

ORIGINAL ARTICLES

Changing Prevalences of Overweight and Obesity in Primary School Children - a Glimmer of Hope?

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Abstract

Background

The current epidemic of childhood obesity is a growing public health concern. Estimates of the prevalence of obesity are necessary so that secular trends can be monitored and the need for preventative measures assessed.

Aims

To establish the prevalences of overweight and obesity in Aberdeen primary schoolchildren and to investigate how children have been changing with respect to body fatness during their primary school years. Methods: Retrospective study of two cohorts of school entrants, using height and weight data from school nurse records.

Results

Data were collected on 1018 children. The prevalence of overweight among children in primary year 1 decreased from 28.7% in 1997/98 to 21.5% in 2001/02 ($P < 0.01$). The mean BMI SD score also significantly decreased in boys from 0.51 in 1997/98 to 0.32 in 2001/02. For the 1997/98 school entrants, the prevalences of overweight and obesity did not change between school entry and the end of primary school. The mean BMI SD score decreased significantly during primary school in boys but not in girls.

Conclusion

Although childhood overweight and obesity remain major public health concerns, we report a slight improvement in measures of obesity over time, particularly in boys.

Key words

Obesity, children, prevalence, body mass index

Introduction

The current epidemic of childhood obesity is a growing public health concern, with increasing recognition of the adverse physical and psychosocial consequences both during childhood and in the long term. Estimates of the prevalence of obesity are necessary so that secular trends can be monitored and the need for preventative measures assessed. The limited published Scottish data have suggested that the prevalence of obesity is higher in Scotland than in England¹. The aims of this study were, first, to establish the prevalences of overweight and obesity in two recent cohorts of children in primary year 1 and, second, to investigate how children have been changing with respect to body fatness during their

primary school years.

Methods

Data were extracted from the school nurse records of all children entering primary year 1 (P1) in 1997/98 and 2001/02 in 19 city primary schools in Aberdeen. These children had their heights (to 0.1 cm with a portable stadiometer, Raven Minimetre) and weights (to 0.1 kg with Seca scales, in light indoor clothing) measured in P1 as part of routine child health surveillance. In addition, the 1997/98 cohort were measured again in primary year 6 or 7 (P6/7) in 2002/03. Body mass index (BMI) was calculated from the formula (weight in kg/height in m²) and data converted to BMI centiles and SD scores using the UK 1990 reference data for BMI in childhood². Overweight was defined as BMI \geq 85th centile (SD score \geq 1.04) and obesity as BMI \geq 95th centile (SD score \geq 1.64)³.

The percentages of overweight and obese children were compared by χ^2 test for the two P1 cohorts and by McNemar's test for the longitudinal cohort. Mean BMI SD scores were compared by unpaired t test for the cross-sectional groups and by paired t test for the paired longitudinal data. The BMI centile values were not normally distributed and so the Mann Whitney and Wilcoxon matched pairs tests were used to compare them in the cross-sectional and longitudinal components of the study respectively.

Results

Data were collected on 1018 children, comprising two complete P1 cohorts from 19 schools. P1 data for 1997/98 and 2001/02 are compared in table I. The 2 cohorts were comparable with regard to their sex and age distribution. Overall, 28.7% of P1 children were overweight in 1997/98, with 14.7% obese. In 2001/02, the prevalence of overweight had decreased significantly to 21.5% but, when boys and girls were considered separately, this fall was significant only in boys. There was a non-significant decrease in the prevalence of obesity to 11.4% in 2001/02. The mean BMI SD score decreased significantly between 1997/98 and 2001/02 in boys but not in girls. Overall, the BMI centile values were

lower in 2001/02 than in 1997/98 ($Z=3.83$, $P<0.001$) with a greater difference in boys ($Z=3.34$, $P=0.001$) than in girls ($Z=2.01$, $P=0.05$).

Paired P1 and P6/7 data were available for 367 children (191 boys), representing 65% of the 1997/98 P1 cohort. These 367 children were representative of the whole P1 cohort in terms of their age and sex distribution and the percentages of overweight and obese children. The data for this longitudinal cohort are summarised in table II. The prevalences of overweight and obesity did not change significantly between P1 and P6/7. Differences in prevalence between boys and girls were not statistically significant. However, the mean BMI SD score decreased significantly during primary school in boys but not in girls. Similarly, the BMI centiles were significantly lower in P6/7 compared to P1 ($Z=3.50$,

