



Assessment of Contributing Factors and Wound Severity in Diabetic Foot Ulcer - A Prospective Study

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ABSTRACT

The study aims to assess the factors contributing to the development of Diabetic Foot Ulcer (DFU) and wound severity of ulcer in DFU, and also to assess the type of dressing used and provide relevant patient care education to patient with DFU. It is a prospective observational study conducted for 6 months, from November 2021 to April 2022 in the in-patient and out-patient facility of the surgery Department at ESIC Hospital, Nacharam, Hyderabad, Telangana in India. A total of 103 subjects were included in the study. The contributing factors of DFU and wound severity were assessed by Wagner-Meggitt classification system. This study concluded that along with hyperglycemia, hypertension (55.33%), traumas (33%) are the leading risk factors for DFU. The highest number of patients falls under moderate numbness. Various types of dressing used in different severity grade patients was assessed and was found that highest type of dressing used was saline dressing. Based on wound severity specific counselling points were provided to the patient to progress the wound healing process. Counselling regarding diabetic diet and lifestyle modification was provided based on the GRBS (Glycemic index) of the patients.



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INTRODUCTION

In India, around 3 crores patients were diagnosed with Diabetes by 2021. Prevalence rate among Adults in urban region were found to be 9% and in rural region it is 3% [1]. Diabetes is a metabolic

condition that occurs due to inability of pancreas to produce sufficient amounts of insulin or due to improper usage of insulin by the body [2]. Diabetic foot occurs due to ulceration with neuropathy and/or peripheral arterial disease. It is a serious and damaging complication of diabetes and can be caused due to lack of feeling in the foot, poor circulation, foot deformities, irritation (such as friction or pressure), trauma, duration of diabetes.

In order to provide treatment plan and follow up, proper diagnosis and classification of DFUs are required. Wagner-Meggitt classification system is based mainly on the depth of the wound and it consists of 6 wound grades. The Wagner diabetic foot ulcer classification system assesses the depth of the ulcer and the presence of gangrene and osteomyelitis by the following grades—Grade 0 – intact Skin,

Grade 1 – superficial ulcer of skin or subcutaneous tissue, Grade 2 – ulcers extend into tendon, bone, or capsule, Grade 3 – deep ulcer with osteomyelitis, or abscess, Grade 4 – partial foot gangrene, Grade 5 – whole foot gangrene and requires amputation [3]. There are different methods for dressing the wound they are alginate dressing, hydro fiber dressing, foam dressing, hydrocolloid dressing, low-adherence dressing, hydrogel dressing, transparent film dressing, and papaya dressing.

Regular foot examinations to check the presence of foot abnormalities are important to prevent Diabetic foot ulcer, it can be self-examination or clinical examination. Diabetes related complications are reduced by controlling blood glucose levels. Regular maintenance of healthy diet, lifestyle and taking prescribed medications as directed can play vital role in managing diabetes. The risk of damaging the nerves that can further lead to DFU can be prevented by controlling blood glucose levels. Quit smoking, ensure no injuries to feet and increase risk of injury and burns, wash your feet regularly with lukewarm water and soap, maintain good foot hygiene, always check for foot related complications during medical visits, selecting healthy food choices, optimal exercise, maintain normal bodyweight.

METHODOLOGY

Study Design

The present study is a Non - Invasive Prospective Observational Study.

Study Place

The study was conducted at ESI Sanathnagar, a 550 bedded hospital, located at Nacharam Hyderabad-Telangana State.

Study Duration

The present study was carried out for 6 months period i.e., from December 2021 to april 2022.

Study Population

The study includes 103 patients.

Selection of Subjects

For present study the patients who visited ESI hospital with Diabetic foot ulcer were enrolled based on the inclusion and exclusion criteria.

Inclusion Criteria

1. Patients with diabetes mellitus
2. People who are willing to participate
3. Patients who are conscious and cooperative

4. Patients with diabetic complications and comorbidities
5. Patients above the age of 30 years

Exclusion Criteria

1. Patients with no complications in respect to diabetes
2. Patients with psychiatric illness.
3. Patients with gestational diabetes
4. Patients below the age of 30 years

Study Materials

Data collection form, Patient information leaflets (PIL's).

