Urban	19	38	00	17	04	
	d. Sub- urban					02	
10	**Family history of**	07	14	00	05		Chi square=1.8
	Diabetes Mellitus	19	38	02	15		NS
	a. Yes	24	48	02	18	02	
	b. No					02	
	c. Unknown					04	

The above table shows that the sample distributions according to the demographic variables. Among 50 clients, 40% were between 46-55 years in age, 66% were male, 52% were daily labor, 66% were under the 5001-10,000 income group, 58% were Hindu, 36% of people were1-2years of illness, 64% were married, 44% were residing at rural area, 48% of clients were not known the family history of diabetic. The same table shows age, occupation and dietary pattern of diabetic clients were highly significant at p 0.05 levels.

IMPLICATIONS:

The findings of the study have implication in Nursing service, Nursing administration and Nursing research.

Nursing service:

The nursing personnel functioning in the service sector have humble of opportunity to communicate with diabetic clients to find out the level of stress and can council this regard.

Nursing education:

Nursing education should not concentrate only on control of diabetes and its related physical complication; it has to extend the arms to psychosocial aspects of the clients.

Nursing administration:

Nurse administrator himself/herself engages to study the psychosocial aspects of the diabetic clients and also encourage other nursing personnel to concentrate on this matter. The nurse administrator should allot adequate fund and time to study more on this.

Nursing research:

Nurse researchers should concentrate on the psychosocial aspects of the diabetic clients and indepth study can be conducted on that.

RECOMMENDATIONS:

- The similar study can be conducted between rural and urban diabetic clients
- The study can be replicated in different settings
- The study can be conducted with large sample in community setup.
- In order to improve the quality of life and reduce the stress an intervention based study can be conducted.

CONCLUSION:

Health education is an important aspect to prevent the disease and promote the health of the individual and society. Awareness can be given through diabetic camps along with implications to the diabetic clients.

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LETTER SEEKING EXPERT OPINION FOR CONTENT VALIDITY

From

Mrs P. Tamilselvi,
Ph.D scholar,
Adhi Parasakthi College of Nursing
Melmaruvathur- 603 319.

To

Respected sir/madam

Sub: Requisition for expert opinion on suggestion for content validity of the tool to assess the effectiveness of infrared radiation, insulin dressing and metronidazole dressing in healing of diabetic ulcer foot.

I am Ph.D scholar of AdhiParasakthi College of Nursing, Melmaruvathur, Kanchipuram district, affiliated to The Tamil Nadu Dr.M.G.R Medical University, Chennai.

I am conducting "**A comparative study to assess the effectiveness of Infra Red Radiation, Insulin dressing and Metronidazole dressing in Healing of Diabetic Ulcer Foot at MAPIMS".**

Herewith I have enclosed structured knowledge questionnaire relevant to diabetes and Bates Jansen's wound assessment tool, kindly validate the tool and render your expert opinion in this regard.

Thanking you

Yours sincerely

P.Tamilselvi

CONTENT VALIDITY EXPERTS

1. **Dr. A. JAYASUDHA, Ph. D (N),**

   Associate Professor,

   Female College of Applied Medical Sciences,

   Bisha, King Khalid University,

   Saudi Arabia.

2. **Dr. A. MARIA THERESE, Ph. D (N), MSN, M.A (Hosp.Adm)., PGDG&C.,**

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   Puducherry.

7. **Dr. VALLIAMMAL, M. Sc (N)., Ph. D (N),**

   Lecturer, College of Nursing,

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8. **Dr. KATHIRAVAN, MD,**

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9. **Dr. ANANDBABU., MS.,**

   Professor & HOD,

   Department of General Surgery,

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   Melmaruvathur,

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10. Dr. D. BALAJI., M S.,

Professor of surgery,

MAPIMS, Melmaruvathur,

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11. Dr. APPANRAJ,MD., Diabetologist,

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12. Dr. T.K.V. SHARAVANAN M D., Diabetologist

Asst. Prof., Department of Medicine,

MAPIMS, Melmaruvathur,

Kancheepuram district,

Tamil Nadu.

