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## ORIGINAL PAPER

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# Predictive Role of Preventive Measures in Preventing the Progression of Diabetic Foot

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**ABSTRACT**

**Introduction:** Diabetes mellitus (DM) is one of the most common endocrine disease of modern life. Diabetic foot (DF) is the term for a foot of a patient suffering from DM with the potential risk of a number of pathological sequels, including infection, ulceration and/or destruction of deep tissue. **Goal:** To determine the importance of preventive measures to prevent the development of diabetic foot. **Results:** The gender structure of respondents categorized by the complication of DF (yes/no) was uniform. The average age was  $60.15 \pm 12.2$  years. Respondents without DF, 63% had 2 visits to the doctor a month, while in the group of those with DF, 39% of them had 3 visits to a doctor and 33% four or more times. Wearing comfortable shoes and foot hygiene in relation to the development of the DF are interdependent:  $\chi^2=4,409$ ;  $\chi^2 = 12,47$  ( $p < 0.0005$ ). Also, recurrent foot injury, and slow healing of sores in comparison to the development of the DF are mutually dependent;  $\chi^2=13,195$ ;  $\chi^2=14$  ( $p < 0.0005$ ). **Conclusion:** We found that there is a significant statistical relationship between preventive measures and development of the DF. **Key words:** diabetic foot, preventive measures.

**1. INTRODUCTION**

Diabetes mellitus (DM) is the most common metabolic disorder and certainly one of the most common endocrine diseases of modern life. The disease is a chronic flow, incurable and lasts until the end of life. It is anticipated that in the period from 2000 to 2030, the number of people currently affected from 171 million will increase to 366 million (1,2). Several pathogenetic processes are involved in the development of DM. Ranked from the autoimmune destruction of pancreatic beta-cells with consecutive insulin deficiency to abnormalities that result in insulin resistance activation (3).

As defined by the World Health Organization, Diabetic foot (DF) is a term for foot of a patient with DM with the potential risk of a number of pathological consequences including infection, ulceration and/or destruction of deep tissue associated with neurological abnormalities, varying degrees of peripheral vascular disease and/or metabolic complications of DM in the lower limb (4, 5).

DF is a major public health problem in countries around the world (Figure 1). The success of treatment or the quality and effectiveness of the measures taken is estimated by the number of amputations. Since the number of amputation in patients with DF is increasing, the fact of the insufficient progress of the treatment, whereby we increase the rate of disability, morbidity, and can be justified to say and mortality (6).

**2. MATERIAL AND METHODS**

A total of 40 patients of both sexes, adult population, treated in Travnik Cantonal Hospital and Primary Health Care Centre Gornji Vakuf-Uskoplje was evaluated in the period from January 1, 2011 to December 31, 2013. This is a retrospective-prospective clinical study. Data were obtained from the history of disease as well as from outpatient findings. We analyzed:



Figure 1. Diabetic foot-chronic ulcer (Archives of the PHCC Gornji Vakuf)

demographic characteristics (age, gender); anamnesis and clinical parameters (A insight on the number of monthly visits to a doctor, the nurturing feet–to wear comfortable shoes, hygiene foot injury, speeds wound healing.

**3. RESULTS**

Gender structure of the respondents, categorized according to the complication of DF (yes/no) was uniform,  $c^2 = 0.004$  ( $p=0.949$ ). The average age was  $60.15 \pm 12.2$  years. Patients with DF had average age of  $56 \pm 13.6$  years, patients without DF complications are on average older  $64 \pm 9.09$  years, but this difference was not statistically significant (Figure 2).