Sources of Data

Patients case notes and prescription, Treatment charts, interviewing patients and/or patient representatives, interviewing health care professionals for more details.

Study Procedure

The study began with the selection of patients based on the inclusion criteria followed by the collection of all the baseline parameters, demographic details, past allergies, past history, and present treatment and all the data of subjects are collected by using the patient data proforma. The patient's data that were included in the study was classified based on grading according to Wagner's scale. The patients are categorized based on different stages. Assessment of the factors contributing to the development of diabetic foot ulcer, wound severity of ulcer in diabetic foot ulcer and wound dressing in DFU was done. Patient education regarding the various aspects in respect to patient's diabetic foot ulcer was provided along with patient counseling on Diabetic diet with respect to their glycemic index.

RESULTS

A total of 103 patients were included in our study. The percentage of patient's age group below 60 was found to be 64.0% & patient's age group above 60 was found to be 35.9% represented in Figure 1. Among all the study participants 71.84% of study participants were male and 28.16% found to be female were represented in Figure 2.

The patient's data who were included in the study based on signs and symptoms were found to be redness 74.75%, swelling 75.72%, pain 88.34%, open sore 62.12%, foot odor 24.27%, exudates

35.92%, granulation 23.33%, fever 29.12%, numbness 65.04%, corns and calluses 19.41% depicted clearly in Figure 3.

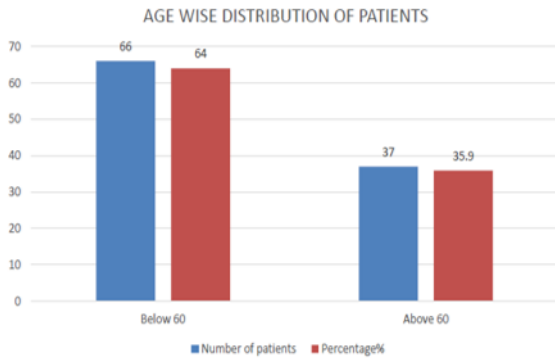


Figure 1: Distribution of Patients Based on Age Group

on diagnosis of diabetic foot ulcer were found to be as: newly diagnosed 43.6% and previously diagnosed 56.3% represented in Figure 5.

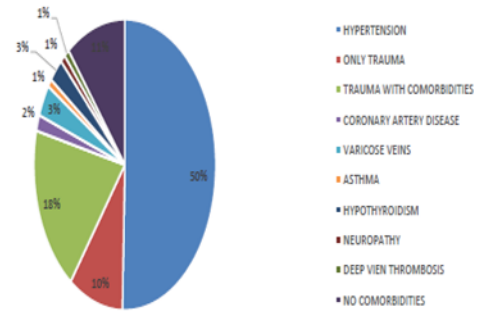


Figure 4: Distribution of Subjects Based on Co Morbidities and Contributing Factors in DFU

