
Bojan Leskošek, Janko Strel and Marjeta Kovač
University of Ljubljana, Faculty of Sport, Ljubljana, Slovenia

ABSTRACT

The proportion of overweight children and adults has been growing rapidly in the last few years in many European and other countries. Certain consequences of overweight are already manifested in youth; in adulthood they are one of the main causes of death and several diseases. The study examined the proportion of overweight and obese Slovenian girls aged 7 to 18 with the use of an annually repeated cross-sectional study. The study lasted from 1991 to 2006 and was based on the body mass index according to IOTF norms. The results show that in this period the proportion of overweight girls increased by almost 30% (from 13.5% to 18.8%), whereas the proportion of obese girls doubled (from 2.3% to 4.6%). The prevalence of overweight and obesity is highest in childhood and early adolescence where it is around two to three times higher than at the age of 18.

Key words: body mass index, overweight, obesity, girls, Slovenia

Introduction

Overweight and obesity are reaching epidemic proportions around the world. In 2003, the WHO reported more than 1 billion overweight adults globally, with at least 300 million of them being obese. 17.6 million of them are children under the age of five. Over the last decade, the prevalence of obesity in Western and Westernising countries has more than doubled. It is estimated that 400,000 extra children are becoming overweight or obese each year within the expanded European Union. In Canada, Australia and parts of Europe 1% of all children are becoming overweight every year. Twenty-five percent of children in the USA are overweight and eleven percent are obese.

About 70% of obese adolescents grow up to become obese adults. Obese children under three years of age whose parents are not obese have a low risk of becoming obese in their adulthood. Nevertheless, with older children obesity is an increasingly important predictor of future adult obesity, regardless of whether their parents are obese or not.

Obesity holds many health consequences. As well as increased mortality, obesity is a risk factor in a range of chronic diseases such as Type 2 (adult-onset) diabetes, coronary heart disease, some types of cancer, osteo-arthritis and back pain. Obesity also has social and psychological consequences – including stigmatisation, discrimination and prejudice. Researches have linked obesity with a low self-image, low self-confidence and depression.

Some consequences of childhood obesity – hyperinsulinaemia, poor glucose tolerance and a raised risk of Type 2 diabetes, hypertension, sleep apnoea, social exclusion and depression – onset already in childhood, while other consequences of obesity pass through to adulthood.

The economic consequences of obesity are enormous and include the direct costs of health services, the indirect costs associated with premature death and lost economic production, and individual costs such as purchases of special clothing and so-called slimming products. The total direct and indirect costs of obesity have been estimated at up to 0.9% of GDP among countries in the EU, 1.2–1.4% in the United States and 2.1% in China.

The mechanism of the development of obesity is not fully understood and is believed to be a disorder with multiple causes. Genetic factors influence the susceptibility of a given child to an obesity-conducive environ-
ment. However, environmental factors, lifestyle preferences and the cultural environment seem to play major roles in the rising prevalence of obesity worldwide. It is confirmed that obesity occurs when energy intake exceeds energy expenditure, thus suggesting that a proper diet and physical activity are the key strategies for controlling the current obesity epidemic6.

There is a wide variety of definitions of child obesity; however, no commonly accepted standard definition has so far emerged. Although less sensitive than skin-fold thickness, the body mass index (weight/height²) is widely used in adult populations, and a cut-off point of 25 kg/m² and 30 kg/m² is recognised internationally as a definition of adult overweight and obesity, respectively10. These cut-off points are only appropriate for adults as they are much lower in children and adolescents. The International Obesity Task Force (IOTF) proposed age- and sex-specific cut-off points from 2–18 years, which correspond to adult cut-off points of 25 kg/m² and 30 kg/m². They are internationally based and should help provide internationally comparable prevalence rates of overweight and obesity in children. Then norms are published in the form of centile curves, from which tables for both genders and for all ages between 2 and 18 years are derived11. Several studies have found BMI to be a good representative of body fat; e.g. in a recent study of Swedish schoolgirls aged 8–11 years12, a very high linear correlation (r=0.95) was found between BMI and both total and abdominal fat mass.