13. Prof. ASHOK., M.Sc., M. Phil.,

Professor and HOD of Statistics Department

Adhiparasakthi College of Nursing,

Melmaruvathur

CONSENT FORM

I_____ D/o. / S/o. _____

agree to take part in the research study, conducted by **Mrs P.TAMILSELVI**, Ph.D Scholar, Department of Research in Adhiparasakthi College of Nursing, entitled as **"A comparative study to assess the effectiveness of Infrared Radiation, Insulin Dressing and Metronidazole Dressing in healing of diabetic ulcer foot at MAPIMS**.I acknowledge that the research study has been explained to me and I understood and agree to participate in the research means that I am willing to:

- Provide information which is only the truth to the best of my knowledge.
- Allow to accept to do dressing for my foot ulcer.
- Allow the researcher to have access to the medical records, pertaining to the purpose of the study.
- Allow to participate in the analysis program.

I have been informed about the purpose of my queries towards the research. I have consent myself to the researcher to use the information given by me for educational purpose only. I assured that my participation is voluntary and I have right to withdraw at any stage of research without giving any reason.

Signature of the Participant

Date :

Signature of the Investigator

Date :

ஒப்புதல் படிவம்

நான்..... த/பெ.....

ஆதிபராசக்தி செவிலியர் கல்லூரியில் ஆராய்ச்சி பிரிவில், டாக்டர் பட்டபடிப்பு மாணவரால் நடத்தப்படும் ஆராய்ச்சிக்கு சம்மதிக்கிறேன். சர்க்கரை நோயினால் காலில் ஏற்பட்ட காயத்திற்கு மெட்ரோனிடசோல்/இன்சுலின்/இன்ப்ராரெட் லைட் ஏதேனும் ஒரு மருந்து முறையினால் சர்க்கரை நோய் கால் புண்ணை குணப்படுத்துவது பற்றிய ஆராய்ச்சி படிப்பு. இந்த ஆராய்ச்சினால் வரும் நன்மைகளைப் பற்றி என்னிடம் விளக்கி கூறினார்கள். ஆராய்ச்சி விதிமுறைகளை நன்கு புரிந்துக்கொண்டு இந்த ஆராய்ச்சியில் பங்கேற்க கீழே கொடுக்கப்பட்டுள்ள அனைத்து விதிகளையும் பின்பற்ற தயாராக இருக்கிறேன். அவை நான்

1) கொடுக்கும் தகவல்கள் அனைத்தும் உண்மையானவை மற்றும் என் அறிவுக்கு உட்பட்டவை.
2) இந்த ஆராய்ச்சியில் அளித்த தகவல்கள் மருத்துவ படிப்பு ஆவணங்களுக்கு பயன்படும் தொகுப்பாக அமைக்கலாம்.
3) காலில் மேற்கூறப்பட்ட மருந்தினால் கட்டுபோட்டு கொள்ள சம்மதிக்கிறேன்.
4) இந்த ஆராய்ச்சியின் பகுப்பாய்வில் பங்கேற்கிறேன்.

இந்த ஆராய்ச்சியின் முக்கியத்துவம் பற்றிய எனது சந்தேகங்கள் தெரிவிக்கப்பட்டன. நான் கல்வியின் முக்கியத்துவத்திற்காக மட்டுமே என்னை பற்றிய தகவல்களை அளிக்க ஒப்புகொள்கிறேன். என்னுடைய பங்கு இந்த ஆராய்ச்சியில் தன்னிச்சையானது என்றும், இந்த ஆராய்ச்சியின் எந்தக் கேள்விகளுக்கும் பதில் கூற மறுக்கவோ, எந்த நிலையிலும் ஆராய்ச்சிலிருந்து விலகி கொள்ளவோ முழு உரிமை உள்ளது.

நோயாளியின் கையொப்பம் ஆராய்ச்சியாளர் கையொப்பம்

தேதி தேதி

SECTION – A

PART – 1: DEMOGRAPHIC VARIABLES

Sl.No.	Demographic variables
1	**Age in years**
	a. 25-35
	b. 36-45
	c. 46-55
	d. 56 -65
	e. 66 and above
2	**Sex**
	a. Male
	b. Female
3	**Religion**
	a. Hindu
	b. Muslim
	c. Christian
	d. Others
4	**Education**
	a. Uneducated
	b. Primary school
	c. High school
	d. Higher secondary
	e. Graduate and above
5	**Occupation**
	a. Unemployed
	b. Daily labor
	c. Private Employee
	d. Government Employee
	e. Professionals
6	**Family income per month**
	a. Up to 5000
	b. 5001-10000
	c. 10001-20000
	d. Above 20000

