Paediatrics

The effect of diabetes on neuropsychological health

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Sub-optimal care of children with type 1 diabetes can have a devastating impact on long-term health and well-being. Poor glycaemic control can result in microvascular complications which can present in adolescence. Yet children are also at risk of detrimental neuropsychological sequelae which have been consistently reported in studies of childhood diabetes.[1] Children with early-onset diabetes (EOD), usually defined as onset before the age of 7 years, develop defects in tests of fluid intelligence, that is, the ability to process new information in novel ways. On the other hand, children with late-onset diabetes (LOD), develop defects in tests of crystallised intelligence: well-practised skills relying on stored knowledge. The reasons for these defects are unclear but severe hypoglycaemia has been a major culprit for some time. Other factors, including chronic hyperglycaemia and psychosocial issues, may also be important.

In this study (see right) the authors performed a neuropsychological test battery and structural magnetic resonance imaging in a group of young adults with type 1 diabetes and compared the findings between those with either EOD or LOD. Only physiological variables such as diabetes duration, evidence of microvascular disease and retrospective reporting of prior exposure to severe hypoglycaemia could be assessed in a study of this nature. The study found that EOD was associated with lower non-verbal intelligence, poorer information processing ability and slower psychomotor speed, all consistent with previous studies.[2] The authors also found higher ventricular volumes and higher frequency of mild ventricular atrophy in those with EOD. Both the structural and cognitive performance findings were not related to presence of retinopathy or diabetes duration, suggesting that the cumulative effects of hyperglycaemia were unlikely to be causative. However, although the authors also found no definite link between hypoglycaemia history and any of these defects it is difficult to exclude this as a cause in view of the well-described problems of hypoglycaemia recall even in the short term.

Studies such as these are a cause for concern for professionals involved in the care of children with diabetes. Recent paediatric audit data suggest that many children in the UK are not achieving targets of good glycaemic control, including young children who may be at greatest risk of both neuropsychological and microvascular complications. Greater understanding of the development of these sequelae needs to be attained if children are to be protected from the long-term consequences of type 1 diabetes.

[1]Northam EA, Anderson PJ, Werther GA et al (1999) Predictors of change in the neuropsychological profiles of children with type 1 diabetes 2 years after disease onset. *Diabetes Care* **22**(9): 1438–44

[2]Northam EA, Anderson PJ, Jacobs R et al (2001) Neuropsychological profiles of children with type 1 diabetes 6 years after disease onset. *Diabetes Care* **24**(9): 1541–6

DIABETOLOGIA

Prepregnancy BMI a good predictor of pregnancy outcomes

Readability	✓✓✓✓
Applicability to practice	✓✓✓✓
WOW! factor	✓✓✓✓

1 American Diabetes Association and National Diabetes Data Group criteria for gestational diabetes were used to determine pregnancy-related outcomes in a cohort of 9270 Spanish women. Individuals were grouped according to body mass index (BMI) and gestational diabetes. Foetal macrosomia and caesarian section were the primary outcomes studied.

2 Secondary outcomes analysed included birth by Caesarian section, pregnancy-induced hypertension (PIH) and large-for-gestational-age newborns (LGA).

3 A high BMI was found to be associated with 23% of macrosomia, 9.4% of caesarian sections, 50% of PIH and 17.6% of LGA. In comparison, gestational diabetes was associated with 3.8% of macrosomia and 9.8% of PIH.

4 The authors conclude that prepregnancy BMI is a better predictor of pregnancy outcomes compared with gestational glucose intolerance.

Ricart W, Lopez J, Mozas J et al (2005) Body mass index has a greater impact on pregnancy outcomes than gestational hyperglycaemia. *Diabetologia* **48**(9): 1736–42

DIABETES CARE

Cognitive ability indicated by age of onset of type 1

Readability	✓✓✓✓
Applicability to practice	✓✓✓✓
WOW! factor	✓✓✓✓

1 Ferguson and colleagues hypothesised that children who develop type 1 diabetes before the age of 7 years (early-onset diabetes [EOD]) have lower cognitive abilities than those who develop the condition after 7 years.

2 A total of 71 young adults participated in the study: 26 were diagnosed with type 1 diabetes before the age of 7 and 45 between 7 and 17 years of age.

3 To assess cerebral structure specialists were employed to measure cranial magnetic resonance imaging, a retinal examination and retrospective recording of episodes of severe hypoglycaemia. Cognitive function was assessed using a battery of tests designed to measure current intellectual performance.

4 Those with EOD had lower non-verbal intelligence which was primarily measured by a test designed to assess spatial ability. Information processing ability was also found to be poorer in those with EOD.

5 Other cerebral functions (such as early visual perception speed, sustained attention and concentration, and frontal and executive functions) were unaffected by age of onset of type 1 diabetes.

6 Age of diabetes onset had a definite correlation with lateral ventricle volume, indicating loss of brain mass and, therefore, function.

7 This study demonstrated subtle but definite links between age of onset of type 1 diabetes and cognitive function later in life.