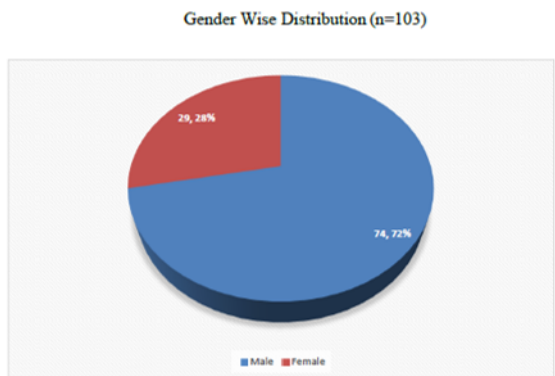


Figure 2: Distribution of Patients Based on Gender Group

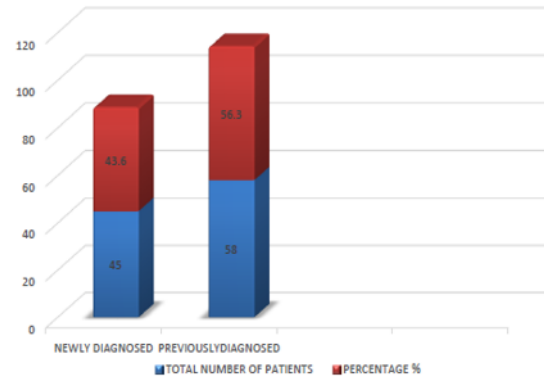


Figure 5: Distribution of Subjects Based on Diagnosis of Diabetic Foot Ulcer

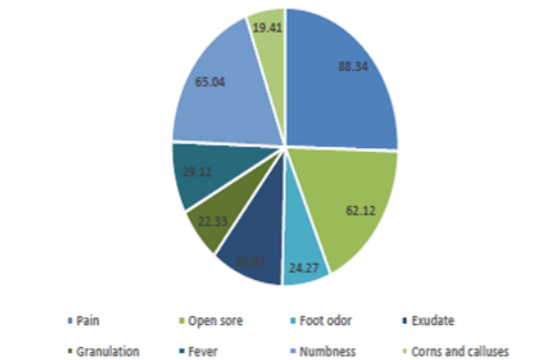


Figure 3: Distribution of Subjects Based on Signs and Symptoms

The patient's data who were included in the study based on contributing factors and comorbidities in diabetic foot ulcer were found to be hypertension 55.33%, trauma 33%, CAD 1.94%, varicose veins 3.88%, asthma 0.97%, hypothyroidism 2.91%, neuropathy 0.97%, deep vein thrombosis 0.97%, no co-morbidities 11.65% depicted in Figure 4. The patient's data who were included in the study based

The patient's data who were included in the study based on grading according to Wagner's scale were found to be Grade 0 – 7.7% Grade 1 – 30%, Grade 2 – 20.3%, Grade 3 20.3%, Grade 4 – 10.6%, Grade 5 – 10.6% were depicted in Figure 6. Total of 103 subjects were included in the study and percentage in stage-1 was 3.88%, stage-2 was 25.25%, stage-3 was 20.38%, stage-4 was 22.33%, stage-5 was 17.47%, stage-6 was 10.67%. Higher numbers of patients were under stage-2 represented in Figure 7.

Among 103 subjects under study, the percentage in category-0 was 3.88%, category-1 was 49.51%, category-2 was 18.44%, category-3 was 28.15% and highest number of patients were under category-1 represented in Figure 8. Among 103 subjects under study and highest number of patients fall under the moderate numbness & among 103 subjects under study highest type of dressing used was saline dress were represented in Figure 9 & Figure 10 respectively.

Among 103 subjects under study, patients with glucose level below 200mg/dl were found to be high

