Incidence and risk as well as protective factors regarding diabetic ketosis in people with type 1 diabetes: A secondary analysis of the PRIMAS and INPUT studies

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BACKGROUND AND METHODS

Risk and protective factors for diabetic ketosis

We combined data from four prospective educational studies examining the efficacy of an education programme for type 1 diabetes (PRIMAS) and for insulin pump users (INPUT), respectively. Two randomised controlled trials tested the education programmes in real-world settings. We prospectively analysed the incidence of DK 6 months after the end of the education phase and determined risk and protective factors for occurrence of DK, by using univariate tests and a multivariable logistic regression model. DK was assessed by Case Report Forms and via interview.

Meta-analyses

To further analyze the impact of structured diabetes education on DK and DKA, we performed a literature search and conducted two meta-analyses. First, we assessed whether participation in structured education could reduce the event rate of DKA. We combined data from four prospective educational studies examining the efficacy of an education programme for type 1 diabetes (PRIMAS) and for insulin pump users (INPUT), respectively. Two randomised controlled trials tested the education programmes in real-world settings. We prospectively analysed the incidence of DK 6 months after the end of the education phase and determined risk and protective factors for occurrence of DK, by using univariate tests and a multivariable logistic regression model. DK was assessed by Case Report Forms and via interview.

Meta-analyses

• In univariate tests, people reporting DK were significantly more frequent on at least one DK event (3-1), and studies reported the event rate of DKA (L2.4-7).
• We added data from the four studies described above and included the number of people experiencing at least one DK event before and after participation in the structured intervention (B-11).
• Figure 3 shows that structured self-management education could reduce the number of people experiencing at least one DK event by 56%. This effect was shown for DKA and DK with slightly higher effects of diabetes education on DKA.
• Figure 4 shows that also the number of DK events could be significantly reduced by 61% after participation in structured diabetes education.

CONCLUSION

Experiencing an event of DK was a significant risk factor for a recurrent event. Interestingly, participation in a structured self-management education programme was associated with a reduced risk for a DK event. However, assessing DK via Case Report Form and interview is clearly a limitation of this study.

Nevertheless, mean incidence rate and percentage of study participants affected by DK clearly indicates the existence of risk groups for DK. A better understanding of risk factors for DK or for DKA is needed to identify at risk persons and to employ risk mitigation strategies for those risk groups.

The meta-analyses demonstrated the importance of structured diabetes education as a risk mitigation strategy. Not only the number of affected people was reduced by diabetes education but also the number of DK events. In summary, structured self-management education is a potent protective factor for the development of diabetic ketosis and ketonuria.

RESULTS

Risk and protective factors for diabetic ketosis

• Analyses were based on 760 participants with type 1 diabetes (see Table 1).
• At baseline, only 8.4% of participants reported at least one DK event. During the follow-up period, the self-reported incidence of DK was 38 events per 100 patient years; but only 5.5% of the sample reported at least one DK event, which indicated a highly skewed distribution.
• In univariate tests, reporting DK were significantly more frequent on insulin pump therapy, did not participate in the education programmes PRIMAS or INPUT, had a higher depression score, and reported more CKD by DK clearly indicates the existence of risk groups for DK. A better understanding of risk factors for DK or for DKA is needed to identify at risk persons and to employ risk mitigation strategies for those risk groups.

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The literature search yielded 24 studies of which three studies reported the number of people experiencing at least one DK event (3-1), and studies reported the event rate of DKA (L2.4-7).

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