

EDUCATION ON PROPHYLACTIC FOOTWEAR IN THE ELDERLY PEOPLE WITH DIABETES MELLITUS

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Abstract

One of the objectives of a comprehensive specialized education for diabetics is to prevent the development of diabetic foot syndrome. All the diabetics, including old people, should take the preventive education on comprehensive foot care. Awareness and adherence to appropriate foot care, which also includes choice of high-quality prophylactic footwear, help to prevent the development of the above-mentioned syndrome. To find out the effect of education on the knowledge of prophylactic footwear and on the quality of the shoes worn for seniors with diabetes mellitus. The sample consisted of 278 seniors with diabetes mellitus, 134 (48.0 %) men and 144 (52.0 %) women monitored in outpatients' departments of diabetes and general practitioners' surgeries. Data collection was carried out through guided structured interview and completed with direct non-standardized observation. The average number of completed respondents' education sessions was 0.85 education session, half of them attended more than one education session. Women were shown to remember, on average, more criteria characterizing appropriate prophylactic footwear (1.86 criteria) compared to men (1.2 criteria) after an education session, after two education sessions, the gender difference was eliminated (on average, women and men remembered 3.19 and 3.22 criteria, respectively). Existing shoes showed the following parameters: closed shoe style (95.0 %), solid sole (80.0 %), Velcro and lacing fastening (71.0 %). The use of recommended prophylactic footwear was influenced by the number of criteria that seniors remembered within the provided education session. The appropriate shoes, according to educational recommendations, were worn by respondents who completed more education sessions.

Keywords: education, elderly people, diabetes mellitus, prophylactic footwear, diabetic foot syndrome

1. INTRODUCTION

As vital statistics show, the number of seniors in the Czech Republic is increasing. According to the Czech Statistical Office, at the end of 2017, the Czech Republic had less than two million inhabitants aged 65 and over (1,988,922 inhabitants) out of a total of 10,578,820 inhabitants. Currently, this social group reaches 18.8% of the Czech population (Czech Statistical Office 2018). Even in the coming years, the situation will not change, on the contrary, the age will grow and number of people of higher age will increase. Among others, the incidence of diabetes also increases with the age. More than 20% prevalence can be expected in the population over 65 years. Currently, more than one third of seniors are affected by this disease, most of them suffering diabetes mellitus type 2; for age of 70 and over, this is in 95.0 % of cases. Possibilities of compensation get worse in the course of this disease, although modern diagnostic and therapeutic procedures try to prevent this (Jirkovská et al. 2016, p. 40; Piřhová 2017, p. 73). The occurrence of this entity, including micro and macrovascular complications, contributes to a reduction in life expectancy, on average between 3 and 7 years (Weber, et al. 2014). The number of especially late complications is increasing, which leads to increased morbidity and mortality of diabetes seniors. One of the most serious is the Diabetic Foot Syndrome (DFS), which strikes less than 6.0 % of patients and significantly affects their quality of life. Consistently applied preventive measures significantly reduce its incidence, including the risk of limb amputation (Piřhová 2017, pp. 71–72).

All the diabetics should undergo a targeted preventive education related to complex foot care, which should help to achieve awareness and education aimed at making lifestyle changes leading to the prevention of complications. Adhering to proper foot care focused on their self-control, hygiene, nail and skin treatment, the choice of appropriate prophylactic footwear helps prevent occurrence of the Diabetic Foot Syndrome. The prophylactic footwear is intended for patients with diabetes mellitus

without advanced complications. They are recommended in the early stage of the disease when late complications of diabetes are not yet fully developed, especially in mild forms of peripheral neuropathy, or in patients with ischemic lower limb disease. In addition, they are suitable for patients with insignificant deformities and a positive history of the Diabetic Foot Syndrome, but without active ulceration (Jirkovská et al. 2006; Bakker et al. 2015; Jeffcoate et al. 2018).

2. MATERIALS AND METHODS

The research aimed to find out whether the respondents, seniors with diabetes mellitus, were educated on suitable prophylactic footwear within the prevention of the Diabetic Foot Syndrome and, if the education was performed, to identify the relation between the number of education sessions and the knowledge of respondents about recommended criteria of suitable prophylactic footwear. At the same time, the objective was to assess the real shoes of this group of respondents and to determine the impact of the education on the quality of worn shoes. The respondents were familiar with the research and provided their informed consent. The STATISTICA statistical program was used to analyse the data; the results were described using descriptive statistics, while determination of position characteristics, variability, concentration of selection, estimation of population characteristics, scaling of qualitative variables, investigation of probability distributions (alternative, normal), testing of statistical hypotheses (chi-square test), and alignment of statistical data using normal probability distribution were performed.