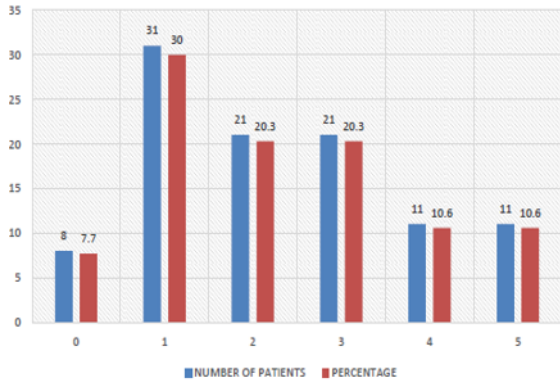


Figure 6: Distribution of Subjects Based on Grading {Wagner Scale}

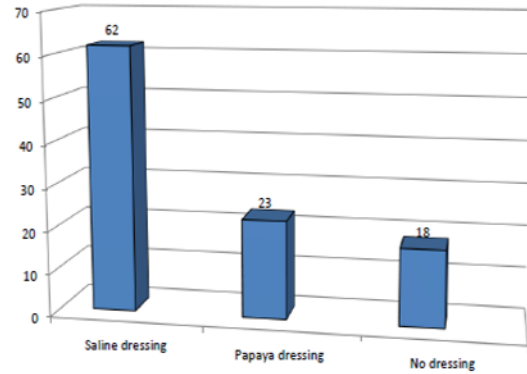


Figure 10: Distribution Based on Type of Dressing

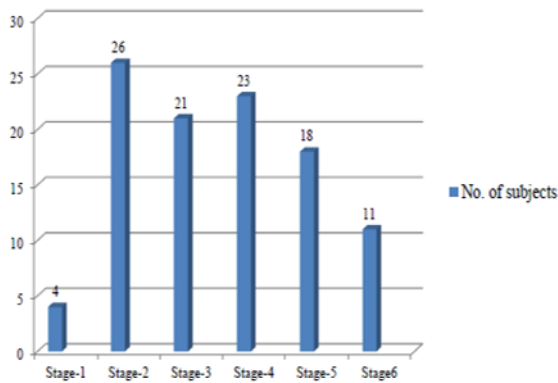


Figure 7: Distribution of Subjects Based on Staging

represented in Figure 11. Among 103 patients there are 12 high risk patients which are divided based on wound grade severity. The results found to be 66.6% of complications and co-morbidities, 16.6% of trauma & co-morbidities, 8.3% of only DM and 8.3% of only trauma represented in Figure 12. Among the subjects under study highest num of patients with high risk of severity falls under grade 1 (47.6%) which are trauma and co-morbidities group, and follows with only trauma (45.4%) in grade 2. Most of the patients fall under grade-3 wound severity, in that the patients are more in only co-morbidities (21.5%) represented in Figure 13.

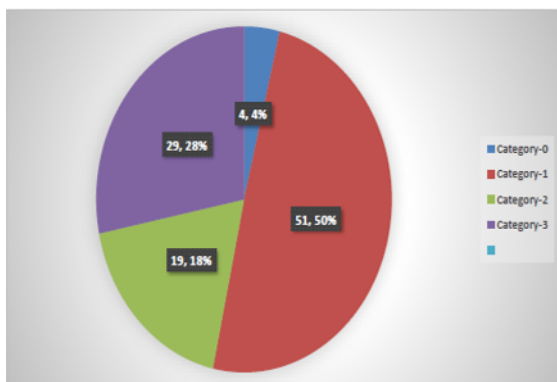


Figure 8: Distribution Based on Risk Category

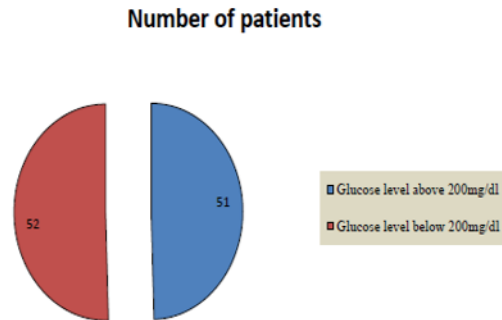


Figure 11: Distribution Based on GRBS Levels

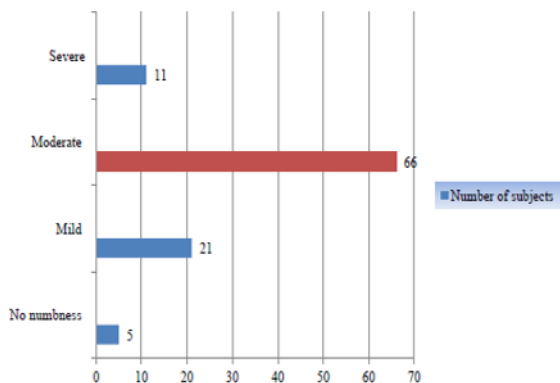


Figure 9: Distribution Based on Numbness

DISCUSSION

In our study of subject size 103 patients, pain (88.34%), swelling (75.72%) and redness (74.75%) were the majorly observed symptoms, which is similar to a study conducted by Saneh Khunkaew et al. of sample size 12 which states that presence of pain and high levels of C –Reactive Protein is observed which indicates inflammation [4]. In our study with subject size of 103, 55.33% of the patients have hypertension as co-morbidity which is most observed comorbidity, similarly a study conducted by Khalid Al-Rubeaan et al. at sample size of

