Age-Related Differences in the Frequency of Ketoacidosis at Diagnosis of Type 1 Diabetes in Children and Adolescents

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OBJECTIVE — We studied the prevalence of diabetic ketoacidosis (DKA) at diagnosis of type 1 diabetes in children in Finland.

RESEARCH DESIGN AND METHODS — From 2002 to 2005, data on virtually all children <15 years of age diagnosed with type 1 diabetes (n = 1,636) in Finland were collected.

RESULTS — DKA was present in 19.4% of the case subjects, and 4.3% had severe DKA. In children aged 0–4, 5–9, and 10–14 years, DKA was present in 16.5, 14.8, and 26.4%, respectively (P < 0.001). Severe DKA occurred in 3.7, 3.1, and 5.9%, respectively (P = 0.048). DKA was present in 30.1% and severe DKA in 7.8% of children aged <2 years.

CONCLUSION — The overall frequency of DKA in children is low in Finland at diagnosis of type 1 diabetes. However, both children <2 years of age and adolescents aged 10–14 years are at increased risk of DKA.

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BMI at diagnosis than those without DKA (Table 1).

Children <2 years of age more often had DKA and severe DKA at diagnosis when compared with older children (Table 1), and the degree of consciousness was more often impaired in these very young children (14.9 vs. 4.8%; P < 0.001). We compared children diagnosed in the university hospitals with those diagnosed in other pediatric centers and observed that the frequency of DKA was higher in subjects admitted to the university hospitals (23.1 vs. 17.1%, P = 0.003). Furthermore, severe DKA occurred more frequently in children treated in the university hospitals (6.3 vs. 3.0%; P = 0.001). The proportion of children <2 years of age at diagnosis was higher in the university hospitals (7.9 vs. 5.2%; P = 0.026).

When comparing children diagnosed in the DIPP centers (n = 353) with those treated in other university hospitals (n = 263), similar DKA frequencies were observed (21.2 vs. 25.3%, respectively; P = 0.240). The frequency of severe DKA was not significantly different in children diagnosed in the DIPP centers (4.7 vs. 8.2%, P = 0.076).

**CONCLUSIONS** — In the current study, the frequency of DKA in children <5 years of age at diagnosis of type 1 diabetes was 16.5% and the lowest reported so far in this age-group (6–10). Earlier studies from Finland have shown that the frequency of DKA has markedly decreased over time in children diagnosed at <5 years of age, at 32.1% from 1982 to 1991 and 17.7% from 1992 to 2001 (6,7). In Germany and Austria, the frequency of DKA at diagnosis was 26.5% in children <5 years of age from 1995 to 2007 (10). In the U.S., DKA was present in 43.7% of children <6 years of age diagnosed with type 1 diabetes during the 1990s in the Boston area (11), and recently a DKA frequency of 37.3% was reported in children <5 years of age (8).

DKA is still common among children <2 years of age, although the present results show that the frequency of DKA in these children was lower (30.1%) than in earlier surveys (6,7). In the Finnish nationwide study from 1986 to 1989, the frequency of DKA in children <2 years was as high as 53.3% (7). In northern Finland the overall frequency of DKA in children <2 years of age at diagnosis was 50% from 1982 to 1991 and 39.1% from 1992 to 2001 (6). These very encouraging results indicate that information and awareness have led to earlier diagnosis nowadays with milder metabolic decomposition in these very young children.

It is worrisome that children ≥10 years of age seem to have an increased risk of DKA. It is possible that the emerging independence of teenagers makes them unwilling to admit to their early symptoms of diabetes, and therefore they run a higher risk of developing DKA. In addition, shared time in families has decreased in recent decades, and single-parent families are more frequent. Such factors may play a role in the delayed reporting of symptoms of diabetes in adolescents.

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