Title: Impact of Participation in Longitudinal Monitoring of At-Risk Individuals on Type 1 Diabetes Presentation and Treatment Outcomes

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Abstract

Background: Screening of type 1 diabetes (T1D) is a topic of considerable scientific and clinical interest. Recognition of disease risk and early diagnosis may prevent life-threatening ketoacidosis and improve long-term treatment outcomes, but data remain limited. We investigated this issue by leveraging data from genetically at-risk children followed from birth in the Type 1 Diabetes Prediction and Prevention (DIPP) study.

Methods: Comprehensive data on clinical presentation at diagnosis and one-year treatment outcomes were collected from medical records and compared between 126 T1D patients who had participated in DIPP study and 440 patients diagnosed outside of screening programs.

Results: Children in the DIPP study were diagnosed at a significantly younger age (median 6.3 vs 8.9 years, $p<0.001$) and more frequently had a family history of T1D compared to non-DIPP controls (any relative: 51.6% vs 39.8%, $p=0.026$; first-degree relative: 30.2% vs 28.6%, $p=0.015$). Additionally, their clinical presentation was milder, with significantly lower rates of diabetic ketoacidosis (5.6% vs 23.6%, $p<0.001$), lower median blood glucose levels (12.3 vs 23.4 mmol/l, $p<0.001$), less dehydration, and fewer severe electrolyte imbalances. Moreover, intensive care was required less frequently (5.6% vs 33.2%, $p<0.001$), and hospital stays were shorter. One year after diagnosis, the DIPP group maintained significantly lower HbA1c levels (median 55.0 vs 61.0 mmol/mol, $p<0.001$) and insulin requirements (0.57 vs 0.70 IU/kg/day, $p<0.001$) compared with controls.

Conclusions: Participation in the genetic screening program and longitudinal follow-up of children at risk were associated with earlier diagnosis, milder clinical presentation, and more favorable treatment outcomes after one year.