7 Marital status

a. Married
b. Unmarried
c. Widowed/ Widower
d. Divorced/Separated

8 Sources of information on DM

a. Health personnel
b. Mass media
c. Friends
d. Relatives
e. Others

9 Duration of Illness

a. < 1 year
b. 1-2 years
c. 3-4 years
d. 5-6 years
e. >6 years

10 Dietary Pattern

a. Vegetarian
b. Non-vegetarian

11 Residential Area

a. Rural
b. Urban
c. Sub-urban

12 Family History of Diabetes

a. Yes
b. No
c. Unknown

13 Duration of Foot Ulcer

a. < one year
b. One year
c. Two year
d. >Two year

SECTION – B

MODIFIED BATES JENSEN WOUND ASSESSMENT TOOL

Item	Assessment	Date score	Date score	Date score
1.Size	1 = length × width <4sq cm 2 = length × width 4 - < 16 sq cm 3 = length × width 16.1 - <36 sq cm 4 = length × width 36.1 - < 80 sq cm 5 = length × width >80 sq cm			
2. Depth	1 = Non – blanchable erythema on intact skin 2 = partial thickness skin loss involving epidermis and/or dermis 3 = Full thickness skin loss involving damage or necrosis of subcutaneous tissue; may extend down but not through underlying fascia; and/or mixed partial and full thickness and/or tissue layer obscured by granulation tissue. 4 = Obscured by necrosis 5 = Full thickness skin loss with extensive destruction , tissue necrosis, or damage to muscle , bone or supporting structures.			
3. Edges of wound	1 = Indistinct, diffuse, none clearly visible 2 = Distinct, outline clearly visible , attached even with wound base 3 = Well – defined , not attached with wound base 4 = Well – defined , not attached to base, rolled under, thickened 5 = Well – defined , fibrotic, scarred or hyperkeratotic.			
4. Undermining	1 = None present 2 = Undermining < 2 cm in any area 3 = Undermining 2 – 4 cm involving <50% wound margins 4 = Undermining 2 – 4 cm involving >50% wound margins 5 = Undermining > 4 cm or tunneling in any area			
5. Slough Tissue type	1 = None present 2 = White /gray non visible tissue and/or non – adherent yellow slough 3 = Loosely adherent yellow slough 4 = Adherent, soft, black eschar 5 = Firmly adherent, soft, black eschar			

Item	Assessment	Date score	Date score	Date score
6. Percentage of slough Tissue	1 = None present 2 = < 25% of wound bed covered 3 = 25% to 50% of wound covered 4 = >50% to < 75% of wound covered 5 = 75% to 100% of wound covered			
7. Type of wound discharge	1 = None 2 = Bloody 3 = Serosanguineous, thin, watery, pale red/pink 4 = Serous: thin, watery, clear 5 = Purulent: thin or thivk, opoque, tan/yellow, with or without colour			
8. Exudates Amount	1 = None , dry wound 2 = Scant, wound moist but no observable exudate 3 = Small 4 = Moderate 5 = Large			
9. Skin colour Surrounding Wound	1 = Pink 2 = Bright red and / or blanches to touch 3 = White or grey pollar or hypo pigmented 4 = Dark red or purple and /or no - blanchable 5 = Black or hyperpigmented			
10. Peripheral tissue edema	1 = No swelling or edema 2 = Non – pitting edema extends < 4cm around wound 3 = Non – pitting edema extends ≥ 4cm around wound 4 =Pitting edema extends < 4cm around wound 5 = Crepitus and/or Pitting edema extends < 4cm around wound			
11. Peripheral tissue Induration	1 = None present 2 = Induration, < 2 cm around wound 3 = Induration, 2 - 4 cm extending <50%around wound 4 = Induration, 2 - 4 cm extending ≥50%around wound 5 = Induration, > 4 cm in any area of wound			
12. Granulation Tissue	1 = Skin, intact or partial – thickness wound 2 = Bright, beefy red;75% to 100% of wound filled and/or tissue overgrowth 3 = Bright, beefy red;<75% to >25% of wound filled 4 =Pink, and/or dull, dusky red and/or fills ≤ 25% of wound 5 = No granulation tissue present			

Item	Assessment	Date score	Date score	Date score
13. Epithelialization	1 = 100% wound covered , surface intact 2 = 75% to 100% wound covered and/or epithelical tissue extends > 0.5cm into wound bed 3 =50% to <75% wound covered and/or epithelical tissue extends > 0.5cm into wound bed 4 = 25% to 5<50% wound covered 5 =<25% wound covered			

