

## IS IT POSSIBLE TO TREAT HYPOGLYCAEMIA ADEQUATELY IN PUPILS SUFFERING FROM TYPE 1 DIABETES IN SCHOOLS IN THE TUZLA CANTON?

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**Objective** - The study was undertaken in order to assess on the basis of the opinions of high school teachers if the conditions exist in their schools to provide adequate assistance to pupils suffering from type 1 diabetes mellitus in a state of hypoglycaemia.

**Subjects and Methods** - 74 teachers from 35 different schools were surveyed by means of a cross-sectional study. According to whether the school was attended by a pupil suffering from T1DM, the teachers were divided into two groups: group 1 (schools with a pupil suffering from T1DN; n=7) and group 2 (schools without any pupils suffering from T1DM; n=47).

**Results** - Most of the teachers knew what hypoglycaemia is, and there was no statistically significant difference between the two groups in this regard ( $p=0.718$ ). There were more negative answers in both groups ( $p=0.001$  and  $p<0.001$ ) to the question: "Does the school have written instructions on how to treat hypoglycaemia?" In the first group the question: "Can a pupil measure his/her blood sugar levels during lesson time?" received more positive replies ( $p=0.013$ ), whilst in the second group the difference between the replies was not statistically significant ( $p=0.144$ ). In response to the question "Does the school have drinks or food available to treat hypoglycaemia?" there were more negative answers in both groups ( $p<0.001$  and  $p<0.001$ ). To the question: "Can a child suffering from diabetes eat food or have a drink during lesson time?" there were more positive answers in both groups ( $p<0.001$ , and  $p<0.001$ ). In response to the question: "Does the school have people who know how to give an injection of glucagon?" there were more negative answers in both groups ( $p=0.003$ , and  $p<0.001$ ). There were no statistically significant differences between the groups in terms of the answers given. The main reasons for insufficient care for pupils suffering from T1DM whilst in school were seen by 40.5% of teachers as a lack of attention given to the problems of these pupils and the lack of education of teaching staff about T1DM.

**Conclusion** - The results obtained indicate that the conditions are not met in our schools to provide appropriate assistance to children suffering from T1DM in a state of hypoglycaemia.

**Key Words:** Type 1 diabetes ■ Hypoglycaemia ■ Pupils ■ School

## Introduction

Type 1 Diabetes mellitus (T1DM) is one of the most common chronic diseases in childhood (1). The incidence of this illness is constantly growing from year to year (1, 2), and is higher than the incidence of other chronic illnesses in childhood (3). In the Tuzla Canton the incidence of T1DM in the period increased on average each year by 15% from 1995 to 2004 (4). This resulted in an increase in the total number of children suffering from T1DM in this region.

The complex and complicated method of treatment, which above all imposes the need to think about the illness constantly and which constantly interferes with all the child's activities, requires greater or lesser involvement, depending on the child's age, from people in the child's immediate or more distant environment. Most children, who suffer from T1DM, continue in high school after they have completed their elementary school education, where they spend almost one third of their day. During their time in school those pupils need to be ensured with a certain level of safety regarding their illness (5). Teaching staff at the school need to be educated about the illness, at least so that they are able to recognize the problems of a child suffering from T1DM and how to help the child in certain situations (5, 6, 7). In this context, the most important thing is to know in good time how to recognize and treat hypoglycaemia, which is a condition that may occur unexpectedly and which may endanger the life of the child. By recognizing the basic symptoms of this illness teaching staff, would not only help a child suffering from T1DM, but could also notice children manifesting the illness which has gone unnoticed by their family.

However, teachers may be afraid when they have a child in their class suffering from T1DM. This fear arises from a lack of understanding of Type 1 diabetes and therefore they tend to avoid the issue. In developed countries with well-organized health and education systems, the problem has been solved by the introduction of legislation on educating teaching staff correctly (7, 8), but in countries with low incomes and transition countries, there is no solution on the horizon. Our previous research (9), in which this problem was analysed from the point of view of elementary school pupils suffering from T1DM and their parents, as well as research into the readiness of elementary school teachers to help a child suffering from T1DM (10), shows that these pupils do not have the vital help they need in relation to their illness while they are at school. Research by two authors (3, 11) who analysed this problem also indicates that help for children suffering from T1DM while they are at school is insufficient.

The aim of the study was to assess, on the basis of the opinions of teaching staff at high schools in the Tuzla Canton, whether the conditions exist in their schools to give adequate assistance to children with T1DM who are suffering from hypoglycaemia.

## Subjects and methods

### The area covered by the study

The Tuzla Canton is an administrative unit in the north-eastern part of the Federation of Bosnia and Herzegovina, covering an area of 2649 km<sup>2</sup> with a population in 2010 of 498,549.