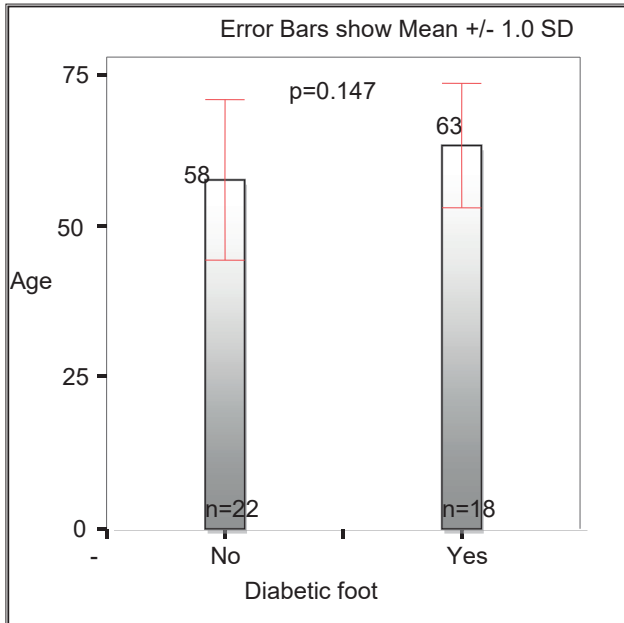


Figure 2. Age structure of the patients compared to patients with/without DF

Respondents without DS, 63% had 2 visits to the doctor a month, while in the group of those with DS, 39% of those with DS, had 3 visits to doctor a month and 33% four or more times (Figure 3).

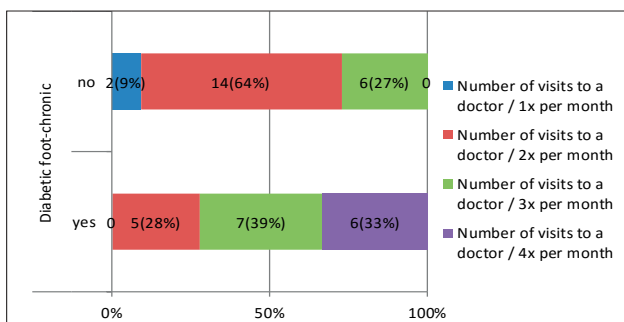


Figure 3. Number of visits to a doctor per month

Comfortable shoes and DF development are interdependent,  $c^2 = 4.409$  ( $p=0.036$ ). Odds ratio to develop the DF is 0.18, or 18% higher if not wearing comfortable shoes (Figure 4).

Hygiene of the feet and DF development are interdependent,  $c^2=12.47$  ( $p<0.0005$ ). Odds ratio to develop the DF is 0.04, or 4% higher in case of inadequate foot hygiene in diabetic patients. From baseline 94.4% of those with DF do not implement adequate hygiene, and only 5.6% of them implemented. In the group of patients without DF, this ratio is closer or 41% who have not implemented and 59% who conducts foot hygiene (Figure 5).

Frequent foot injury and the development of the DF are

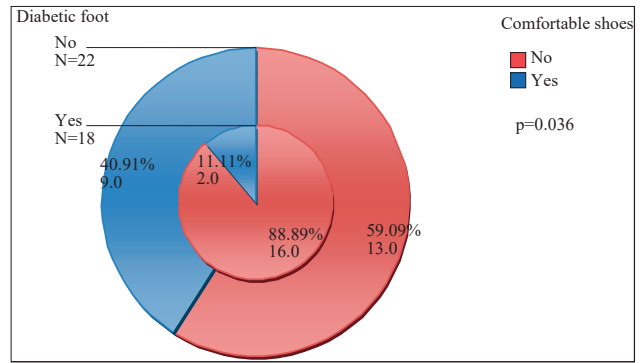


Figure 4. Wearing comfortable shoes compared to those who have or not DF.

interdependent,  $c^2 = 13.195$  ( $p<0.0005$ ). Odds ratio is 17.1 or 89% of diabetics with DF have frequent injuries of the foot, as opposed to 31% of diabetics without DF.

