Diabetic Foot Syndrome Prophylaxis is Inadequate due to Deficient Relevant Patient Knowledge, Inappropriate Foot Care Practices, and Inadequately Conducted Preventive Measures

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Abstract

The prevention of the diabetic foot syndrome is inadequate. Prophylactic measures are not consistently practiced. An awareness of the problem through the patient have to be reached.

Keywords: Diabetes; Diabetic foot syndrome; Footware; Foot care; Patient knowledge

Introduction

Diabetic foot syndrome (DFS) is a serious disease caused by diabetes mellitus. It frequently leads to non-traumatic amputations which go along with high mortality levels, high medical costs, and loss of the quality of life [1]. 6.5% of the type 2 diabetes patients in Germany have a diabetic foot syndrome. Other risk factors resulting in the development of diabetic foot syndrome have a higher prevalence. These are, for example, diabetic neuropathy with 30% prevalence and peripheral vascular disease with 25% prevalence [2]. Thus the prevention and the recurrent prophylaxis of diabetic foot syndrome is of great meaning. In addition to the above noted endogenous risk factors, exogenic factors such as inappropriate footwear play decisive roles [3-5]. According to the International Consensus on Diabetic Foot (1999) the prevalence of diabetic foot syndrome can be decreased by regularly inspecting the feet and the footwear, by educating patients, family members, and health care employees, and by also wearing appropriate footwear. Patient education on how to self-inspect feet is an important and effective intervention method that must be documented as well as evaluated [6,7].

Interdisciplinary supervision is necessary for the treatment of diabetic foot patients [8,9]. National treatment guidelines, disease management programs, and structured patient education programs have long been established, but most diabetes patients do not know that they must actively participate in promoting the well-being of their feet. Effective foot prevention assumes that patients at risk are identified at an early stage and that they receive long-lasting education. Furthermore, it assumes that a tight control over the risk factors and indicators are implemented [10].

The patient’s own level of competence and feeling of responsibility must be promoted as part of patient education. It is necessary that the patients learn to consciously be aware of their feet in spite of the loss of feeling in their feet [11]. If diabetes patients have an adequate understanding for the need to care for their feet, then the rate of diabetic foot prevalence would be much lower [12].

Numerous studies show the importance of regular foot and shoe inspection in regards to the prevention of diabetic foot syndrome [13-16]. But only few studies show the patients’ levels of problem awareness and levels of understanding as well as which preventive measures they should apply. The aim of the study was to ascertain what the patients are doing incorrectly in regards to their foot care. Diabetes patients were questioned in regards to their knowledge level pertaining to the prevention of diabetic foot syndrome and about their personal behavioral activities in regards to this purpose.

Methods

Interview locality and time frame

During the period between January and July, 2008 randomly selected diabetes patients at the Red Cross Hospital in Kassel, Germany were questioned in regards to their knowledge of diabetic foot prevention, foot care measures, the frequency of and the content of their medical examinations. The interviewer informed the patients about the study and obtained permission from them to use their data. The patients were told that their participation would have no influence on the personal treatment process for their disease. The questions and answer categories were read in the same order to all of the patients and the answers were directly noted there after on the questionnaire. The data acquisition remained strictly anonymous. Ethics committee approval was not needed.

Questionnaire

The plan was to compare two groups of patients; a representative study was not intended. The two groups were patient with all manifest diabetes type 1 or type 2 and diabetic foot syndrome classified in Wagner stadium 0 without current lesions or patient with diabetic foot syndrome classified in Wagner stadium 1-5 with current lesions. A minimum of 40 persons per group were to be questioned in consideration of statistical, resource and time factors.

The questionnaire included 20 questions of which most had several items.

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Classifications

It is of utmost importance that diabetes patients wear the correct footwear, use the proper foot care products, and follow adequate hygienic foot care practices. These are such that they protect the foot as much as is possible from any form of damage.

Footwear, foot care products and hygienic foot care are to be classified as either appropriate or inappropriate.

