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ORIGINAL ARTICLE

DIABETIC FOOT SYNDROME: AN ANALYSIS OF THE CAUSES, HEALTH AND SOCIAL BACKGROUND OF PATIENTS

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Abstract

Diabetic foot syndrome is defined as ulceration or foot tissue deterioration in diabetics.

It is a serious problem, especially regarding the length and costs of treatment, the high risk of amputation and social and economic liability.

The goal of the study was to find the cause of diabetic foot syndrome in inpatients of the Department of Surgery in České Budějovice hospital and to assess the health and social background of patients.

The results were acquired using a secondary data analysis of medical records as well as by a qualitative research using the open question method, which contained a question on the cause of the diabetic foot wound.

The patients were hospitalized at the Department of Surgery in České Budějovice hospital in 2012, 2013, 2014 and 2015 with a diabetic foot diagnosis. The sample group contained of 277 patients (201 men – 73% and 76 women – 27%).

Patients with the highest risk of diabetic foot syndrome are men between 61 and 70 years, men living in the countryside, married men or pensioners. Most patients caused the injury by wearing the wrong type of shoes, walking barefoot, wrong nail treatment, having hard skin, and not treating mycosis and cracks. 34% of patients do not know the cause of the ulceration. Most patients have lived with diabetes for less than 10 years (15 years on average).

It is possible to prevent a number of ulcerations by following recommended procedures.

Keywords: *diabetic foot syndrome; health and social background; diabetic foot cause; limb amputation*

INTRODUCTION

According to the WHO, diabetic foot syndrome is defined as an ulceration or deterioration of foot tissue in diabetics. It is associated with neuropathy, various degrees of the lower limb ischemic disease and infections (Jirkovská et al. 2006).

It is a serious medical, social and economic problem, especially due to the number of incidences, length and costs of treatment and the high risk of amputation.

According to the data from the Institute of Health Information and Statistics of the Czech Republic, 861 647 patients were treated for diabetes in 2013. 44 657

patients suffered from diabetic foot and 11 168 underwent amputation (Zvolský 2013).

The diabetic foot international working group states that more than a million amputations a year are carried out globally (Foster and Lauver 2014).

The causes of diabetic foot contain a number of factors. These are hyperglycaemia, diabetic microangiopathy, and specific changes in capillaries and atherosclerosis, which occur twice or four times more frequently in diabetics than non-diabetics (Piťhová 2009).

The most interesting factor of diabetic foot syndrome is diabetic neuropathy. This is a damage of the peripheral motor, sensation and vegetative nerve function and structure. The most frequent symptom of sensory neuropathy is paresthesia – a burning, shooting, stabbing foot pain. Diabetics stop perceiving the pain, stop having the feeling of hot and cold and vibrations and they do not pay attention to their feet, which is the reason why they do not treat small wounds in time (Rušavý 1998).

Education is a necessary part of diabetic treatment. The main goal is the improvement of a patient's health condition, diabetes compensation and the quality of life. The education of diabetics includes diabetic foot prevention. The recommended preventatives are daily feet check-ups, wearing the right footwear, avoiding barefoot walks, and thorough foot hygiene that includes ointments and professional pedicures (Výbor České diabetologické společnosti 2012a, b, c).

The goal of the study was to find the cause of diabetic foot wounds in patients hospitalized at the Surgery department of the České Budějovice Hospital and to assess their health and social background.

MATERIALS AND METHODS

The study worked with patients with diabetic foot syndrome hospitalized at the Surgery department of the České Budějovice Hospital between 2012 and 2015. There were 277 patients (201 men – 73% and 76 women – 27%).

The research was carried out using retrospective data collection from medical records and by asking the open question: *"How did the foot wound occur?"*

All patients signed the agreement to give permission for the use of their medical records for study and scientific purposes.

RESULTS

Between 2012 and 2015, the Surgery department of the České Budějovice Hospital had a total of 277 inpatients with diabetic foot syndrome (201 men – 73%, and 76 women – 27%). Eighteen patients were hospitalized over the course of 2 years. If there were multiple hospitalizations, the data from the last hospitalization was used.