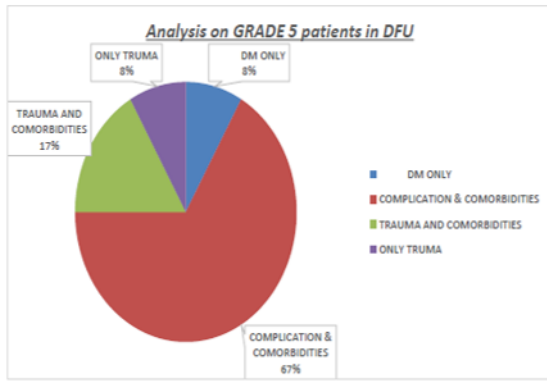


Figure 12: Distribution Based on Grade 5 Patients in DFU

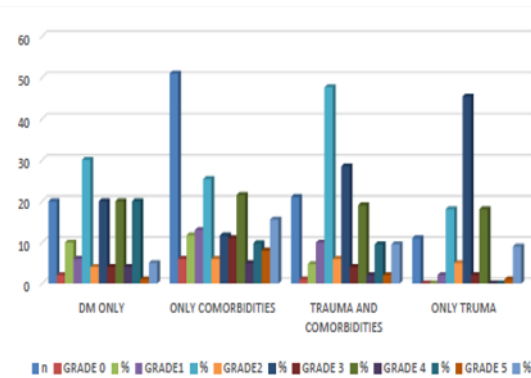


Figure 13: Distribution Based on Severity, Comorbidities and Trauma in DFU

62681 of which 46.90% patients have hypertension as comorbidity which is one of the major contributing factor in DFU [5].

In our study of subject size 103, 56.3% of the patients are previously diagnosed DFU patients and 43.6% are newly diagnosed patients. In our study with subject size of 103 subjects, most number of patients fall under grade-1(30%), grade-2(20.3%), grade-3(20.3%), which states that patients mostly fall in moderate severity, which is similar to a study conducted by Andrew J. Boulton et al. in general population of US states that patients who fall under grade-1,2,3 will heal in a moderate time period [6]. In our study, with subject size of 103 subjects, most of the patients fall under stage-2 class of 25.24%. In our study with subject size of 103 subjects, patients with amputation falls under the grade-5(10.6%), which is similar to a study conducted by Yotsapon Thewjitcharoen et al. of a sample size of 290 patients, states that 26.9% have amputation [7].

In our study, with subject size of 103 subjects, most of the patients are under moderate numbness group of 64.07%. In our study with subject size of 103 subjects, papaya dressing (22.33%) and saline dressing (60.19%) are used which can be correlated to a com-

parative study conducted by Vasuki V et al. of subject size 100 in which 50 % are treated with papaya dressing and 50% are treated with saline dressing which states that Papaya dressing is a better enzymatic dressing agent which can be suggested when compared to wet to dry normal saline mechanical debridement. In our study with subject size of 103 subjects, patients with GRBS level below 200mg/dl were found to be slightly higher (50.48%) when compared to GRBS level above 200mg/dl (48.54%).

CONCLUSION

This study with sample size of 103 DFU patients, were assessed the contributing factors and wound severity by using Wagner-Meggitt classification system. After assessment of 103 patients, this study had concluded that, the contributing factors are HTN (Hypertension), trauma and uncontrolled hyperglycemia are the leading factors or risk factors for DFU. This study assessed and reported the types of dressing used in different severity grade patients; and used the Wagner-Meggitt classification system to find out the wound severity in order to give specific counselling points to the patient to progress the wound healing process and also, this study had taken the data from patients about GRBS (Glycemic index) to counsel their diabetic diet and even counseled about lifestyle modification.

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Conflict of Interest

The authors declare that there is no conflict of interest.

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