

THE TREATMENT OF DIABETIC NEUROPATHY AND THE WAY TO LOWER ITS ECONOMIC BURDEN

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Abstract

Many investigations, including ours, offer data about the economic burden of diabetic neuropathy. In Bulgaria the costs of this disease to the society are huge. In 2008, diabetic neuropathy was the eighth cause of hospitalization, imposing relatively high costs on our country. There is a strong connection between diabetic neuropathy and the following factors: patients' age, duration of diabetes mellitus, the presence of micro-vascular changes and finally poor control of the blood glucose level. Data show difficulties in the diagnostics and treatment of neuropathy, this having a negative impact on the prognosis. From an organizational point of view, it is very important to apply screening techniques for the diagnosis of diabetic neuropathy. Considering the present financial situation of the Bulgarian health system, it is critically important that people with diabetes and their medical doctors collaborate in order to create a higher level of practice in the management of the disease. For this process to be effective, the patients have to be accepted as experts and equal members of the therapeutic team. Diabetic neuropathy is a heterogeneous disease with diverse clinical manifestations. It is one of the complications of diabetes that usually occurs in association with chronically elevated blood glucose levels that may damage the nerves, predominantly in the patients' legs.

keywords: *diabetic neuropathy, costs, pharmacoeconomy, alpha-lipoic acid, clinical management.*

Our Bulgarian experience in the clinical management of diabetic neuropathy

A recent study that took place in our country examined 212 patients (122 women and 90 men) hospitalized in eight wards, with different stages of diabetic neuropathy. They were all treated with medical products based on benfotiamin and the effectiveness of the treatment was then evaluated. In the following diagram the effectiveness of the treatment is correlated with the period of time patients were treated. (figure 1).

The mean age of the patients in this study was 44.3 ± 9.8 . The distribution of the patients

according to the duration of diabetes indicates a mean duration of $11.49 \text{ years} \pm 4.6 \text{ years}$. 25% of the patients have a duration of the disease of more than 20 years; 22%: 15-20 years and 20%: 10-15 years. The study proves a statistically significant relationship between the duration of diabetes and the presence of symptoms of diabetic neuropathy - difficulties in the movement, going to bed without need of help, getting dressed and undressed, fornication, feelings of burning and steaming in the feet, pain mainly at night with the same location etc.

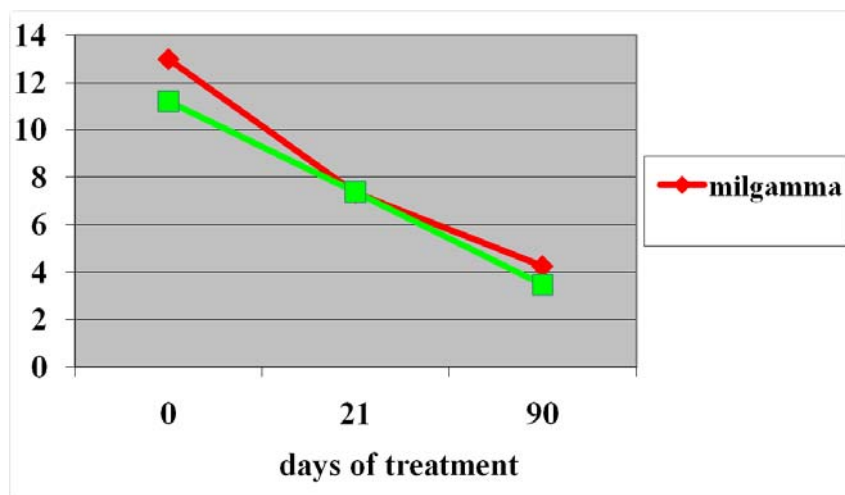


Figure 1. Effectiveness of the treatment with Benfotiamin

The positive effect of the treatment was evaluated by: the decrease of the subjective symptoms of tingling in the fingers and toes and of pain and by changes in the neurological examination, checking the level of the vibration sensitivity and performing EMGs that showed an improvement in the speed of the transmission in the motor and sensitive nerves.

Using logistic regression the following variables were studied:

1. Duration of diabetes mellitus and the presence or the absence of numbness - binary variable with two categories – presence (1) and absence of the symptom.