The youngest patient was a 26-year-old woman and the oldest was a 92-year-old woman. The largest group included patients between 61 and 70 years (36%) (Table 1).

Table 1 – Sample group by age

Age	up to 50	51–60	61–70	71–80	81–90	91 and higher
Men	10 (5%)	48 (24%)	75 (37%)	41 (20%)	26 (13%)	1 (1%)
Women	2 (3%)	10 (13%)	26 (35%)	25 (32%)	12 (16%)	1 (1%)
Total	12 (4%)	58 (21%)	101 (36%)	66 (24%)	38 (14%)	2 (1%)

A total of 26 patients (9%) had Type 1 Diabetes and the other 251 (91%) had Type 2 Diabetes. Most patients in our sample group had suffered from Diabetes mellitus for up to 10 years (the average was 15 years). 8 patients were diagnosed with Diabetes mellitus after the incidence of the diabetic foot syndrome (Table 2).

A long treatment of diabetic foot syndrome is quite common. The average hospitalization length of patients in our sample group was 34 days. This differed when patients who were hospitalized for a short period (up to 10 days) were admitted in such a critical condition that 20 patients out of 46 (43%) died (Table 3).

Table 2 – Period in life in which respondents had diabetes (*n* = 181)

Period in years	Newly diagnosed	Up to 10 yrs.	11–20	21–30	31 and more
	8 (4%)	74 (41%)	62 (34%)	27 (15%)	10 (6%)

Table 3 – Hospitalization period

Period in days	10 and fewer	11–20	21–50	51–100	More than 100
Total	46 (17%)	75 (28%)	107 (39%)	34 (12%)	15 (4%)
Deceased	20	13	22	5	1

Most patients were hospitalized for 21 to 50 days (39%). Men who were hospitalized for the longest period (220 and 221 days) were further hospitalized at the Long-term care department. A total of 91% of patients used the services of the Long-term care department (33%).

Treating diabetic foot syndrome

277 patients underwent a total of 420 surgical procedures or another type of anaesthesia such as incisions, necrectomies and amputation. One patient had a diabetic defect on his hand after a finger injury and an amputated finger. For this reason, he was not included in the group of patients with lower limb amputations.

A total of 41 patients were treated with bandaging or other wound treating methods, such as damp treatments, spraying or suction. Out of these 41 patients (who were mostly polymorbid) 11 died. Of the total 277 patients, 61 (22%) died in the year the amputation was carried out. A total of 100 patients (36%) underwent a high amputation (i.e. thigh or shin amputation). 25 (25%) patients died in the year the amputation was carried out (Table 4).

Table 4 – Amputation height (*n* = 276)

	Bandaging	Incisions	Fingers/Toes	Transmetatarsal	Shin amp.	Thigh amp.
Number of amputated patients	41 (15%)	22 (8%)	91 (33%)	22 (8%)	45 (16%)	55 (20%)
Deceased	11	1	15	5	6	19

Before 2012, 60 (22%) patients had a healed defect or amputation of one limb. 27 (10%) patients had undergone a thigh amputation (9 patients), or an amputation under the knee (18 patients). Between 2012 and 2015, the second limb was treated.

At the end of 2015, 3 patients had undergone a thigh amputation of both legs, 6 patients had undergone one thigh amputation and one amputation under the knee, and 7 patients had undergone two amputations under the knee. 16 patients (6%) had undergone a double-sided high amputation.

The patients also suffered from a chronic diabetes mellitus complication, i.e. diabetic nephropathy. 20 patients (7%) had a terminal renal failure and were treated with haemodialysis. Diabetics on dialysis are very frail and other diseases are usually fatal for them. 15 out of 20 dialysed patients died in the year diabetic foot was diagnosed.