A number of studies on the prevalence of obesity in European children and adolescents in different years after 1990 were reviewed by Lobstein, Baur & Uauy3. The prevalence of overweight (incl. obese) children aged around 7–11 years using the IOTF cut-off points was especially high in southern Europe (Italy 36%, Spain 34%, Greece 31%), and substantially lower in northern Europe (Holland 12%, Denmark 15%, Germany 16%). Among adolescents aged around 14–17 years the prevalence ranged from below 10% (Slovakia, Czech Republic, Russia) to above 20% in certain southern countries (Cyprus 23%, Greece 22%, Spain 21%). There are differences between boys and girls, e.g. in Great Britain the prevalence of overweight and obesity in 5- to 10-year-old children for the period 1984 to 2002-3 is much higher in girls13.

There are also some differences between genders in terms of the psychosocial consequences of obesity. The NHICM Foundation’s Issue Brief4 reports results of US studies where obese girls – and not boys – in kindergarten have many behavioural problems such as anxiety, loneliness, a low self-esteem, sadness, anger, arguing and fighting. Similarly, in third grade only overweight girls show depressive symptoms. This is probably a result of the views of modern society, which promotes the cult of physical appearance; this cult is widespread and tough on women and has the highest degree of moral authority. Namely, a thin body is perceived as a healthy body and a healthy body equals a good person13.

For Slovenia, only partial results for overweight prevalence exist. According to the IOTF cut-off points, the prevalence of overweight children among five-year-olds in the period 2003-05 was 12.5% and 16.7% in boys and girls, respectively. The obesity criteria are fulfilled in 4.1% boys and 4.7% girls. Among adolescents, 18.9% boys and 16.7% girls are overweight and 3.5% boys and 3.4% girls are obese16. The percentage of overweight and obese girls and boys between the ages 7 and 19 grew dramatically from 1983 to 2006, especially in younger age groups17.

The present study used data from the Sports educational chart fitness evaluation system which has been carried out in all Slovenian schools annually since 1991. Because of the huge amount of data created, only the results for girls were analysed and are presented in this article.

Materials and Methods

Sample

The repeated cross-sectional sample (Table 1) consists of all girls who participated in measurements for the Sport educational chart fitness evaluation system18,19 from 1991 to 2006. 90% of girls aged less than 15 years were included in the measurements, whereas the proportion of older girls (16 to 19 years) was between 60–80%, depending on the type of high school20. Measurements of body weight and height were conducted by PE teachers annually in April during the usual physical education lessons in all Slovenian schools according to a standard protocol18,19. Only healthy girls who were not exempt from physical education for health reasons and whose parents had given their written consent to participate in the measurements were measured.

In the first year of school (7-year-old children) an apparent increase in the number of girls is noted between 2000 and 2004. In that period, a gradual transition to the new nine-year long compulsory education started in Slovenia, meaning that children started school earlier. The smaller number of girls is noticed in other years as a result of the birth rate decreasing by more than one-third.

Data analysis

Data were analysed with the use of the SPSS 15.0 statistical package. The prevalence of overweight (excluding obesity) and obesity were determined according to the IOTF cut-off points11 separately for age (7- to 18-year-old girls, +/- 6 months) and the year of measurement (1991 to 2006). Confidence intervals for proportions were computed using Collett’s formula21.

Results

The prevalence of overweight and obese 7- to 18-year-old girls from 1991 to 2006 is shown in Tables 2 and 3. The 95% confidence interval width for the overweight proportion ranges from 1% to 3.1%, but is only wider than 2% for 7 years old girls. The 95% confidence interval width for the proportion of obese ranges from 0.4% to 2% and rarely exceeds 1%. The confidence interval width...
for the proportion of overweight and obese girls is never higher than 18.7% and 38.9%, respectively, of its point estimate. As the sample used in this study is not a probability sample, the above confidence intervals should only be used for descriptive purposes.

When the entire sample is considered, irrespective of the girls’ ages, the proportion of overweight and obese girls is almost steadily growing from 1991 to 2006. Although the overall prevalence of overweight and obese girls is continuously growing from 1991 to 2006,
the pattern of changes (Figures 1 and 2) remains almost the same. The percentage of overweight children has the highest values between the ages of 9 and 11 and then gradually decreases until the age of 18, whereas the percentage of obese children only rises from the age of 7 to 8 and up until the age of 18 it decreases to less than half its maximum value.

Discussion

There are some limitations of the study. Although the sample is large, it is not a probability sample of all girls aged 7–18 years in Slovenia. Namely, after 1996 (when new educational legislation was accepted) only healthy girls wishing to participate and having the written consent of their parents are included. Nevertheless, the same limitations apply even to probability sampling; further, the sampling procedure was the same throughout the study. Therefore, there is no reason for the described trends not to apply to the entire population. However, there is some reason to believe that the prevalence of overweight and especially obesity are in fact a little higher in the population than as described in this study since obese pupils are probably less likely to participate.