Appropriate is: closed, amply wide shoe with a firm sole that leaves plenty of room for the foot and does not offer any pressure for inside as well as outside of the home; Emory board for shortening the nails, a pumice stone for removing calluses, and a moisturizing cream such as a cream containing urea;

Inappropriate is: shoes with pre-formed sole beds, sneakers, sandals, flip-flops, rubber boots, and shoes with straps, thongs or hard front caps; walking barefoot or in socks; scissors, nail clippers, callosity planes, corn parers, and clarus or corn plasters, soap, and all skin creams containing the ingredient keratol; daily showering followed by an inspection of the feet including a closer look between the toes; taking footbaths and the usage of soap

Analysis

A descriptive analysis was performed. A confidence interval of 95% was calculated. The prevalence of the categorical features of the groups were compared using the chi2-Test. The associative features in the groups were also calculated using the chi2-Test. The frequency of ordinal variables in the groups was calculated using the Wilcoxon Test for non-parametrical distribution. The correlation between the ordinal variables was calculated according to the Spearman-Correlation. All analyses were made using the statistical program SAS version 9.2.

Results

The collected patient characteristics are summarized in table 1. The groups show no significant difference in regards to the number of patients older than 65, the most recent HbA1C values, and the number of patients being treated with insulin. There is no variance in the duration that the patients have had diabetes. Patients in the Wagner 1-5 group are significantly more often male than female.

31.2% of the questioned patients did not know if they had diabetic polyneuropathy (DPN) or peripheral vascular disease (PVD) in their legs or feet. 25% of the patients having a classification of Wagner 1-5 group did not know if they had polyneuropathy and/or if they had peripheral vascular disease. Furthermore, 35% of the patients did not know that the podiatrist profession existed.

20% of the questioned (n=90) answered that they wore shoes with a firm sole. But, 48% stated that they also wore open shoes, for example sandals or flip-flops. Furthermore, 15% of the interviewed patients said that they wore shoes with a pre-formed foot bed. An analysis of the Wagner 0 group showed that 86% (n=50) wore sneakers, sandals, flip-flops, shoes with pre-formed foot beds, or rubber boots (Figure 1,2).

12.5% of the Wagner 1-5 group walked barefoot or in socks at home. Approximately half of the Wagner 0 group (n=53) wore appropriate slippers (for example, slippers with a firm sole or special shoes for diabetes patients). Only 25% of the Wagner 1-5 group (n=40) wore
Figure 2: Frequency with which patients wore appropriate and inappropriate shoes outside of home.

Figure 3: Shoes of the interviewed diabetes patients for using inside of home.

Figure 4: Frequency with which patients wore appropriate and inappropriate shoes outside house.
appropriate shoes (p=0.0069). Figures 3 and 4 portray the frequency with which patients wore slippers.

78% of the interviewed patients (n=92) reported that they performed hygienic foot care measures which were inappropriate such as footbaths or the usage of soap. The comparison between the Wagner 0 and the Wagner 1-5 groups was not significant. 45% of the Wagner 1-5 group had never been to a podiatrist.

22.4% of those questioned (n=85) used inappropriate objects for the care of their feet. The difference between the Wagner 0 group of patients and the Wagner 1-5 group in regards to the usage of appropriate products was not significant (p= 0.110).

40% of the Wagner 1-5 group (n=40) stated that they had never had a foot examination at a doctor’s office. This circumstance was significant when compared to the Wagner 0 group (p=0.011). Furthermore, 75% of all those questioned (n=92) stated that their doctor had never inspected their shoes and socks. 15% of the Wagner 1-5 group had never undergone a tuning fork examination.