104 out of 276 patients were from České Budějovice, 165 were from the countryside and 7 originated from other South-Bohemian towns (Table 5). Patients from Trhové Sviny and Týn upon Vltava were considered as being from the countryside. The sample group included a few homeless people, who officially had a permanent residence in České Budějovice. The Surgery department of České Budějovice Hospital included patients from other municipalities as well. This was due to

the regional placement of the vascular surgery and the Diabetes centre. According to the Czech Statistical Office, the population of České Budějovice in 2015 was 93 285 and the population of the district of České Budějovice was 190 844 (i.e. 97 559 people lived out of town). It is obvious that the countryside patients were significantly more affected by diabetic foot syndrome (Český statistický úřad, 2015).

Table 5 – Patients by residence (*n* = 276)

	České Budějovice	Countryside	Other district towns
Men	71	123	5
Women	33	42	2
Total	104	165	7

In terms of marital status, most patients were married men, but non-married patients living with a partner were also included in this group. Single, divorced or widowed patients were divided into groups of living alone or with their family members. Patients living in homes for seniors were a separate group. We did not learn one male patient's marital status (Table 6).

Table 6 – Patients by marital status (*n* = 276)

	Married	Living alone	Living with family	Living in a seniors home
Men	135	52	10	3
Women	16	36	18	6
Total	151 (55%)	88 (32%)	28 (10%)	9 (3%)

An interesting fact was that women living alone were the most numerous group in terms of having diabetic foot syndrome.

207 patients were over 60 years old, so most patients were pensioners. 42 patients were disabled or partly disabled pensioners. 44 patients worked in different professions (tax advisor, teacher, university teacher, lawyer, construction manager, locksmith, driver, cashier, labourer, bricklayer, forest labourer, machine operator, excavator operator, tractor driver, car mechanic, technician, cook, production manager, publican, carpenter, dispatcher, electrician, court official, masseuse), but there were also 5 unemployed people who were registered at a job centre (Table 7).

Table 7 – Patients by occupation (*n* = 277)

	Pensioner	Disabled pensioner	Employed
Men	126	34	41
Women	65	8	3
Total	191 (69%)	42 (15%)	44 (16%)

We asked the patients hospitalized in 2012, 2014 and 2015 how the wound on their foot occurred, but we failed to get all patients' answers. The reasons were a serious health condition during hospitalization, death, or progressing dementia. 142 patients gave us valid answers that we could asses (Table 8).

Table 8 – Diabetic foot cause (*n* = 142)

	Men (*n* = 103)	Women (*n* = 39)	Total (*n* = 142)
I do not know	35 (34%)	13 (34%)	48 (34%)
Pressure sore, blister from shoes	15 (14%)	6 (15%)	21 (14%)
A specific injury	26 (25%)	8 (20%)	34 (24%)
Corns, pedicure	6 (6%)	8 (20%)	14 (10%)
Mycosis, crack	7 (7%)	0	7 (5%)
Vascular closure	3 (3%)	1 (3%)	4 (3%)
Decubitus, varicose ulcer	11 (11%)	3 (8%)	14 (10%)

The most frequent answer to the question was: "I do not know. The foot was suddenly black."

The specific injuries that the patients mostly stated as the cause of the diabetic foot were: I stepped on 11 push pins, I stepped on glass, I stepped on a screw, I stepped on something by the sea 3 years ago, I kicked a rock, I played football tennis barefoot in a gym, a piece of wood or tree or piece of iron fell on my foot, I got pricked by a piece of wire, I stepped on a hornet's nest, I walked barefoot at home, I got scratched by the rug or stumbled.

DISCUSSION

Our sample group of diabetic foot patients included 201 men (73%) and 76 women (27%). According to Fejfarová et al. (2014), it responded to other sample groups – 70.9% of men and 29.1% of women. Yao et al. (2012) state 88 men and 43 women, and Ribu et al. (2007) state 72 men and 28 women. We agree with the assumptions of the HELEN studies by the authors from the National Institute of Public Health that women adhere to the recommendations for diabetes and diabetic foot prevention and they take care of themselves more on the whole (Žejglicová et al. 2017).

