Diabetic ketoacidosis in an adolescent and young adult population in the UK in 2014; national survey comparison of the management in adult and paediatric settings

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Introduction

The management of diabetic ketoacidosis (DKA) differs in the UK between adults and children, but the extent of use of national guidelines (JBDS in adults, and BSPED in children) and outcomes in the teenage and young adult age group are unknown.

Aim

To determine if the management and outcomes of DKA in teenagers and young adults are different across adult and paediatric services.

Methods

We sent a standardised questionnaire to adult diabetes services requesting details of all DKA admissions (ref). A variation of this survey was send to paediatric services requesting details of all DKA admissions in teenagers over the age of 14 years. Both surveys took place during a 6 month period in 2014. Data collected covered clinical, biochemical, outcome, and discharge information. Data from those 'adult' admissions under the age of 22 was compared with the 'paediatric' admissions.

Results

Number of patients:
64 'adult' patients in the main survey were aged less than 22; 10 were young people aged 10-16.
71 'paediatric' patients aged 14-18.

Treatment area	Paediatric (n=71)	Adult (n=64)
Level 1 (General ward)	21.4%	10.9%
Level 2 (High dependency)	41.4%	12.5%
Level 3 (Intensive care)	2.9%	12.5%
Acute Medical Unit	5.7%	43.8%
Accident and Emergency	18.6%	10.9%
Combination	8.6%	9.4%
Missing data	1.4%	0

Precipitating cause of DKA	Paediatric (n=71)	Adult (n=64)
New diabetes diagnosis	1 (1.4%)	3 (4.5%)
Infection	9 (12.7%)	14 (21.9%)
Alcohol	2 (2.8%)	4 (6.3%)
Gastroenteritis	7 (9.9%)	9 (14.1%)
Non-adherence	37 (52.1%)	16 (25%)
Appendicitis/pancreatitis	0	2 (3.1%)
Insulin pump problems	5 (7.0%)	0
Psychological including anorexia	2 (2.8%)	3 (4.5%)
No precipitating cause identified	8 (11.3%)	13 (20.3%)

Variable	Paediatric	Adult	p value
Mean age (SD) yr	14.9 (1.4)	19.2 (2.3)	
Mean length of stay (SD) days	2.35 (2.3)	2.53 (2.4)	n.s.
DKA developed during an inpatient stay	n=1	n=6	
More than 1 previous DKA admission in last 6 months	37.2%	42.2%	n.s.
Admission pH (mean; SD)	7.17 (0.19)	7.15 (0.20)	n.s.
Admission blood glucose (mean; SD) mmol/l	25.0 (6.9)	26.8 (8.5)	
Ketones NOT measured	n=11	n=9	
National Guideline followed	96%	87%	
Senior review first 12 hours	76%	84%	
0.9% saline bolus given	45%	unknown	
Insulin bolus given	0	17% *	
Time to start insulin (median) min	100	39	p<0.001
Hypoglycaemia (BG<4) occurred during first 24 hours	42.3%	36%	n.s.
Lowest mean (SD) potassium level during first 24 hours (mmol/l)	3.83 (0.49)	3.51 (0.56)	p<0.005
Percentage potassium values <3.5 mmol/l	8.8%	23.6%	p<0.005
Was a referral to the diabetes team made?	84.3	81.7	
After DKA resolution, were they reviewed by the diabetes team?	91.4	87.3	
Education support before discharge?	82.9	80.3	
Psychological support before discharge?	11.4	5.6	

*includes one patient under the age of 18 years

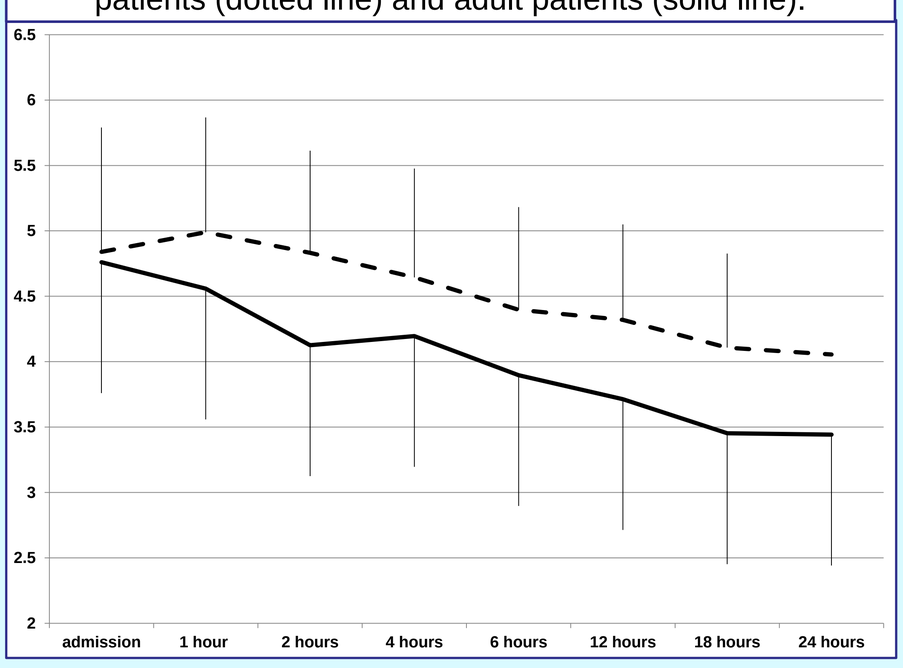
Hypoglycaemia was common in both paediatric and adult patients.

Hypokalaemia was more common in adult patients, possibly because of insulin bolus, but also adult guidelines suggest only adding potassium to fluid once plasma potassium is less than 5.5 mmol/l, and not from the first fluid bag.

In the 9 paediatric patients given the lower dose insulin rate (0.05 units/kg/hour) compared with 61 with the higher dose, pH was the same, patients were younger (mean 13.9 vs 15.0 years, p=0.02). Time to resolution of DKA was longer (21.4h vs 15.3h, p<0.005) but none became hypoglycaemic.

Paediatricians were more likely to attribute the precipitating cause to adherence problems rather than infection, even though equal numbers in both groups had multiple previous admissions, suggesting the same prevalence of adherence problems. Psychological support before discharge was twice as likely to be available in paediatric centres.

Plasma potassium levels during first 24 hours in paediatric patients (dotted line) and adult patients (solid line).



Conclusions

Young adults and teenagers in the UK are treated largely according to national guidelines, but hypoglycaemia and hypokalaemia are unacceptably common. The greater degree of hypokalaemia in adults may be related to an insulin bolus and late potassium replacement.

Potassium replacement in adult guidelines and insulin and glucose in all DKA guidelines need to be reviewed.

Adult physicians should be encouraged to use paediatric protocols if they are treating teenagers under 18 years of age.

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Websites for guidelines JBDS – JBDS -http://www.diabetologists-abcd.org.uk/JBDS/JBDS.htm ; BSPED - http://www.bsped.org.uk/clinical/docs/DKAGuideline.pdf.

Reference for adult survey - National survey of the management of Diabetic Ketoacidosis (DKA) in the UK in 2014. KK Dhatariya, I Nunney, K Higgins, MJ Sampson, G Iceton. Diabetic Medicine. 2015. DOI: 10.1111/dme.12875