Results: $B=0.067$, $S.E.=0.025$, $Wald=7.416$ $p<0.01$, $Exp.(B)=1.07$ with CI (95%) 1.019-1.123, Nadelkerke $R^2=0.063$, X^2 goodness-of fit test $p<0.01$, Hosmer and Lemeshow test $p>0.05$. The prognosis for 10 years $P(10)=1.95$, with CI (95%) 1.20-3.19.

Analysis: Between the variables: duration of diabetes and the symptom numbness there is an adequate model of connection with ratio $B=0.67$ and risk $Exp(B)=1.07$ with CI (95%) 1.019-1.123. The prognosis for a duration of diabetes of 10 years is $/P(10)=1.95/$ or the risk for continuous difficulty in movement

becomes 1.95 times higher in the interval CI (95%) 1.20-3.19.

About 6.3% of the variations of numbness can be explained by the duration of diabetes in this model.

2. Duration of diabetes mellitus and tingling: binary variables with two categories: presence of the symptom (1) and its absence.

Results: $B=0.78$, $S.E.=0.022$, $Wald=12.883$ $p<0.01$, $Exp(B)=1.081$ with CI (95%) 1.036-1.128, Nadelkerke $R^2=0.1$, X^2 goodness-of-fit test $p<0.01$, Hosmer and Lemeshow test $p>0.05$. Prognosis for 10 years $/P(10)=2.18/$ with CI (95%) 1.42-3.36.

Analysis: There is an adequate model of connection between the two variables with ratio $B=0.078$ and risk $Exp(B)=1.081$ with CI (95%) 1.036- 1.128.

The prognosis with the growth of the duration of diabetes mellitus with 10 years is $/P(10)=2.18/$ or the risk for permanent difficulty in the movement of the leg becomes 1.95 times higher in the interval CI (95%) 1.2-3.36. About 10% of variations of this symptom can be explained by the duration of diabetes mellitus.

3. Duration of diabetes mellitus and the feelings of burning in the feet - binary

variables with two categories - presence of the symptom (1) and its absence.

Results: $B=0.066$, $S.E.=0.021$, $Wald=10.243$ $p<0.01$, $Exp(B)=1.068$ with CI (95%) 1.026-1.112, Nadelkerke $R^2=0.78$, X2 goodness-of-fit test $p<0.01$, Hosmer and Lemeshow test $p<0.05$. The prognosis for a 10 year period /P (10)=1.93/ with CI (95%) 1.28-2.92.

Analysis: Between the variables duration of diabetes mellitus and the symptom of burning in the feet there is an adequate model of connection $B=0.066$ and risk $Exp(B)=1.068$ with CI (95%) 1.026-1.112. The prognosis for a duration of diabetes mellitus over 10 years is /P (10)=1.93.

The feelings of burning in the feet can be explained by the duration of diabetes mellitus.

4. Duration of diabetes mellitus and a variation in pain intensity, becoming stronger at night - binary variable with two categories – the presence of a variation in the pain's strength, (becoming stronger at night) (1) and the its absence.

Results: $B=0.062$, $S.E.=0.019$, $Wald=10.119$ $p<0.01$, $Exp(B)=1.063$ with CI (95%) 1.024-1.105, Nadelkerke $R^2=0.72$, X2 goodness-of-fit test $p<0.01$, Hosmer and Lemeshow test $p>0.05$. Prognosis for 10 years /P (10)=1.86/ with CI (95%) 1.28-2.70.

Analysis: Between the two variables there is an adequate model of connection with ratio $B=0.062$ and risk $Exp(B)=1.063$ with CI ((95%) 1.024-1=105. The prognosis for the increase of the duration of diabetes mellitus with 10 years is /P (10)=1.86/ or the risk for feelings of burning in the feet increases 1.86 times or the interval CI (95%) 1.28-2.70.

About 7% of the variations of this symptom can be explained by the duration of diabetes mellitus.

5. Duration of diabetes mellitus and the sense of hot and cold - binary variable with two categories – presence (1) and absence.