### Subjects

The study involved 74 teachers from 35 high schools in the Tuzla Canton, who attended a lecture entitled "Schools and Type 1 Diabetes", organized as part of the out-of-school activities of high school teachers. The organizer of the meeting was the "Association of Parents and Children with Diabetes" with the approval of the Ministry of Education, Science, Culture and Sport of the Tuzla Canton. Before the lecture, all the teachers present com-

pleted the questionnaire. The teachers were divided into two groups: group 1 comprised those teachers whose schools were attended by at least one pupil suffering from T1DM (hereinafter: group 1) and group 2 with teachers whose schools, as far as they knew, were not attended by any child suffering from this illness (hereinafter: group 2).

## Methods

This study was conducted as a cross-sectional study. Data on the "safety" of pupils suffering from type 1 diabetes in the school environment from the point of view of their illness were collected by means of a questionnaire (3) which was adapted to our local situation. In order to assess the level of education and readiness of high school teachers to help children suffering from diabetes in a state of hypoglycaemia, the answers to the following questions were used from the completed questionnaire:

- a) Do you know what hypoglycaemia is?
- b) Does the school have written instructions on how to treat hypoglycaemia?
- c) Can a pupil suffering from diabetes measure his/her blood glucose level during lesson time?
- d) Does the school have drinks and food available for treating hypoglycaemia?
- e) Can a child suffering from diabetes have a drink or eat food during lesson time?
- f) Does the school have staff who know how to give a glucagon injection? and
- g) What is the greatest problem in your school in providing the necessary assistance to a pupil suffering from diabetes?

It was possible to answer all the questions with Yes, No or Don't know, apart from the question "Do you know what hypoglycaemia is?" where the possible answers were Yes or No, and the question "What is the greatest problem in your school in providing the necessary assistance to a pupil suffering from

diabetes?", where the surveyed teachers could circle one or more possible replies.

Before they completed the questionnaire, an explanation was given to the school staff about what the information would be used for and the fact that by completing the questionnaire they were consenting to take part in the study. The ethics committee of Tuzla University Clinical Hospital gave their approval for this study as part of the project: "School and Diabetes in children and adolescents".

## Statistical analysis

The results are presented in absolute and relative numbers, and the differences in the replies between the groups were tested using the  $\chi^2$  test for independent samples. The differences in the answers to the question "Do you know what hypoglycaemia is?" were tested by the Fisher test. The differences between the samples was considered to be significant if  $p<0.05$ . The results were tested using the Arcus QuickStat (12) statistical program.

## Results

Of 74 teachers surveyed 27 were placed in group 1 and 47 in group 2. In reply to the question "Do you know what hypoglycaemia is?" there were 25/27 positive answers in group 1 and 43/47 in group two. There was no statistically significant difference between the groups ( $p=0.718$ ).

In Table 1 the responses by the teachers are shown regarding the conditions that exist in the school to help a pupil suffering from T1DM in a state of hypoglycaemia.

In their replies to the question "Does the school have written instructions on how to treat hypoglycaemia?" in both groups there was a significantly higher number of negative replies ( $\chi^2=14.22$ ;  $p<0.001$ , and  $\chi^2=27.10$ ;  $p<0.001$ ), however the difference in the replies given between the groups was not statistically significant ( $\chi^2=0.11$ ;  $p=0.948$ ).

In group 1 in the replies to the question: "Can a pupil measure his/her blood glucose level during lesson time?" the number of positive replies was statistically significantly higher ( $\chi^2=8.66$ ;  $p=0.013$ ), whilst in the second group that difference was not statistically significant ( $\chi^2=3.87$ ;  $p=0.144$ ). There was no statistically significant difference between the groups ( $\chi^2=1.75$ ;  $p=0.417$ ).

In the replies to the question: "Does the school have drinks and food available for treating hypoglycaemia?" there were statistically significantly more negative replies in both groups ( $\chi^2=25.03$ ;  $p<0.001$ , and  $\chi^2=34.76$ ;  $p<0.001$ ), however the differences in the replies given were not statistically significant between the groups ( $\chi^2=0.06$ ;  $p=0.968$ ).

In both group 1 and group 2 in the replies to the question: "Can a child suffering from diabetes have a drink or eat food during lesson time?" the number of positive replies was statistically significantly higher ( $\chi^2=28.66$ ;  $p<0.001$ , and  $\chi^2=26.34$ ;  $p<0.001$ ), whilst the difference in the replies to the same question between the groups was not statistically significant ( $\chi^2=1.82$ ,  $p=0.403$ ).