Undoubtedly the prevalence of overweight and obesity is taking on epidemic proportions. The percentage of overweight and obese girls in Slovenia has been rising almost constantly every year from 1991 to 2006, with the only real exception at the beginning of the period (in 1992), which is probably due to the establishment of the new country of Slovenia in 1991. In that year the migration of the population was not monitored and some nov-

<table>
<thead>
<tr>
<th>Year</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
<th>12</th>
<th>13</th>
<th>14</th>
<th>15</th>
<th>16</th>
<th>17</th>
<th>18</th>
</tr>
</thead>
<tbody>
<tr>
<td>1991</td>
<td>3.7</td>
<td>3.7</td>
<td>3.2</td>
<td>3.0</td>
<td>2.5</td>
<td>2.2</td>
<td>2.0</td>
<td>2.0</td>
<td>1.8</td>
<td>1.7</td>
<td>1.3</td>
<td>1.0</td>
</tr>
<tr>
<td>1992</td>
<td>4.0</td>
<td>3.0</td>
<td>2.8</td>
<td>2.3</td>
<td>2.0</td>
<td>1.8</td>
<td>1.5</td>
<td>1.5</td>
<td>1.4</td>
<td>1.4</td>
<td>1.1</td>
<td>0.8</td>
</tr>
<tr>
<td>1993</td>
<td>4.8</td>
<td>4.3</td>
<td>3.4</td>
<td>2.9</td>
<td>2.4</td>
<td>2.4</td>
<td>2.0</td>
<td>1.7</td>
<td>1.6</td>
<td>1.4</td>
<td>1.3</td>
<td>1.2</td>
</tr>
<tr>
<td>1994</td>
<td>5.5</td>
<td>4.4</td>
<td>4.1</td>
<td>3.2</td>
<td>2.6</td>
<td>2.5</td>
<td>2.4</td>
<td>2.1</td>
<td>1.9</td>
<td>1.7</td>
<td>1.4</td>
<td>1.3</td>
</tr>
<tr>
<td>1995</td>
<td>5.5</td>
<td>4.9</td>
<td>4.4</td>
<td>3.9</td>
<td>3.1</td>
<td>2.6</td>
<td>2.7</td>
<td>2.4</td>
<td>2.0</td>
<td>1.7</td>
<td>1.6</td>
<td>1.3</td>
</tr>
<tr>
<td>1996</td>
<td>5.6</td>
<td>4.9</td>
<td>4.6</td>
<td>4.0</td>
<td>3.6</td>
<td>2.9</td>
<td>2.7</td>
<td>2.3</td>
<td>2.3</td>
<td>1.7</td>
<td>1.5</td>
<td>1.5</td>
</tr>
<tr>
<td>1997</td>
<td>5.8</td>
<td>5.0</td>
<td>4.5</td>
<td>4.0</td>
<td>3.3</td>
<td>2.8</td>
<td>2.3</td>
<td>2.1</td>
<td>1.8</td>
<td>2.0</td>
<td>1.8</td>
<td>1.3</td>
</tr>
<tr>
<td>1998</td>
<td>5.2</td>
<td>5.2</td>
<td>4.9</td>
<td>4.1</td>
<td>3.6</td>
<td>3.2</td>
<td>2.8</td>
<td>2.2</td>
<td>2.4</td>
<td>2.0</td>
<td>1.7</td>
<td>1.5</td>
</tr>
<tr>
<td>1999</td>
<td>5.1</td>
<td>5.5</td>
<td>5.3</td>
<td>4.5</td>
<td>3.7</td>
<td>3.3</td>
<td>2.9</td>
<td>2.7</td>
<td>2.2</td>
<td>2.2</td>
<td>1.8</td>
<td>1.5</td>
</tr>
<tr>
<td>2000</td>
<td>6.3</td>
<td>5.3</td>
<td>5.5</td>
<td>4.7</td>
<td>4.2</td>
<td>3.7</td>
<td>3.0</td>
<td>2.6</td>
<td>2.4</td>
<td>2.4</td>
<td>1.9</td>
<td>1.8</td>
</tr>
<tr>
<td>2001</td>
<td>6.3</td>
<td>6.1</td>
<td>5.1</td>
<td>5.0</td>
<td>3.8</td>
<td>3.6</td>
<td>3.3</td>
<td>2.6</td>
<td>2.5</td>
<td>2.5</td>
<td>1.8</td>
<td>1.7</td>
</tr>
<tr>
<td>2002</td>
<td>6.3</td>
<td>5.7</td>
<td>5.4</td>
<td>4.4</td>
<td>4.1</td>
<td>3.1</td>
<td>3.0</td>
<td>2.7</td>
<td>2.3</td>
<td>2.1</td>
<td>2.0</td>
<td>1.3</td>
</tr>
<tr>
<td>2003</td>
<td>5.9</td>
<td>6.1</td>
<td>5.5</td>
<td>4.5</td>
<td>3.5</td>
<td>3.2</td>
<td>2.7</td>
<td>2.4</td>
<td>2.4</td>
<td>2.2</td>
<td>2.2</td>
<td>1.9</td>
</tr>
<tr>
<td>2004</td>
<td>6.5</td>
<td>6.4</td>
<td>6.3</td>
<td>5.1</td>
<td>4.4</td>
<td>3.4</td>
<td>3.3</td>
<td>2.6</td>
<td>2.5</td>
<td>2.4</td>
<td>2.1</td>
<td>2.2</td>
</tr>
<tr>
<td>2005</td>
<td>6.1</td>
<td>6.9</td>
<td>6.2</td>
<td>6.2</td>
<td>4.8</td>
<td>4.0</td>
<td>3.3</td>
<td>2.8</td>
<td>2.3</td>
<td>2.6</td>
<td>2.1</td>
<td>2.1</td>
</tr>
<tr>
<td>2006</td>
<td>6.5</td>
<td>7.0</td>
<td>7.0</td>
<td>6.0</td>
<td>5.7</td>
<td>4.5</td>
<td>3.6</td>
<td>3.1</td>
<td>2.9</td>
<td>3.0</td>
<td>2.5</td>
<td>2.5</td>
</tr>
</tbody>
</table>