The age division in the sample group and the average life expectancy with diabetes mainly corresponds with other authors. Our sample group mostly included patients between 61 and 70 years. For instance, García-Morales et al. (2011) state the age of 61 to 82, which is ± 11.08 years.

Fejfarová et al. (2014) state the average life expectancy with diabetes to be 19.2 ± 9.9. In our sample group, the average life expectancy with diabetes was 15 years, but the largest number of patients had had diabetes for 10 years. However, 8 patients were diagnosed with diabetes mellitus after the incidence of the diabetic foot syndrome. Yao et al. (2012) state that the average length of diabetes is 13.78 years.

Long treatment is characteristic of the diabetic foot syndrome illness. The average length of treatment in Czech hospitals in 2012 was 6.4 days, and the average length of treatment in surgical departments was only 5.3 days (Zdravotnická statistika 2013). The average hospitalization period of the patients in our sample group was 34 days. This fact is distorted by the fact that hospitalized patients for a short time (up to 10 days) were in such a critical condition that 20 out of 46 patients (43%) died.

Krajcová (2006) stated that 80% of patients had a family background. In our sample group, 88 patients (32%) lived alone, but this does not mean that they did not get help from family members. Our data is not well suited for comparison with Krajcová (2006) because our question was asked differently. Our sample group included only 44 working patients (16%). Others were pensioners or disabled pensioners. Ribu et al. (2007) stated that 40% of patients from their sample group were working. Norwegian authors worked with a much younger sample group. Only 33 out of 127 patients were over 67 years old and 29% suffered from Type 1 Diabetes, the incidence of which is much higher in Northern Europe than Central

Europe. Our sample group included only 9% of type 1 diabetics. This percentage almost corresponds with the percentage of Type 1 diabetics in the Czech Republic (Type 1 diabetics – 6.9%, Type 2 diabetics – 91.8%) (Výbor České diabetologické společnosti, 2012 a, b, c). 34% of our patients did not know how the foot wound occurred; the neuropathic diabetic foot does not hurt, so they did not pay sufficient attention to it. Yao et al. (2012) stated a figure of 28.3%. According to these authors, other causes of the wound incidence are: shoe injury – 19.8% (in our sample group, it was 14%), mycosis – 6.1% (in our sample group, it was 5 %), injury – 17.6%, burns – 9.9%, or frostbite – 2.3%. These external causes made up 29.8%, while in our sample group it was 24%. It is interesting that our sample group results were comparable to the Chinese sample group from Shanghai (Yao et al. 2012).

CONCLUSION

Diabetic foot syndrome is a diabetes mellitus complication that leads to long and costly treatment, and long hospitalizations with sad results – 22% of patients died in the year the amputation was carried out and 36% underwent a high amputation.

Thoroughly following the recommended education methods and the recommended care of patients with diabetic foot syndrome can prevent a number of ulcerations. It is also necessary to pay special attention to married men, men living in the countryside and pensioners.

CONFLICT OF INTERESTS

The authors have no conflict of interests to disclose.