Results: $B=0.011$, $S.E.=0.02$, $Wald=0.318$ $p>0.05$, $Exp(B)=1.011$ with CI (95%) 0.972-1.052, X2 goodness-of-fit test $p>0.05$, Hosmer and Lemeshow test $p<0.05$, Nadelkerke $R^2=0.002$.

Analysis: Between the variables there is no strong connection.

Many randomized, double-blinded, placebo-controlled studies have proven the importance of antioxidants in the prevention of the peripheral dysfunction of the nerves in diabetic patients. The treatment with alfa-lipoic acid has a positive effect on the main pathogenic mechanism of diabetic neuropathy. One study that was performed using some technical help from us, examined the effects of alfa-lipoic acid in 50 patients (27 men and 23 women) with severe peripheral and autonomous diabetic neuropathy. The mean age of the patients was 41.3 ± 9.2 with a duration of diabetes of 11.7 ± 5.2 years. The results showed:

- significant decrease in the pain - 13.9 before and 2.6 - two months after the treatment
- improvement of the vibratory sensitivity
- good laboratory results, good control of the blood glucose

Aims of our study

To examine the pharmacoeconomical aspects of the application of different therapeutic approaches of the diabetic

neuropathy and to offer arguments for its importance for the society of Bulgaria

Methods of our study

Documentation analysis, Interview, Economical methods /expense-results etc.

Findings of our study

The diagnostic and therapeutic technologies applied for diabetes mellitus are very important tools in the assessment of a good quality of life of the patient. The modern approach includes therapeutic courses twice a year. In one third of the examined patients in our study a specific therapeutic algorithm of treatment was applied. The results show that only one third of the patients have undergone special courses for coping with diabetes. Only 26% participated in educational courses for the clinical management of diabetic neuropathy and knew how to take care of their legs. In the European countries there is a special project of developing the area of self-management of the disease. To this effect, in Bulgaria the diabetic patient will make something like a contract about his health

goals, will monitor his own diet and physical activity and will control strictly the level of his blood glucose. Thus he will learn how to live with the disease adequately and valuably. Obviously, when we decrease the invalidization level of the patients with diabetes, the total work force will have an elevated level.

The rational and individualized pharmacological treatment of the neuropathy can be an important mean of saving in the future.

It is important to perform proper algorithms of coping with diabetic neuropathy including:

- regular examination of the legs and application of tests
- regular monitoring of the condition of the legs of people at risk
- effective treatment of hyperglycaemia and the other clinical symptoms

The total annual cost of the diabetic neuropathy treatment in Bulgaria in 2009, for example, was 4 357 544 € and the data will keep on similar level in the following years, as shown in the table below:

Table 1. Total annual cost for treatment of diabetic neuropathy in Bulgaria in 2009/Source: IMS Health.

Measure : EURO Sales PUBL (Absolute)	EURO Sales PUBL YTD/M12/2006	EURO Sales PUBL YTD/M12/2007	EURO Sales PUBL YTD/M12/2008	EURO Sales PUBL YTD/M12/2009
THIOCTIC ACID	1 978 924	2 492 288	3 450 211	3 923 305
PHARMACY MARKET	1 251 801	1 664 975	2 281 357	2 546 460
HOSPITAL MARKET	727 123	827 313	1 168 854	1 376 845

Keeping in mind that the main indication for the treatment with alpha-lipoic (Thioctic) acid is diabetic neuropathy, we can realize the economic burden of this treatment not only in our country, but also in Europe.

We have found three main barriers for the good quality of life of the patients with this chronic condition – the fragmentation of the health system and lack of coordination, the absence of continuity of the health care,

mistakes in the structuring of the responsibilities of different medical departments and hospitals.

Our study shows that educating the patients and answering their questions about diabetes must become an integral part of their treatment. In Bulgaria there are large opportunities in this sphere.

Conclusions

Experts from WHO underline how important is the proper and effective treatment of diabetes for the society. Furthermore, it has to be based on the common European values,

scientific evidences and proper algorithms for clinical management in order to reach the necessary health results both in social and individual aspects. The results of the study of the European Commission show that with age, diabetes mellitus causes more serious problems for the citizens and the health systems as a hole. For this reason, diabetes mellitus, as a common and wide spread disease with serious health risks, is a priority for the health management in the European Union in 2008-2013.

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