Fig. 1. Proportion of overweight girls at different ages in Slovenia from 1991 to 2006.

Fig. 2. Proportion of obese girls at different ages in Slovenia from 1991 to 2006.
elities were introduced into the education system. Obesity is rising at higher rates than overweight, as it has more than doubled in just 15 years.

The proportion of overweight and especially obese girls is rapidly falling from around 11-year-old to 18-year-old girls. This might seem promising as it should lead to the conclusion that the proportion of obesity in adulthood, when it becomes a real health problem, is falling. In contrast, the WHO (infobase.who.int) estimates that the percentage of adult (15+ years) obese (BMI>30 kg/m²) females in Slovenia exceeds 25% and is twice as high as for males.

The age period between 11 and 18 years is marked in the Slovenian education system by the introduction of specialised physical education teachers; the results of motor tests significantly improve due to the greater systematic work, better working conditions for this age group (a smaller number of children per group) and better knowledge of sports teachers about the selection of suitable contents and the work load.

The prevalence of overweight and obesity, its secular trends and pattern of changes from childhood to adolescence in Slovenia are similar to those in many other countries in Europe and the rest of the world. Although data are not directly comparable with recent studies in other European countries, as reviewed by Lobstein & Frelut, due to methodological and other differences it seems that the prevalence of overweight children in Slovenia is in conformity with its geographical position in Europe. As an example, in 2000 the prevalence of overweight (including obese) 7-9-year-old girls in Slovenia was 21.8%, while the prevalence of overweight children (Lobstein & Frelut did not report the results separately for boys and girls) of the same age and in a similar period (most studies were done in 1997–2001) was around 30–35% in Mediterranean countries and around 20% in the other countries. With 14- to 17-year-old girls, the equivalent prevalence in Slovenia was 13.7%, while it ranged around Europe from 8–23%.

The increase in the proportion of both (overweight and obese) groups in developed countries is probably a result of several factors, although their relative impact in the epidemiology of obesity is somewhat controversial. It seems that one of the key factors is the change in dietary and physical activity patterns of young people. The way young people spend their free time has changed in recent years. Most studies show that girls are less physically active than boys in their free time and that the volume of free-time sportily active spending of free time. In the Slovenian part of the Health Behaviour in School-aged Children (HBSC) study, 8% of boys and 20% of girls were found to follow some kind of diet; at the same time 64% of boys and only 41% of girls were happy with their body weight. The proportion of people dieting with the intent of losing weight is increasing with age. 8% of girls thought that they are extremely overweight and 44% of girls thought that they are slightly overweight. The proportion of people who consider their body as being in shape is decreasing with age, while the proportion of people who think of themselves as overweight is rising.