Decisive risk factors having a negative influence on the development of diabetic foot syndrome (Odds Ratio, 95% CI; adjusted according to the age of the patient, the duration of the diabetes, the most recent HbA1c value) were: male gender (OR: 3.14; CI: 1.33-7.44), wounds caused by inappropriate foot care (OR: 3.38; CI: 1.05-10.97), and the lack of foot controls by the general practitioner (OR: 4.20; CI: 1.51-11.67)

Positive factors that explicitly avert a diabetic foot syndrome were: professional foot care by podiatrists (OR: 0.05; CI: 0.01-0.23) and daily self-inspection of the feet (OR: 0.28; CI: 0.10-0.75). Equally positive was the usage of the following foot care measures: pumice stone usage for the care of calluses (OR: 0.37; CI: 0.14-0.99), the usage of Emory boards to shorten toenails (OR: 0.29; CI: 0.09-0.98), and the application of foot cream containing urea (OR: 0.15; CI: 0.005-0.42). In addition, the wearing of appropriate shoes and slippers (OR: 0.20; CI: 0.08-0.50) had a favorable influence in regards to determing the development of diabetic foot syndrome (Table 2).

Discussion

A total of 93 patients were questioned during the survey time frame. In spite of the small number of patients questioned, a clear tendency is to be noted and shows that the patients have a wide range of cognitive recognition and self-appraisal in regards to diabetic foot syndrome. The perception of symptoms and risk factors and that a problem awareness is realized are of extraordinary importance for the prevention and the treatment success of diabetic foot syndrome. In educational settings diabetes patients are taught which footwear they should wear. The conviction to also wear such shoes is often difficult to achieve because due to neuropathic developments patients no longer perceive that their former footwear no longer fits. By full understanding his foot problems and by regularly undergoing professional foot controls and/or through the self-inspection of his feet, the patient needs to compensate for his missing sensory capabilities.

Several studies clearly conclude that in 30% to 50% of the cases the footwear is the main trigger for an initial lesion [13]. Many patients wear shoes that are too tight because due to an existent polyneuropathy they lack the sensory capability to perceive that their feet are not comfortable in their shoes which are too tight [3]. Furthermore, certain types of footwear are dangerous for the neuropathic foot. These are, for example, shoes having pre-formed cork foot beds with toe grips or leather bands between the first and second toes. Shoes with straps or caps in the front or, in other words, shoes that exert local pressure are not suitable for the polyneuropathic foot. Furthermore, shoes with straps or caps in the front are not appropriate for the neuropathic foot since they may exert pressure on the foot.

48% of those questioned in our survey stated that they wore open shoes such as sandals or flip-flops. The probability of damage is very high in open shoes. If the neuropathic foot does not sense an injury, an ulcer can develop which can then develop gangrene.15% of the patients wore shoes with pre-formed foot beds. Such foot beds usually do not fit the deformed foot of the patient properly. The toe grips do not fit to the anatomy of the foot and thus can cause skin lesions or blisters through shear force. Shoes worn by the patients can be classified as either being appropriate or inappropriate. Appropriate shoes for diabetic patient are wide enough shoes with a firm sole. All other shoes, such as sandals or flip-flops, sneakers with a soft sole, rubber boots and, above all, shoes with a pre-formed foot bed are inappropriate for diabetic patient.

Footwear for the home should be the same as that recommended for wear outside of the home [4,17]. Here, too, proper shoes must have a firm sole. Once more, shoes with pre-formed foot beds are inappropriate. Furthermore, slippers, flip flops, the wearing of socks, or walking barefoot is also adverse for diabetes patients because the probability of injury is very high.

12.5% of the patients with foot lesions walked with bare feet or wore only socks. And, 32% of the patients wore slippers. The risk of injury in the home due to inappropriate footwear is high.