Research questions

Were the respondents educated in the issues of prophylactic footwear within the prevention of the Diabetic Foot Syndrome? What are the relationships between the number of education sessions on the appropriate prophylactic footwear for seniors with DM and their knowledge of recommended criteria for preventive shoes?

Hypothesis

1H₀ Knowledge of the prophylactic shoe criteria does not depend on the number of education sessions.

1H_A Knowledge of the number of prophylactic shoe criteria varies depending on the number of education sessions.

3. RESULTS

The research investigation provided the basic demographic data of the sample, which consisted of 278 (100.0 %) respondents, 134 (48.0 %) men and 144 (52.0 %) women (see Table 1). Some of these data were used from the research of M. Ambruzová (2018, pp. 38-40).

Gender	Men		Women		Total	
Age	n	%	n	%	n	%
60 – 65	21	7,7	33	11,9	54	19,6
66 – 70	50	17,9	46	16,6	96	34,5
71 – 75	26	9,2	37	13,4	63	22,6
76 – 80	19	6,9	14	5,0	33	11,9
81 – 85	10	3,5	9	3,3	19	6,8
86 – 90	7	2,5	5	1,8	12	4,3
91 – 95	1	0,3	0	0,0	1	0,3
Total	134	48,0	144	52,0	278	100,00

Table 1. Respondents' gender and age (source: author of the contribution, 2019)

Table 2 shows the results of respondents' education, 48.0 % men and 52.0 % women were educated; 49.0 % men and 51.0 % women were not educated. When evaluating the number of educated and non-educated persons, we can say that there are no major differences between the genders. One education session was attended by 75.0 % men and 74.0 % women, 25.0 % men and 26.0 % women took two education sessions. The average number of the completed education session per respondent is 0.85 education session, the interval estimate for the population is from 0.81 to 0.89 education session. Half of the patients took more than one education session.

Gender	Educated respondents						Non-educated respondents					
	Men		Women		Total		Men		Women		Total	
Age	n	%	n	%	N	%	n	%	n	%	n	%
60 - 65	11	52,0	20	61,0	31	16,3	10	48,0	13	57,0	23	26,1
66 - 70	33	66,0	36	78,0	69	36,3	17	34,0	10	20,0	27	30,7
71 - 75	22	85,0	24	65,0	46	24,2	4	15,0	13	73,0	17	19,3
76 - 80	15	79,0	9	64,0	24	12,6	4	21,0	5	73,0	9	10,2
81 - 85	8	80,0	8	89,0	16	8,4	2	20,0	1	84,0	3	3,4
86 - 90	2	29,0	2	40,0	4	2,1	5	71,0	3	33,0	8	9,1
91 - 95	0	0,0	0	0,0	0	0,0	1	1,0	0	0,0	1	1,1
Σ	91	48,0	99	52,0	190	100,0	43	49,0	45	51,0	88	100,00

Table 2. Level of Education of Respondents (source: author of the contribution, 2019)

Based on the information obtained from the sample, Table 3 lists the point and interval estimates for the population of all the diabetics under the same conditions (from the same database). The sample is almost the same when converting to the population; the information obtained can be applied to all the diabetics living in the Czech Republic. Men are affected by diabetes in, on average, 0.48 ± 0.06 proportion of all the diabetics. The average age of a diabetes senior ranges from age of 70.9 to age of 71.7, half of them is older than age of 69. Based on the questionnaire survey, the average duration of the disease is about 8.1 years, the interval estimate of the average population is from 7.7 to 8.3 years. The average number of the completed education session per respondent is 0.85 education session, the interval estimate for the population is from 0.81 to 0.89 education session. Half of the patients took more than one education session. The standard deviation indicates that 68.26% of respondents fit into the “mean $\pm$ standard deviation” interval.