Eating disorders have been noticed in numerous young people. It is estimated that about 5% to 10% of teenage girls have eating disorders; similar values can also be noticed for Slovenian high school girls.

The health consequences of overweight during childhood are less clear, but a systematic review shows that childhood obesity is strongly associated with risk factors of cardiovascular disease (CVD) and diabetes, orthopaedic problems and mental disorders. The number of children with health problems is also on the rise in Slovenia, particularly among the youngest children. A growing trend is noted for diseases of the muscular-skeletal system and mental and behavioural disorders.

Conclusion

Undoubtedly the prevalence of overweight and obesity is also taking on epidemic proportions in Slovenia. The percentage of overweight and obese girls in Slovenia was rising almost constantly every year from 1991 to 2006, with the only real exception at the beginning of the period (in 1992). Obesity is going up at higher rates than overweight, as it has doubled in just 15 years.

The proportion of overweight and especially obese girls is decreasing for girls between the ages of 11 and 18, which is probably a result of the quality physical education in schools and fashion trends that demand young girls to be thin. Nevertheless, data on the adult population show that the proportion of obese (BMI>30 kg/m²) females in Slovenia exceeds 25% and is twice as high as with males.

Warnings on these negative trends have already been issued for some time now; unfortunately, the government does not listen to the opinions of health and sports experts. Particularly in the last years a reduction in the hours of physical education lessons has occurred in high school programmes, with this being one of the biggest mistakes of educational policy-makers. Therefore, sports pedagogues and health workers are calling for an increase and not a decrease in the number of physical edu-
cation lessons. Further, certain measures that could contribute to a better status are also being suggested: the removal of vending machines offering unhealthy snacks from school premises, safeguarding the school neighbourhood so that children can walk or cycle to and from school, maintenance of playgrounds near the school thus allowing for spontaneous sports activity, an improvement of educational norms (a smaller number of children per teacher) and an improvement in the quality of physical education in the first few years of education involving the combined teaching of form teachers and PE teachers²⁷.

REFERENCES


SAŽETAK

Udio prekomerno debele djece i odraslih na području mnogih Europskih ali i drugih zemalja, u zadnjih nekoliko godina, u ubrzanoj stopi korak. Određene posljedice pretilosti već su vidljive kod mladih; u odrasloj dobi jedan su od doprinosa odraslinju i povećanju rizika za teške bolesti. Ova studija istražuje razmjere prekomjerne debljine i pretilosti kod slovenskih učenica između 7 i 18 godina, a rezultati su izraženi u razvojnom periodu. Stabilnost u trećem reduzilo je uspoređivanje demografskih i socijalno-konstrukcijskih podataka. Poddijeljeno je 120 učenica iz enovitih škola, a faktori su podijeljeni na geografske, etničke, socijalne i zdravstvene sredine. Rezultati pokazuju da je u ovom periodu udio prekomerno debele djece i odraslih veći od onog prilikom prethodne istraživanja. Ova studija pokazuje da je u ovom periodu udio prekomerno debele djece i odraslih veći od onog prilikom prethodne istraživanja. Ova studija pokazuje da je u ovom periodu udio prekomerno debele djece i odraslih veći od onog prilikom prethodne istraživanja. Ova studija pokazuje da je u ovom periodu udio prekomerno debele djece i odraslih veći od onog prilikom prethodne istraživanja. Ova studija pokazuje da je u ovom periodu udio prekomerno debele djece i odraslih veći od onog prilikom prethodne istraživanja. Ova studija pokazuje da je u ovom periodu udio prekomerno debele djece i odraslih veći od onog prilikom prethodne istraživanja. Ova studija pokazuje da je u ovom periodu udio prekomerno debele djece i odraslih veći od onog prilikom prethodne istraživanja. Ova studija pokazuje da je u ovom periodu udio prekomerno debele djece i odraslih veći od onog prilikom prethodne istraživanja. Ova studija pokazuje da je u ovom periodu udio prekomerno debele djece i odraslih veći od onog prilikom prethodne istraživanja. Ova studija pokazuje da je u ovom periodu udio prekomerno debele djece i odraslih većijih od onog prilikom prethodne istraživanja.