

Advantages of Metformin Therapy for Diabetic Foot Ulcer Prevention and Mitigation

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ABSTRACT

Introduction: Diabetes foot is one of the most common complications of diabetes. Metformin treatment may aid in lowering the prevalence of diabetic foot ulcers in diabetic patients.

Study objectives: The purpose of this study was to look into the prevalence of diabetic foot ulcers among diabetic patients attending out-patient, as well as the impact of metformin treatment on the development of diabetic foot ulcers.

Methodology: To collect data from diabetic patients' files, a retrospective design was used. Demographic variables such as gender and age were included in the study, as well as clinical variables such as diabetes duration, metformin treatment, and diabetic foot ulcer status. Data was gathered and entered into SPSS version 20 for analysis. Descriptive features of statistical analysis included frequency, percentage, mean, and standard deviation. Various statistical models, such as the Chi-square test, One Way Anova, and Pearson's correlation, were used to investigate the relationship between variables. If $p < 0.05$, the significance was accepted.

Results: The study included 62 diabetic patients with an average age of 56.9511.98 years. The males were 33 (53.2%), the duration of diabetes was 7.55.86 years, metformin was prescribed to approximately 66% of patients, the mean metformin dose was 1617.32649.49 mg, and the prevalence of DF was 8.1%. There were no significant relationships between DF and gender or metformin use ($p > 0.05$). Both the One-Way Anova Test and the correlation test revealed that DF was significantly related to DF.

Conclusion: The current study found that metformin treatment is significantly associated with metformin dose and could protect diabetic patients from developing DF.

KEYWORDS: Diabetic foot (DF), Diabetes, Metformin, Ulcer.

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INTRODUCTION

Diabetes is a group of metabolic diseases characterized by hyperglycemia and abnormal lipid metabolism, carbohydrates, and insulin resistance, and it is the leading cause of death in the world for noncommunicable diseases¹. Epidemiological studies revealed that approximately 382 million people worldwide were diagnosed with diabetes in 2013, with the number expected to rise to 592 million cases by 2020. worldwide². Diabetes is associated with a number of complications, including cardiovascular problems, vascular insufficiency, renal damage, retinopathy, and diabetic foot (DF). Diabetic patients' quality of life suffers as a result of these complications³ and healthcare systems are

overburdened⁴⁻⁷.

DF is regarded as one of the most serious diabetic complications, with significant financial and quality-of-life consequences. At the global level, DF is the leading cause of non-traumatic amputation^{4, 8}. The global prevalence of DF has been estimated to range between 4.4 and 10.5%⁹.

Diabetic foot lesions are a complicated matter that requires the presence of three factors: neuropathy, peripheral vascular disease, and infection¹⁰⁻¹¹.

Several studies have found that metformin reduces the risks of microvascular and macrovascular disease by lowering weight gain and hyperinsulinemia, improving endothelial function and fibrinolysis, and decreasing low-grade

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inflammation, oxidative stress, and glycation¹²⁻¹⁴.

Diabetes patients are more likely to require insulin treatment¹⁵. However, other studies in insulin-treated diabetic patients have shown that metformin has the potential to improve glycemic control, reduce insulin needs, and reduce weight gain¹⁶⁻¹⁸.

STUDY OBJECTIVES

To look into the prevalence of diabetic foot ulcers among diabetic patients who come to Medical Services for out-of-hours care, as well as the role of metformin treatment in the development of diabetic foot ulcers.

METHODOLOGY

A retrospective design was used to collect data from diabetic patients' files. The study sample included 62 diabetic patient files. Demographic variables such as gender and age were included in the study, as well as clinical variables such as

diabetes duration, metformin treatment, and diabetic foot ulcer status. Data was gathered and entered into SPSS version 20 for analysis. Descriptive features of statistical analysis included frequency, percentage, mean, and standard deviation. Various statistical models, such as the Chi-Square test, One Way Anova, and Pearson's correlation, were used to investigate the relationship between variables. If $p < 0.05$, the significance was accepted.

RESULTS

Characteristics of Study Participants

The study included 62 diabetic patients, according to the data in table (1). The average age was $56.95 \pm 11.98\%$. Males were found to be 33 (53.2%) of the time (Figure 1); the duration of diabetes was 7.5 ± 5.86 years; metformin use was documented in approximately 66% of diabetic patients (Figure 2); the mean metformin dose was 1617.32 ± 649.49 mg, and the prevalence of DF was 8.1%. (Figure 3).