To the question: "Does the school have staff who know how to give a glucagon injection?" there were statistically significantly more negative replies in both groups ( $\chi^2=11.5$ ;  $p=0.003$ , and  $\chi^2=18.7$ ;  $p<0.001$ ), however, the difference in the answers given was not statistically significant between the groups ( $\chi^2=2.87$ ;  $p=0.238$ ).

**Table 1** Replies by teachers to questions about the conditions for treating hypoglycaemia in their school

| Questions                                                                        | Teachers' replies |           |            |                |           |            |
|----------------------------------------------------------------------------------|-------------------|-----------|------------|----------------|-----------|------------|
|                                                                                  | Group 1 (n=27)    |           |            | Group 2 (n=47) |           |            |
|                                                                                  | Yes               | No        | Don't know | Yes            | No        | Don't know |
|                                                                                  | n (%)             | n (%)     | n (%)      | n (%)          | n (%)     | n (%)      |
| Does the school have written instructions on how to treat hypoglycaemia?         | 1 (3.7)           | 17 (63.0) | 9 (33.3)   | 2 (4.3)        | 31 (66.0) | 14 (29.8)  |
| Can a pupil measure his/her blood glucose level during lesson time?              | 16 (59.3)         | 7 (26.0)  | 4 (14.8)   | 22 (46.8)      | 12 (25.5) | 13 (27.7)  |
| Does the school have drinks and food available for treating hypoglycaemia?       | 1 (3.7)           | 23 (85.2) | 7 (25.9)   | 2 (4.3)        | 34 (72.3) | 11 (23.4)  |
| Can a child suffering from diabetes have a drink or eat food during lesson time? | 22 (81.5)         | 1 (3.7)   | 4 (14.8)   | 32 (68.1)      | 5 (10.6)  | 10 (21.3)  |
| Does the school have staff who know how to give a glucagon injection?            | 9 (33.3)          | 13 (48.2) | 5 (18.5)   | 12 (25.5)      | 29 (61.7) | 6 (12.8)   |

**Table 2** The numbers of positive replies by teachers to each reply related to the question "What is the greatest problem in your school in providing the necessary assistance to a pupil suffering from diabetes?"

| Replies offered                                        | Number of positive replies |                   |                   |
|--------------------------------------------------------|----------------------------|-------------------|-------------------|
|                                                        | Total<br>(n=74)            | Group 1<br>(n=27) | Group 2<br>(n=47) |
|                                                        |                            | n (%)             | n (%)             |
| Lack of attention paid to problems of pupils with T1DM | 30 (40.5)                  | 11 (40.7)         | 19 (40.4)         |
| Lack of education of teaching staff about T1DM         | 30 (40.5)                  | 8 (29.6)          | 22 (46.8)         |
| Lack of parental involvement                           | 15 (20.3)                  | 6 (22.2)          | 9 (19.1)          |
| Lack of cooperation with parents                       | 10 (13.5)                  | 3 (11.1)          | 7 (14.9)          |
| Other                                                  | 4 (5.4)                    | 3 (11.1)          | 1 (2.1)           |

T1DM = type 1 diabetes mellitus

The numbers of positive replies by teachers to each reply related to the question: "What is the greatest problem in your school in providing the necessary assistance to a pupil suffering from diabetes?" are given in Table 2.

About 40% (30 of 74) of teachers questioned believe that the lack of attention given to the problems of pupils with T1DM and the lack of education of teaching staff about T1DM are the most important problems encountered in providing the necessary assistance to these pupils, whilst the lack of parental involvement and lack of cooperation with parents of children suffering from T1DM are less important issues for most teachers questioned. Teachers in both groups have very similar opinions about resolving this problem.

## Discussion

Most teachers in both groups in our study stated that they know what hypoglycaemia is. However the replies to the questions about the conditions for treating hypoglycaemia in pupils suffering from T1DM during their time in school indicate that the conditions are unsatisfactory in the schools in question. This fact is unacceptable in view of the fact that it is completely realistic to expect that during the many hours pupils suffering from T1DM spend in school every day they may sometimes fall into a state of hypoglycaemia, and the fact that severe hypoglycaemia may threaten their lives.

The fact that of 74 teachers only three gave a positive reply to the questions: "Does the school have written instructions on how to treat hypoglycaemia?" and "Does the school have drinks and food available for treating hypoglycaemia?" indicates that the management of the schools do not show any interest in the health of children suffering from chronic diseases. It is certain that

parents also bear some of the responsibility for this situation, as do the local health institutions. That is to say, it could be expected that parents and health personnel from the local health care services would inform those responsible at the school about the new situation after a child suffering from T1DM returns to school.