	Gender	Age	Time from diabetes diagnosis identification	Number of education sessions	Sum of criteria knowledge	Worn shoes – parameters
	Proportion	Years	Years	Number	Number	Number
Point estimate of the mean value	0,48	71,28	8,01	0,85	1,35	8,08
Mean interval (+ -)	0,06	0,39	0,31	0,04	0,10	0,14
Median		69	7	1	0,5	8,5
Standard deviation σ		6,43	5,14	0,71	1,59	2,27

Table 3. Point and Interval Estimates of the Population Characteristics

Source: Author of the contribution, 2019

The results regarding the relationships between the number of education sessions on appropriate prophylactic footwear for seniors with diabetes and their knowledge of recommended criteria for preventive shoes yielded the following findings shown in Tables 3 and 4. The respondents' knowledge is expressed by the number of retained criteria for prophylactic footwear acquired during the education session.

Knowledge of Prophylactic Footwear Criteria										Σ criteria
	Shoe length by 1–2 cm	Shoe width	Closed	Rigid sole	Upper without seams	Heel height	Shoe fastening	Intromissive insole	Other	
Number	73	70	87	50	20	40	30	0	4	374
Proportion	0,26	0,25	0,31	0,18	0,07	0,14	0,11	0,00	0,01	*0,15

Table 4. Knowledge of Prophylactic Footwear Criteria

* per person and criterion

Source: Author of the contribution, 2019

The answers given to the 9 criteria listed (closed shoes, shoe longer than the longest toe by 1–2 cm, wide shoe toe, rigid sole, upper without seams, heel height up to 2.5 cm and 2 cm for women and men, respectively, shoe fastening (Velcro, lacing), damping intermissive insole, and others), which characterize prophylactic footwear, within the questionnaire survey show that the best known criterion among respondents is the criterion of closed shoes, which is known by 31.0 % of them. Information about the insole properties are the least known (0 % of respondents). In order to evaluate the quality of knowledge, the sum of all the criteria can be used, the size of this indicator ranging from 0 to 9. It turned out that the respondents remembered a maximum of 5 criteria (see Table 5). Depending on the number of education sessions, the number of retained criteria increases.

Determination of the effect of the number of education sessions on the knowledge of prophylactic shoe criteria; 95.0 % probability that the observed dependencies would occur only by chance was chosen. The chi-square test was used to determine the effect of the number of education sessions (see Table 5).

Knowledge of the number of criteria								
Number of education sessions	Data	0	1	2	3	4	5	Σ
0	n	91	0	0	0	0	1	92
	%	98,91	0,00	0,00	0,00	0,00	1,09	100,00
1	n	44	17	45	23	4	4	137
	%	32,12	12,41	32,85	16,79	2,92	2,92	100,00
2	n	4	4	5	14	11	11	49
	%	8,16	8,16	10,20	28,57	22,45	22,45	100,00
total n		139	21	50	37	15	16	278
% total		50,00	7,55	17,99	13,31	5,40	5,76	100,00
Observed frequencies		91	0	0	0	0	1	92,20
		44	17	45	23	4	4	137,00
		4	4	5	14	11	11	49,00

Expected frequencies	46,00	6,95	16,55	12,24	4,96	5,29	92,00
	68,50	10,35	24,64	18,23	7,39	7,88	137,00
	24,50	3,70	8,81	6,52	2,64	2,82	49,00

Table 5. Determination of the Effect of the Number of Education Sessions on Knowledge of Criteria

Source: Author of the contribution, 2019

Chi-square test significance: $p\text{-value} = 1.67^{E-37}$, $p < 0.05$, and, therefore, we reject H_0 at the level of significance and accept the alternative hypothesis. Knowledge of number of prophylactic diabetic shoe criteria at patients with diabetes mellitus is affected by the number of completed education sessions. The probability that the observed differences would occur by chance is less than 5.0 %.

Only 2.95 % of respondents knew five criteria after the first education session. After the second education session, the knowledge of at least five prophylactic diabetic shoe criteria exceeded at 20.0 % of the total number of educated respondents. Without education, 98.9 % of patients did not know any criterion characterizing the prophylactic footwear. Statistical analysis was also used to identify differences in remembering prophylactic shoe criteria between genders. It turns out that women can retain more criteria than men. When completing one education session, they remembered 1.86 criteria on average compared to men who remembered 1.2 criteria. After two education sessions, the gender difference is eliminated (on average, 3.19 and 3.22 criteria for women and men, respectively).