Table 1. Characteristics of study participants

| Variable | Description |
|-----------------------------------|----------------|
| Age (M+SD) years | 56.95+11.98 |
| Gender (N, %): | |
| - Males | 33 (53.2%) |
| - Females | 29 (46.8%) |
| Duration of diabetes (M+SD) years | 7.5+5.86 |
| Metformin use (N, %): | |
| - Yes | 41 (66.1%) |
| - No | 21 (33.9%) |
| Metformin dose (M+SD) mg | 1617.32+649.49 |
| Diabetic foot (N, %): | |
| - Yes | 5 (8.1%) |
| - No | 57 (91.9%) |

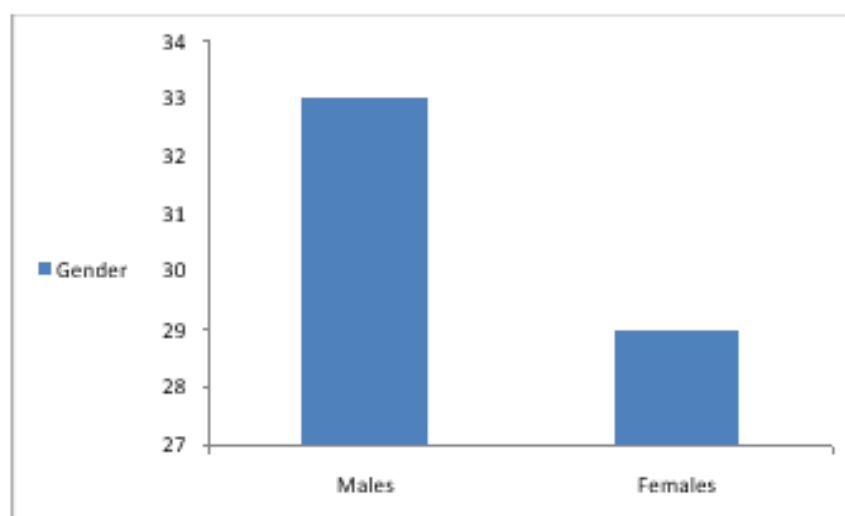


Figure 1: Frequency of diabetic patients by gender

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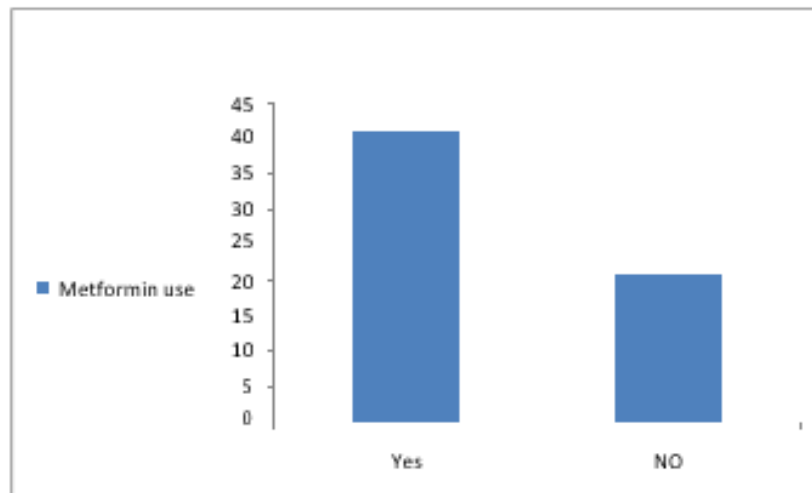


Figure 2: Frequency of diabetic patients by metformin use

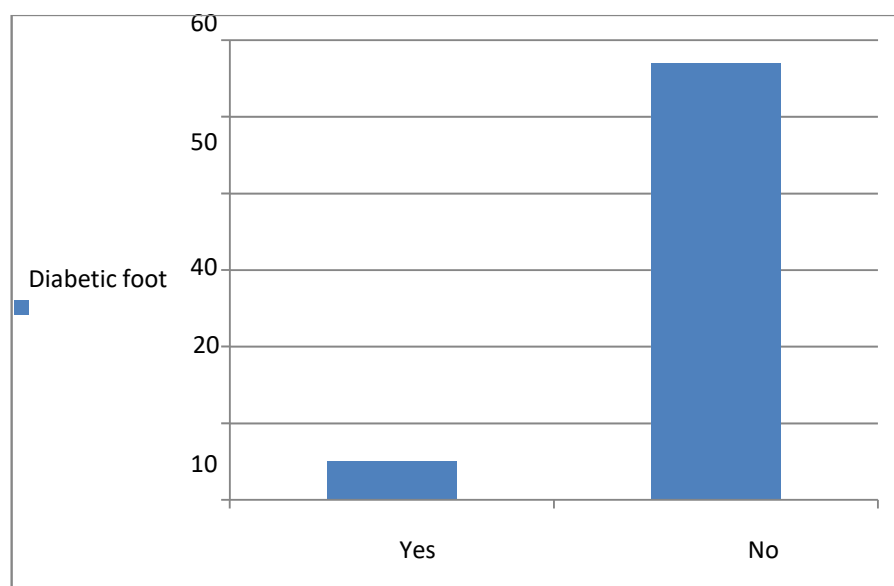


Figure 3. frequency of diabetic foot by diabetic patients

The Relationship Between DF and Study Variables

The Chi-Square test was used to examine the relationship between diabetic DF and study variables. The relationship between DF and gender was not statistically significant