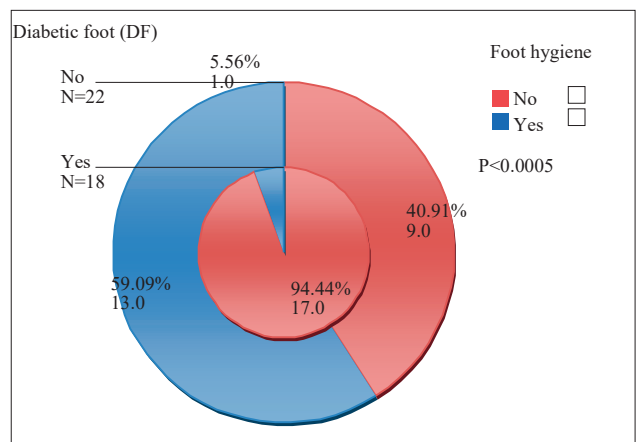


Figure 5. Hygiene of the feet of respondents with respect to those who have or not DF

Slow healing of sores and development of the DF are interdependent,  $c^2=14$  ( $p<0.0005$ ). Odds ratio was 17.0 while the 95% confidence interval = 3.0 to 83.0. That is, 17 times higher chance to get a DF if wounds heal more slowly in patients with diabetes type I. In 83% of respondents with DF sores on the foot heal slowly. From baseline 22% of respondents without DF suffer from slow healing of sores. In 89% of those with DF are present also frequent infections, while only 2% of respondents without DF have problems with infections. Swelling of the feet, as a clinical parameter and the development of the DF are interdependent,  $c^2=19.46$ ,  $p<0.0005$ . Odds ratio is 35, that is, 35 times higher chance for DF development if swelling of the feet is present.

**4. DISCUSSION**

According to Ramsey and associates who presented the results of the demographic characteristics of the patients with DM complications, 52% were male. Other studies have also shown that there is little difference in gender distribution (7, 8, 9). In our study, 55% were males. The gender structure of respondents categorized by the complication of DF is also uniform  $c^2=0.004$ ;  $p=0.949$ . Our study showed that the mean age of the respondents is  $60.15 \pm 12.2$  years. Therefore, the results correlate with other authors. Age over 60 years is the most common factor in terms of developing the DF as a complication of diabetes (8, 10). The study by Hasnain and associates, educational measures on the prevention of the development of the DF are represented as:

knowledge (good, fair and poor) and practice (good, satisfactory, and poor). Education of respondents had a significant statistical association with knowledge ( $p < 0.001$ ) and practice ( $p < 0.001$ ) in comparison to foot care. Other authors have obtained similar results (11, 12, 13). A patient suffering from diabetic neuropathy can develop severe ulcers on the foot after only a few hours of wearing inappropriate, stiff and tight shoes. Fashion trends are actually still enemies of DF. According to Klobučar, optimum footwear for that foot must be made of natural materials, soft and spacious. The inlay in the shoe must be set according to the size of the foot. In certain cases, it is necessary special modeling and making shoes to foot deformity (14). Our respondents according to the results of the statistics were 18 times more likely to develop the DF if they do not wear comfortable shoes. From total sample 88.9% of those with DS do not wear comfortable shoes. The second parameter, foot hygiene in relation to the development of diabetic foot showed statistical significance ( $p < 0.0005$ ). According to IDSA protocols from 2012, clinicians should consider the possibility of infection development in each foot injury of patients with diabetes (15). Our results suggest that frequent infections and the development of diabetic foot are mutually dependent ( $p < 0.0005$ ). Odds ratio to develop the DF is 21, that is, the greater the chance to develop a DF if frequent infections in diabetic patients are present. Thus, the results correspond to a number of other studies, and therefore subject to protocols for managing and treatment of infection (16).

## 5. CONCLUSION

According to a large Spanish study, Alfonso and associates who have tested the effectiveness of prophylactic measures to reduce the incidence of DF in the period between 1993 and 1996 found that screening program has a high efficiency in the detection of patients at high risk of DF. The intervention program is based on a continuous and well-organized training and reduced the incidence of DF to 22.7% in Spain. Given that our country is fragmented into several smaller units that do not have a common program for the prevention and monitoring of patients with increased risk of DF development, in the perspective remains as a challenge to work on such a project (13). We found that there is a significant statistical relationship between preventive measures and development of the DF.

CONFLICT OF INTEREST: NONE DECLARED.

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