In a study of 51 patients (of which 48 had a previous foot ulcer) it could be proven that regular professional foot care treatments not only resulted in fewer recurrences but also reduced the treatment

<table>
<thead>
<tr>
<th>Items</th>
<th>Odds Ratio*</th>
<th>p-Value</th>
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<tr>
<td>Gender male</td>
<td>3.14</td>
<td>[1.33-7.44]</td>
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<tr>
<td>Not-Professional fort controls</td>
<td>4.20</td>
<td>[1.51-11.67]</td>
</tr>
<tr>
<td>Wounds caused through irregular foot care</td>
<td>3.38</td>
<td>[1.05-10.86]</td>
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<tr>
<td>Professional foot care by a podiatrist</td>
<td>0.05</td>
<td>[0.01-0.23]</td>
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<tr>
<td>Daily self- inspection of the feet</td>
<td>0.28</td>
<td>[0.10-0.75]</td>
</tr>
<tr>
<td>Foot care: Crème containing urea</td>
<td>0.15</td>
<td>[0.05-0.42]</td>
</tr>
<tr>
<td>To wear appropriate slippers</td>
<td>0.20</td>
<td>[0.08-0.50]</td>
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<tr>
<td>Foot care: Pumice Stone</td>
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<tr>
<td>Foot care: Emory board</td>
<td>0.29</td>
<td>[0.09-0.98]</td>
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*Odds Ratio, adjusted according to the age of the patient, the duration of the diabetes, the most recent HbA1c value

Table 2: Risk factors for the development of diabetic foot syndrome.
costs for foot problems [6]. Patients in this study received monthly foot care treatments administered by a specially trained therapist. These patients, who also concurrently wore protective foot wear, had an 8% rate yearly of foot ulcer recurrence. Instead of the previously 30 patients, only 7 patients needed to be hospitalized because of foot complications. Before the professional foot care treatments began, 30% of the 51 had performed their foot care their own. Half of these patients had occasionally damaged their feet. The implementation of these correct measures resulted in a cost reduction of 80% [6].

In a further study of diabetes patients older than 75 years of age, only 14% were capable of inspecting the soles of their feet and more than 50% had difficulties taking care of their toenails. Thus, older patients who performed their foot care on their own had a higher risk of damaging their feet [18].

It must be differentiated between appropriate and inappropriate care products for the feet of diabetes patients. Inappropriate objects are such that can more readily cause damage the foot such as scissors, nail clippers or callus planes. Corn plasters and common creams are inappropriate for the feet of diabetes patients because products with keratol ingredients can harm the skin and thus cause lesions. The extremely dry foot skin of diabetes patients suffering from neuropathy should be treated with moisturizing creams and/or products containing urea.

Hygienic measures can also be classified as either appropriate or inappropriate measures. Footbaths and usage of soap are inappropriate measures. Daily showering followed by an inspection of the feet which includes a closer look between the toes are appropriate measures.

Up to 28% of those questioned in our study used nail scissors or nail clippers when caring for their toenails and thus had an increased risk of injury. 40% of the surveyed did not inspect their feet daily. 78% of the patients used inappropriate hygienic measures.

Only rarely do diabetes patients seek out professional foot care and podiatrist support. 58.3% of 230 diabetes patients in a cross section study already had extensive nail and foot mycoses upon their first visit to a podiatrist. As many as 89% of the total patients had deformed feet and scored below 4/8 on the tuning fork test [19].

35% of those surveyed for the current study were unfamiliar with the podiatrist profession. It must be noted that of these, 37.5% had received a non-specialized foot care treatments. Diabetes patients should only be treated by podiatrists who have been explicitly educated for this. 45% of the surveyed patients with current foot lesions had never been in podiatric treatment (p=0.0001). Females visited a podiatrist significantly (p=0.0295) more frequently than males. Only 13% of the females had never been to a podiatrist whereas 32% of the males had never been to a podiatrist. As to how professional care may influence the incidence of the diabetic foot syndrome need be researched in further studies.

Conclusion

The information gained through this study reveals that diabetes patients do not have adequate knowledge concerning the prevention of the diabetic foot syndrome. Prophylactic measures such as professional foot care and the wearing of appropriate shoes, as well as having the patient, his caring relative, or his doctor routinely inspect the patient’s feet, socks and shoes are not consistently practiced. Effective diabetic foot syndrome prevention can only be reached if the patient attains an awareness of the problem through ample access to information and practical training. In addition, doctors and specialized personnel need to educate the patients and to regularly inspect their feet.

References