The situation is slightly more positive in both groups of subjects regarding their replies to the question: "Can a pupil measure his/her blood glucose level during lesson time?" The higher number of positive replies to this question indicates that a certain number of teachers have an understanding of the problems of pupils suffering from T1DM. However, it is worrying that almost one quarter of the teachers questioned believe that a pupil cannot measure their blood glucose during lessons, which is unacceptable according to the postulates of the treatment of T1DM, that is, the pupil testing for him/herself to see if he/she is in a state of hypoglycaemia or not. It is interesting to notice that in the study by Lewis et al. (3) in two of the 65 schools surveyed, pupils suffering from T1DM were not permitted to measure their blood glucose during lesson time.

Perhaps the reply to the question: "Does the school have drinks and food available for treating hypoglycaemia?" best reflects the attention paid by the school to pupils suffering from T1DM. As many as three quarters of the teachers questioned answered "No". This large number of negative replies can only be interpreted as the lack of education of teaching staff at the school, or the fact that the problem of children suffering from diabetes in school is not regulated by any legislation on the level of the wider community. In other places (3) where care for children suffering from T1DM is much better than in this country, this problem was not resolved successfully in 3% of the schools questioned.

When considered in the context of the

replies to the second question in this study, the significantly higher number of positive replies in both groups to the question: "Can a child suffering from diabetes have a drink or eat food during lesson time?" says more about the currently more liberal attitude of school management to the behaviour of pupils during lessons than about their specific concern for pupils suffering from T1DM.

One third of teachers questioned from schools attended by pupils suffering from diabetes gave positive replies to the question: "Does the school have staff who know how to give a glucagon injection?" Seen in general this result could indicate that concern for pupils suffering from T1DM in the high schools in question does exist to some extent. Our results are close to the results of the study by Amillategui et al. (13). That study indicates that of 111 teachers questioned, 14% gave a positive reply to this question, 21% a negative reply and 65% of teachers replied that they did not know. However, most of the positive replies in our study mainly came from schools teaching medical vocations or religious schools (the Catholic School and the Madrasa), so our results cannot be related to most high schools under state control.

The results of this study give a one-sided picture of the conditions in schools regarding care for pupils suffering from T1DM. The situation in schools regarding care for pupils suffering from T1DM in a state of hypoglycaemia, would be more complete if pupils suffering from T1DM and their parents were surveyed at the same time. Amillategui et al. (13) found that 34% of parents believed that teachers did not know how to recognize the symptoms of mild hypoglycaemia and that 17% of parents had problems when they informed the school management of their children's illness. In our previous study (9), in which parents were questioned, 35% were satisfied with the care and treatment provided in school for their child suffering from

diabetes, 67.7% expressed their dissatisfaction in that regard and only 35.2% believed that someone on the staff in the school knew how to recognize hypoglycaemia, whilst the number of positive replies to the question about treating hypoglycaemia (18.9%) or giving a glucagon injection (13.5%) was much lower.

By asking the question: "What is the greatest problem in your school in providing the necessary assistance to a pupil suffering from diabetes?" with suggested replies we tried to obtain a specific answer in our study which could serve as a starting point for action to find a comprehensive solution to the problems encountered by children suffering from T1DM during their time in school. Most teachers believe that "the lack of attention paid to problems of pupils with T1DM" and "the lack of education of teaching staff about T1DM" are the main problems. These replies are absolutely realistic and are practically interdependent because it is obvious that the lack of attention paid to these problems stems from the ignorance of the teaching staff, and it seems to be perfectly realistic to believe that the education of teaching staff about T1DM would be a significant contribution to resolving all the problems encountered by pupils suffering from T1DM during their time in school. The study by Wagner et al. (14) shows that children suffering from T1DM, whose parents stated that the staff of the school had had some education about diabetes, had better metabolic control than those who stated that the school staff had not had any education about the illness. In this study it is also mentioned that the pupils whose class teachers had had education about T1DM had a better quality of life in relation to those whose class teachers were not educated about T1DM.

This study has several limitations. First, in order to see if the conditions existed in the school to assist a pupil with T1DM in a state

of hypoglycaemia during his time in school, it would be necessary to undertake research amongst parents, teachers and pupils suffering from T1DM, but also amongst the head teachers of the schools in question. Secondly, one single study cannot reflect the status of a problem successfully, so in our opinion it is necessary to examine what is responsible for this problem many more times. In the end, this kind of study needs to be conducted in all high schools in a certain geographical region, because the results gained would shed more light on the problem noticed. This would make it possible to resolve the problems of pupils suffering from T1DM systematically, through regulatory acts passed by the competent ministry.

## Conclusion

The results gained show that the appropriate conditions do not exist in high schools in

the Tuzla Canton for pupils suffering from T1DM to be given the appropriate assistance in a state of hypoglycaemia. The results also indicate that the main problems of these pupils stem from the fact that teaching staff are not educated about T1DM and therefore are not able to notice the problems encountered by pupils in relation to their T1DM.

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