4. DISCUSSION

Analysis of the research results shows that 190 men and women, representing 68.3 % of the total number of 278 persons (100.0 %), were educated on the appropriate prophylactic footwear recommended for the Diabetic Foot Syndrome prevention; 73.0 % women and 72.0 % men attended one education session and 26.0 % women and 25.0 % men took two education sessions; 32.0 % of the respondents stated that they did not take any targeted preventive education on this issues. The education was carried out in outpatients' departments of diabetes by a diabetologist or by a general nurse for 42.0 % respondents or 13.0 % respondents, respectively; 11.0 % respondents were educated by both diabetologist and nurse; 8.0 % respondents were educated by a physician or nurse in a general practitioner surgery. 41.0 % seniors received information on suitable shoes from other sources, such as information brochures, Internet, or from family members. At present, 8–9 % of the total population (861.5 thousand patients in 2017) suffer with diabetes, 17.0 % of which having lower limb defect, a diabetic foot. The type 2 diabetes mellitus (91.4 % of cases) contributes the most to the increasing diabetes epidemic. Every fourth diabetic is at risk of the above-mentioned syndrome (Czech Statistical Office 2018). Treatment and continuing health care for a patient with diabetes mellitus type 2 are provided by diabetologists' or general practitioners' surgeries (Piřhová 2017). Treatment of more than 25.0 % of patients with type 2 DM is carried out in general practitioners' surgeries. (Czech Statistical Office 2018) The diabetic foot syndrome can be avoided by an appropriate prevention. The analysis of the above results suggests that both diabetologists and nurses in outpatients' departments of diabetes, including practitioners and general nurses in general practitioners' surgeries, are involved in the education of seniors with diabetes on the prophylactic footwear. The patients should be informed that preventive shoes can prevent ulceration in 60–80 % of cases, protect feet from external influences and reduce plantar pressures. The patient should be aware of the criteria for suitable shoes so that they can choose quality, efficient and comfortable shoes from the offered product range (Záhumenský & Rádl 2007; Piřhová 2017, s. 71; International Diabetes Federation 2017). Jirkovská states (2016, p. 15) that no treatment of chronic disease (diabetes mellitus) can be successful if the patient does not cooperate. Only such patient, who is well-instructed, i.e. educated, is able to cooperate. The education is an important aspect of medical practice and should be a daily routine for all health professionals (Krátká 2018, p. 31). Patients need within education to obtain such knowledge to be able to remember, understand and orientate in the necessary issues in field of their disease and were willing to cooperate with health professionals