Ferguson SC, Blane A, Wardlaw J et al (2005) Influence of an early-onset age of type 1 diabetes on cerebral structure and cognitive function. *Diabetes Care* **28**(6): 1431–7

JOURNAL OF ADVANCED NURSING

Metabolic control is worse in non-Caucasian children

Readability	✓✓✓✓
Applicability to practice	✓✓✓✓
WOW! factor	✓✓✓✓

1 Denmark has an increasing prevalence of type 1 diabetes among its non-Caucasian population. This article reports on a study which analysed whether metabolic control is any different between children of Caucasian origin and those not, and also examined factors affecting metabolic control in the non-Caucasian population.

2 The study included 919 and 58 children of Caucasian and non-Caucasian background, respectively. HbA_{1c} results were collated for all children involved. Thirty-eight families of children of non-Caucasian background also completed a questionnaire, with the aid of an interpreter, which assessed the level of care they had received, from their perspective. The care teams were also sent a questionnaire in order to assess what was done for children from ethnic backgrounds.

3 HbA_{1c} levels were significantly higher in non-Caucasian (mean 9.05 ± 1.4%) compared with Caucasian children (mean 8.62 ± 1.3%; P=0.018). Also, no significant differences were observed between any groups in the prevalence of severe hypoglycaemia or ketoacidosis.

4 Centres provided limited specialised knowledge and support for children and families from ethnic backgrounds.

5 Questionnaire analysis revealed, especially among the mothers, a desire to receive educational material in their own language. The authors conclude that the educational needs of non-Caucasians are not always met by healthcare professionals.

Povlsen L, Olsen B, Ladelund S (2005) Diabetes in children and adolescents from ethnic minorities: barriers to education, treatment and good metabolic control. *Journal of Advanced Nursing* **50**(6): 576–82

METABOLISM CLINICAL AND EXPERIMENTAL

Atherosclerosis linked with CAM levels

Readability	✓✓
Applicability to practice	✓✓
WOW! factor	✓✓✓

1 Concentrations of soluble intercellular and vascular cell adhesion molecules (sICAM-1 and sVCAM-1) and soluble selectins (sE, sP and sL selectins) were measured in young people with atherosclerosis risk factors (such as diabetes, hypertension and obesity) in order to assess whether they could be an indicator of future atherosclerosis.

2 Compared with the healthy group, concentrations of sICAM-1, sVCAM-1 and sE selectin were higher in the group with atherosclerosis risk factors. sP and sL selectin concentrations were no different between the two groups.

3 These data suggest that early markers of atherosclerosis are already present in childhood, especially in obese children with hypertension.

Glowinska B, Urban M, Peczynska J, Florys B (2005) Soluble adhesion molecules (sICAM-1, sVCAM-1) and selectins (sE selectin, sP selectin, sL selectin) levels in children and adolescents with obesity, hypertension, and diabetes. *Metabolism Clinical and Experimental* **54**(8): 1020–6

DIABETES TECHNOLOGY & THERAPY

Insulin delivery regimens not related to glucose excursions

Readability	✓✓
Applicability to practice	✓✓✓
WOW! factor	✓✓✓✓

1 A study group of 14 adolescents with type 1 diabetes on a continuous subcutaneous insulin infusion (CSII) regimen were compared with 14 age and sex matched controls on a multiple daily insulin (MDI) plus twice daily ultralente insulin regimen (age range 3.9–16.8 and 3.9–16.0 years, respectively) with respect to blood glucose (BG) excursions.

2 Participants across both groups had similar BG control (HbA_{1c} levels: 7.9 ± 1.0% for CSII group; 7.9 ± 1.5% for MDI group).

3 Over 48 hours mean BG, mean amplitude of glycaemic excursion and number of hypoglycaemic episodes were calculated. No significant differences were observed between the two groups.

4 The authors conclude that in adolescents with similar glycaemic control blood glucose excursions occur independently of the insulin delivery method.

Alemzadeh R, Palmo-Sisto P, Parton EA, Holzum MK (2005) Continuous subcutaneous insulin infusion and multiple dose of insulin regimen display similar patterns of blood glucose excursions in pediatric type 1 diabetes. *Diabetes Technology & Therapy* **7**(4): 587–96

DIABETES TECHNOLOGY & THERAPY

Alarms wake people during nocturnal hypoglycaemia

Readability	✓✓✓✓
Applicability to practice	✓✓✓✓
WOW! factor	✓✓✓✓

1 Twenty young people with type 1 diabetes wearing devices set to sound an alarm when glucose levels got too low or too high, in real time, were observed when sleeping to determine their reactions to the alarms.

2 Videotape analysis showed that 68% of alarms were audible. Forty per cent of first alarms and 28% of subsequent alarms were acted upon.

3 Although there was a high incidence of false alarms, participants awoke during all confirmed hypoglycaemic events, thus advocating the use of such real-time devices in young people when asleep.

Buckingham B, Block J, Burdick J et al (2005) response to nocturnal alarms using a real-time glucose sensor. *Diabetes Technology & Therapy* **7**(4): 440–7

'In adolescents with similar glycaemic control blood glucose excursions occur independently of the insulin delivery method.'