Table I: Comparison of two primary year 1 cohorts

	1997/98	2001/02
No (%) studied		
Total	564	454
Boys	296 (52.5)	241 (53.1)
Girls	268 (47.5)	213 (46.9)
Mean (SD) age (yrs)	5.63 (0.38)	5.62 (0.41)
No (%) overweight		
Total	162 (28.7)	98 (21.5) **
Boys	91 (30.7)	52 (21.6) *
Girls	71 (26.5)	46 (21.5)
No (%) obese		
Total	83 (14.7)	52 (11.4)
Boys	44 (14.8)	25 (10.4)
Girls	39 (14.6)	27 (12.6)
Median BMI centile		
Total	67.0	55.4
Boys	67.5	53.5
Girls	65.0	57.4
Mean BMI SD score		
Total	0.49	0.35 *
Boys	0.51	0.32 *
Girls	0.47	0.38

Significant difference 1997/98 v 2001/02: * $P<0.05$, ** $P<0.01$

$P<0.001$) but this effect was greater in boys ($Z=2.75$, $P=0.006$) than in girls ($Z=2.23$, $P=0.03$). Of the 367 children, 39 (10.6%) became overweight, 70 (19.1%) remained overweight, 39 (10.6%) had a BMI below the 85th centile in P6/7 despite being overweight in P1 and 219 (59.7%) had a BMI below the 85th centile in both P1 and P6/7. There were no significant differences in sex distribution, age or P1 height centile between those children whose BMI remained below the 85th centile and those who became overweight (data not shown).

Discussion

It is concluded that overweight and obesity are major

Table 2: Comparison of P1 and P6/7 data for longitudinal cohort

	P1 (1997/98)	P6/7 (2002/03)
Total no studied	367	367
Mean (SD) age (yrs)	5.61 (0.38)	10.92 (0.52)
No (%) overweight		
Total	109 (29.7)	109 (29.7)
Boys	64 (33.5)	58 (30.4)
Girls	45 (25.6)	51 (29.0)
No (%) obese		
Total	55 (15.0)	63 (17.2)
Boys	33 (17.3)	34 (17.8)
Girls	22 (12.5)	29 (16.5)
Median BMI centile		
Total	67.0	65.0
Boys	72.0	66.0
Girls	60.5	62.0
Mean BMI SD score		
Total	0.49	0.36 **
Boys	0.59	0.42 *
Girls	0.39	0.3

Significant difference P1 v P6/7: * $P<0.05$, ** $P<0.01$

problems in Aberdeen primary schoolchildren with 20-30% being overweight and 10-15% obese at school entry. The prevalences are significantly higher than the expected prevalences of 15% for overweight and 5% for obesity. The longitudinal component of the study has not shown an increase in prevalence of overweight and obesity with increasing age during primary school years. Rather, these problems appear to be established early in life, prior to school entry. Contrary to a recent report which showed increasing BMI and waist circumference SD scores in a longitudinal cohort⁴, we have not documented worsening obesity measures over time, either in cross-sectional groups measured at school entry or in the longitudinal cohort measured at the beginning and end of primary school. Indeed, the BMI centiles decreased significantly over time and the mean BMI SD score decreased in boys.

The current epidemic of childhood obesity has been attributed largely to a decline in energy expenditure rather than increased energy intake⁵. Recent evidence suggests that children in the UK establish a sedentary lifestyle at an early age and, notably, at the age of 5 years mean physical activity level and total energy expenditure were significantly lower in girls than in boys⁶. A European study of health behaviour in children aged 11 to 15 years has also shown that girls are less active than boys, with the gender gap increasing with age⁷. These findings are consistent with our observations that the BMI SD scores and the prevalence of overweight have significantly decreased in boys but not in girls. Higher levels of physical activity in boys may be protecting against excessive weight gain.

Our findings need to be considered in the light of other studies. Most UK studies have suggested that overweight and obesity in children increased in prevalence throughout

the period covered by our study^{4,8}. It is possible that there are regional variations throughout the UK. Of particular interest are data collated by NHS Quality Improvement Scotland, comprising routinely collected heights and weights as part of child health surveillance in selected regions of Scotland, which appeared to show an increase in obesity prevalence with increasing age⁹. However, the reported prevalences of overweight and obesity for P1 and P7 children in 2001/02 are comparable to our findings and these cross-sectional data may be obscuring secular trends. However, our study is limited by the relatively small sample size which may not be representative of the population as a whole. Furthermore, we used routinely collected data which may be less accurate than those collected prospectively in planned studies. Mis-categorisation of even a small number of children due to inaccurate measurements would be sufficient to alter the calculated prevalences when the sample size is small. A further consideration is the use of BMI as a measure of obesity. Trends in waist circumference during the past 10-20 years have greatly exceeded those in BMI¹⁰. Therefore, a relatively stable mean BMI SD score may be masking an increase in central adiposity. Clearly, childhood obesity remains a significant health and societal concern.

Public health interventions are needed urgently to address childhood overweight and obesity and, in particular, should target pre-school children and their families. However, our study, which is the first to report any improvement in measures of obesity over time, offers a glimmer of hope in the battle against childhood overweight and obesity. Further studies are required to establish the generalisability of our findings and to follow these trends in this and other populations.

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