(Juřeníková 2018, p. 70). In addition to informing and making diabetics do changes to improve their lives and postpone complications, the motivation represents an important part. The more patients express themselves in favour of change, the more likely transformation is. This is significantly influenced by how the healthcare professionals talk to patients, how they listen to them, and work to build a good relationship, but also by respecting the patient's right not to accept recommendations, not to make any changes. The task of healthcare professionals is to monitor and respond to the patient's expression as a part of their own education, to help them clarify what is important and to understand the meaning of such activity (Jirkovská et al. 2016). They should enter such topics in interviews repeatedly because they improve the patient's knowledge, but only discuss when we feel we have a chance to change their attitudes. Information, advice, recommendation should be provided at the right time when the patient is able to accept them, be active. The education on appropriate prophylactic footwear is suitable for seniors at low to high risk of ulceration. Healthcare professionals should motivate people with diabetes mellitus at moderate and high risk of diabetic ulceration development to wear prophylactic footwear both at home and in outdoor (Van Netten 2018; Jeffcoate, 2018). Inappropriate shoes lead directly to the causes of trauma and, consequently, foot ulceration (Záhumenský & Rádl 2007, p. 79–80). Diabetes seniors can be educated individually or in groups. The guided discussion in the group also helps to motivate for changes, to share experience among patients, contributes to psychological calming and acceptance of a new situation (Jirkovská et al. 2016). According to our experience, we recommend to involve family members in the education of seniors. When discussing, keep in mind that the targeted person being educated is a senior. Purposely work with the information that 90.0 % of old people experience worsening of visual perception, 30.0 % worsening of hearing perception; they are particularly aggravated by the short-term memory, that they need 4-times more time to learn a task, 2.5-times more repeats to fully learn the task, and make 4-times more mistakes, and that 50.0 % of new knowledge will be forgotten by the next day (Krátká 2017, p. 42). The spoken word is always advisable to support by a well-prepared written material (font size according to the target group of persons being educated). For example, these can be leaflets, brochures, magazines, books, web-based resource, other various activities, and a supportive curriculum (Krátká 2017, p. 29). Information provided in this way becomes available at any time in the home environment, seniors can return to it repeatedly. At the same time, it is not financially burden. We believe that general nurses should pay more attention to the issues of education of seniors with diabetes, especially in general practitioners' surgeries. They should reserve a time space for education and respond adequately to the needs of seniors in this area, use recommended procedures for these topics. The nurse has more possibilities and opportunities to gain the patient's confidence, motivate them, and communicate new information to them, or repeat the necessary information about the extensive issues of the disease in question. Strategically plan complex education, including prevention of the diabetic foot development, so as to achieve the desired result, taking into account the age and individual peculiarities of the diabetes senior. The prophylactic footwear serves as primary, in some cases secondary, prevention of diabetic foot development in patients without present ulceration. They should protect the feet against negative effects and reduce plantar pressures under the defect threshold. The diabetic foot ulceration occurs in up to 60.0 % of pressure sores caused by improperly chosen shoes (Piřhová 2017, p. 72). More than half of all the diabetic defects are infected, 20.0 % of them result in amputation (Jeffcoate 2018, pp. 645-646). The prophylactic diabetic shoes must meet a number of criteria according to the specific diabetic shoe requirements as mentioned in the Czech Technical Standard (ČSN 79 5600:2005). They must be made of natural, non-toxic materials. The instep may be made of a flexible knit, stretch materials, and this shoes can be used by patients with bunions or hammer toes. The shoe has a closed design, is seamless, and has no internal seams that could injure the foot. It is deep enough and wide with an excess of 1–2 cm. The foot must not be pressed by a toe box, reinforcement of the front part of the shoe ensuring its firm shape. The heel may be up to 20 mm and 25 mm in height for men and women, respectively (related to a medium foot size, i.e. 28/8/42 and 24/4/37 for men and women, respectively), its shape and dimensions must ensure stability; or the shoes are completely without heels. The upper peripheral edges must be bandaged. Fastening is ensured either by lacing or Velcro, without elastics; the sole is rigid. In the shoes, there must be a space to insert a damping insole capable of release the resulting high local pressures (Jirkovská et al. 2016; Záhumenský & Rádl 2007, p. 79–80). Analysis of the results showed that 63 (62.0 %) women remembered 4 or 5 criteria and 74 (87.0 %) of men remembered 3 or 5 criteria after completing two education sessions on appropriate

prophylactic footwear. After the first education session, with the highest frequency, women remembered 1–2 criteria and men remembered 0–1 criterion. After two education sessions, with the highest frequency, women remembered 3–4 criteria and men remembered only 2–3 criteria. Only after completing two education sessions, the frequency of appropriate shoe criteria knowledge became normal; without education and after one education session, the frequency distribution does not show normal distribution characteristics. After analysing the results of our research, an alternative hypothesis that the knowledge of number of prophylactic diabetic shoe criteria at patients with diabetes mellitus is influenced by the number of completed education session has been accepted. We have confirmed the positive effect of repeated education on remembering the recommended criteria. Only after completing two education sessions, the frequency of appropriate prophylactic shoe criteria knowledge became normal. When completing one education session, women remembered 1.86 criteria on average compared to men who remembered 1.2 criteria. After two education sessions, the gender difference is eliminated (on average, 3.19 and 3.22 criteria for women and men, respectively). Healthcare professionals providing education should not neglect the importance of repeated information, advice, and recommendations.

5. CONCLUSION

This contribution aimed to point out the connections between education and patients' knowledge on prophylactic footwear presented in our research, which helps to prevent late complications of diabetes, the Diabetic Foot Syndrome. The preventive shoes work together with appropriate foot care to prevent ulceration. We have proven that the education provided influences the patients' knowledge, and for this reason it is necessary to open educational topics in the communication between healthcare professionals and patients repeatedly as only repeatedly provided information improves their knowledge and can cause the desired changes. At the same time, it is necessary to balance the provision of information, advice and recommendations with the patients' attitudes. To time properly the communication of arguments leading to improved quality of life and postponed complications so that the diabetic is able to receive them; in this particular case, to purchase prophylactic footwear that reduce the risk of foot injuries compared to conventional ready-to-wear shoes.

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