SCORE:

60 – 15 = Wound Degeneration

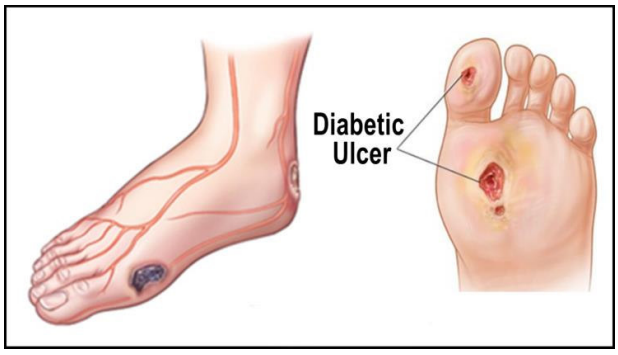
≤ 14 = Wound Regeneration

Sources: Potter and Perry, Fundamentals of Nursing

PHOTOGRAPHS

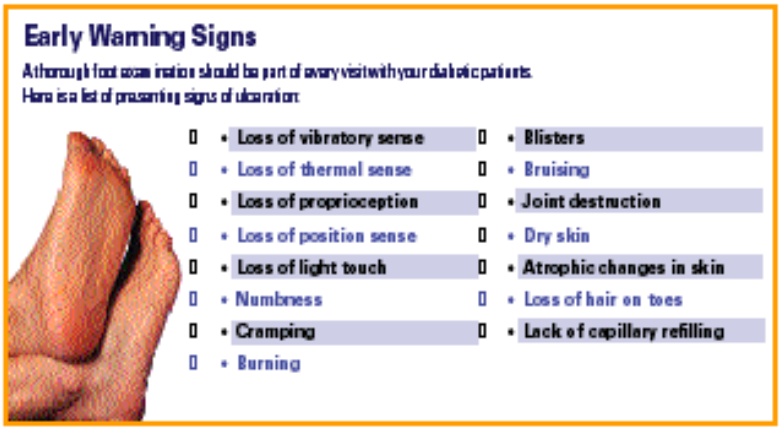
NORMAL FOOT

DIABETIC FOOT



COMMON FOOT PROBLEMS

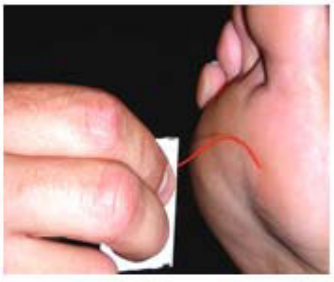
WARNING SIGNS



MANAGEMENT OF FOOT PROBLEMS

Diagnostic tests for Diabetic Peripheral Neuropathy include:

Vibration perception tested with tuning fork



Monofilament screening test

Nerve conduction velocity measurements

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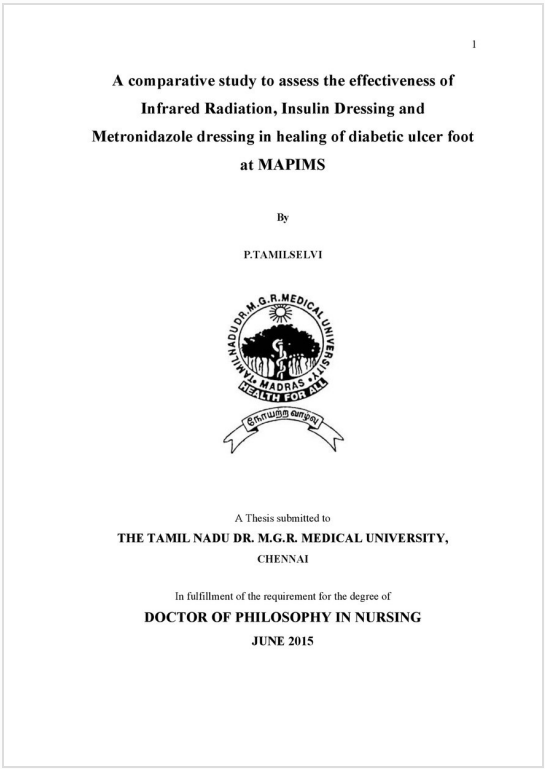

1

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By

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