REFERENCES

1. Český statistický úřad (2015). Počet obyvatel v obcích – k 1. 1. 2015 [Population of Municipalities – data up to 1 January 2015]. [online] [cit. 2015-10-16]. Available from: https://www.czso.cz/csu/czso/pocet-obyvatel-v-obcich-k-112015 (Czech).
2. Fejfarová V, Jirkovská A, Dragomirecká E, Game F, Bém R, Dubský M et al. (2014). Does the diabetic foot have a significant impact on selected psychological or social characteristics of patients with Diabetes mellitus? Journal of Diabetes Research. 2014:371938. Doi: 10.1155/2014/371938.
3. Foster D, Lauver LS (2014). When a diabetic foot ulcer results in amputation: a qualitative study of the lived experience of 15 patients. Ostomy Wound Management. 60(11): 16–22.
4. García-Morales E, Lázaro-Martínez JL, Martínez-Hernández D, Aragón-Sánchez J, Beneit-Montesinos JV, González-Jurado MA (2011). Impact of diabetic foot related complications on the Health Related Quality of Life (HRQol) of patients – a regional study in Spain. The International Journal of Lower Extremity Wounds. 10(1): 6–11.
5. Jirkovská A et al. (2006). Syndrom diabetické nohy: komplexní týmová péče [Diabetic foot syndrome: complex team care]. Praha: Maxdorf, 397 p. (Czech).
6. Krajcová M (2006). Terapeutická zátěž a psychosociální aspekty nemocných s gangrénou dolní končetiny. Diplomová práce 2005/6 [Therapeutic load and psychosocial aspects of the patients with a lower extremity gangrene]. Univerzita Karlova v Praze, 1. lékařská fakulta, Ústav teorie a praxe ošetřovatelství, 95 p. (Czech).
7. Piťhová P (2009). Syndrom diabetické nohy (2. část) [Diabetic foot syndrome (Part 2)]. [online] [cit. 2015-05-23]. Available from: http://www.ediabetes.cz/clanek/280/syndrom-diabeticke-nohy-2-cast/ (Czech).
8. Ribu, L, Hanestad B, Moum T, Birkeland K, Rustoen T (2007). A comparison of the health-related quality of life in patients with diabetic foot ulcers, with a diabetes group and a nondiabetes group from the general population. Quality of Life Research. (16): 179–189. Doi: 10.1007/s11136-006-0031-y.
9. Rušavý Z (1998). Diabetická noha: diagnostika a terapie v praxi [Diabetic foot: diagnostics and therapy in practice]. Praha: Galén, 189 p. (Czech).

10. Výbor České diabetologické společnosti (2012a). Standardy a jiná doporučení: Doporučený postup péče o diabetes mellitus 2. typu – aktualizace 2012 [Standards and other recommendations: recommended methods of care for Type 2 Diabetes Mellitus]. [online] [cit. 2015-10-17]. Available from: http://www.diab.cz/dokumenty/dm2_12.pdf (Czech).
11. Výbor České diabetologické společnosti (2012b). Standardy a jiná doporučení: Doporučení k edukaci diabetika – aktualizace 2012 [Standards and other recommendations: recommendations for the education of diabetics – updated edition 2012]. [online] [cit. 2015-10-14]. Available from: http://www.diab.cz/standardy (Czech).
12. Výbor České diabetologické společnosti (2012c). Standardy a jiná doporučení: Doporučený postup péče o pacienty se syndromem diabetické nohy – aktualizace 2012 [Standards and other recommendations: recommended methods of care for patients with diabetic foot syndrome – updated edition 2012]. [online] [cit. 2015-10-14]. Available from: http://www.diab.cz/standardy (Czech).
13. Yao H, Ting X, Minjie W, Yemin C, Xiqiao W, Yuzhi J et al. (2012). The investigation of demographic characteristics and the health-related quality of life in patients with diabetic foot ulcers at first presentation. The International Journal of Lower Extremity Wounds. 11(3): 187–193.
14. Žejglicová K, Kratěnová J, Lustigová M, Čapková N, Kubínová R (2017). Vybrané ukazatele zdravotního stavu české populace – studie EHES 2014 [Selected indicators of health in Czech population]. Praktický lékař. 97/3: 123–130.
15. Zdravotnická statistika (2013). Praha: Ústav zdravotnických informací a statistiky ČR [Health Statistics (2013). Prague: Institute of Health Information and Statistics of the Czech Republic]. Available from: http://www.uzis.cz/system/files/hospit2012.pdf (Czech).
16. Zvolský M (2013). Činnost oboru diabetologie, péče o diabetiky v roce 2013 [Activities in the field of diabetology, care of diabetics in 2013]. [online] [cit. 2015-05-23]. Available from: http://www.uzis.cz/rychle-informace/cinnost-oboru-diabetologie-pece-diabetiky-roce-2013 (Czech).

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