($p=0.658$). The relationship between DF and metformin use was also investigated, but it was not statistically significant ($p=0.157$). Metformin was prescribed to all diabetic patients who developed DF, according to a trend (table 2).

Table 2. The relationship between diabetic foot and study variables (based on Chi-Square test)

| Variable | DF | | | | P value |
|-----------------------|-----|------|----|------|--------------|
| | Yes | | No | | |
| | N | % | N | % | |
| Gender: | | | | | 0.658 |
| - Males | 2 | 6.1 | 31 | 93.9 | |
| - Females | 3 | 10.3 | 26 | 89.7 | |
| Metformin use: | | | | | 0.157 |
| - Yes | 5 | 12.2 | 36 | 87.8 | |
| - No | 0 | 0 | 21 | 100 | |

Predictors of DF from Study Variables

The One-Way Anova Test was used to determine the

predictors of DF from study variables. Table 3 shows that there was no significant relationship between DF and any of

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the study variables ($p>0.05$), with the exception of metformin dose, which was significantly associated with DF ($p=0.05$).

Table 3. Predictors of DF from study variables

| | | Sum of Squares | df | Mean Square | F | Sig. |
|----------------|----------------|----------------|----|-------------|-------|-------|
| Age | Between Groups | 8.476 | 1 | 8.476 | 0.058 | 0.810 |
| | Within Groups | 8740.379 | 60 | 145.673 | | |
| | Total | 8748.855 | 61 | | | |
| Gender | Between Groups | .095 | 1 | .095 | 0.372 | 0.544 |
| | Within Groups | 15.340 | 60 | .256 | | |
| | Total | 15.435 | 61 | | | |
| Duration | Between Groups | 100.183 | 1 | 100.183 | 3.013 | 0.088 |
| | Within Groups | 1995.063 | 60 | 33.251 | | |
| | Total | 2095.246 | 61 | | | |
| Metformin use | Between Groups | .624 | 1 | .624 | 2.823 | 0.098 |
| | Within Groups | 13.263 | 60 | .221 | | |
| | Total | 13.887 | 61 | | | |
| Metformin dose | Between Groups | 1829015.134 | 1 | 1829015.134 | 4.085 | 0.050 |
| | Within Groups | 17463789.744 | 39 | 447789.481 | | |
| | Total | 19292804.878 | 40 | | | |

Correlation between study variables

When the study variables were correlated, the only significant correlation was found between DF and metformin dose ($p=0.308$).

Table 4. Correlation between DF and study variables

| Variable | | DF | Age | Gender | Duration | Metformin use | Metformin dose |
|----------|---------------------|----|-------|--------|----------|---------------|----------------|
| DF | Pearson Correlation | 1 | 0.031 | 0.079 | 0.219 | 0.212 | 0.308 |
| | Sig. (2-tailed) | | 0.810 | 0.544 | 0.088 | 0.098 | 0.050 |
| | N | 62 | 62 | 62 | 62 | 62 | 41 |

DISCUSSION

The purpose of this study was to determine the prevalence of DF in diabetic patients and to look into the role of metformin treatment in the development of diabetic foot ulcers.

According to the findings of this study, the prevalence of DF was 8.1%. This finding is consistent with other studies that found DF prevalence ranging from 4.4 to 10.5%⁹. Due to the fact that diabetes is becoming more common over time, as well as the effects of DF on economic and quality of life^{4, 8}, Controlling diabetes is critical for mitigating these effects.

The findings of this study revealed that DF was significantly related to metformin dose ($p=0.05$). This finding is consistent with other published studies. These studies focused on the mechanisms by which metformin reduces the risks of microvascular and macrovascular disease, such as lowering weight gain and hyperinsulinemia, improving endothelial

function and fibrinolysis, and lowering low-grade inflammation, oxidative stress, and glycation¹²⁻¹⁴.

Other studies have shown that metformin treatment can improve glycemic control, reduce insulin needs, and reduce weight gain¹⁶⁻¹⁸

CONCLUSIONS

The current study found that metformin treatment is significantly associated with metformin dose and may help diabetic patients avoid developing DF.

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