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Stabilisation in the prevalence of childhood overweight in Liechtenstein between 2004 and 2010

Abstract

Early detection and monitoring of overweight and obesity in childhood has become a public health priority worldwide in the 21st century. Therefore, the aim of this study was to estimate the current prevalence and trends in overweight and obesity among 5, 10 and 14 year-olds children in Liechtenstein. The study is based on a time series of 4 cross-sectional screening examinations conducted in 2004, 2006, 2008 and 2010 and included data of 2978 children (1490 boys and 1488 girls). Body mass index (BMI) was calculated on anthropometric measurements and categorised using international as well as German cut-off criteria. In 2010, the overall prevalence rate found for overweight (obesity) was 15.5% (3.8%) following the International Obesity Taskforce standards and 11.5% (4.9%) following the German standards, respectively. Over the focussed 6 year period, the combined prevalence (overweight and obesity) for the whole sample decreased, although formal statistical significance was not reached ($p > 0.05$). No gender differences in the prevalence of overweight and obesity were observed. In comparison with the increasing trends in most surveys, this study documents an apparent stabilisation of childhood overweight in Liechtenstein.

Zusammenfassung

Die systematische Überwachung von Übergewicht und Adipositas im Kindesalter bildet weltweit eine prioritäre Aufgabe der Gesundheitsvorsorge. In der vorliegenden Studie werden die Entwicklungstrends von Übergewicht und Adipositas bei Heranwachsenden in Liechtenstein für den Zeitraum von 2004 bis 2010 dokumentiert. Diese Trendanalyse basiert auf 4 querschnittlich-ausgerichteten Vorsorgeerhebungen des Amtes für Gesundheit. Die Stichprobe umfasste 2978 Kinder (1490 Knaben und 1488 Mädchen) im Alter von 5, 10 und 14 Jahren. Die Klassifizierung von Übergewicht und Adipositas erfolgte anhand internationaler und deutscher BMI-Grenzwerte. Unter Bezugnahme der International Obesity Taskforce-Kriterien umfasste die Prävalenz von Übergewicht (Adipositas) im Jahre 2010 insgesamt 15.5% (3.8%); gemäss deutschen Kriterien 11.5% (4.9%). Über alle Altersgruppen und Untersuchungsjahre betrachtet, zeigte sich eine rückläufige, jedoch statistisch nicht signifikante Tendenz ($p > 0.05$) in der Gesamtprävalenz (Übergewicht und Adipositas). Zwischen Knaben und Mädchen konnten keine signifikanten Unterschiede in der Übergewichts- und Adipositasprävalenz festgestellt werden. Im Vergleich zu den mehrheitlich besorgniserregenden Entwicklungstrends anderer Studien deuten vorliegende Befunde auf eine offensichtliche Stabilisierung des kindlichen Übergewichts in Liechtenstein hin.

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Introduction

Overweight and obesity in childhood and adolescence are associated with many adverse effects on health (e.g. cardiovascular disease, orthopaedic complications and psycho-social barriers) and a high risk of becoming an overweight adult (Dietz & Robinson, 2005; Singh et al., 2008; Speiser et al., 2005). The multicausality and complexity of the problem are a cause for concern. Seen in a long-term perspective and intending to develop appropriate public health policies, it is important to detect the problem already in early childhood. Therefore, the prevalence and trends of overweight and obesity in childhood need to be monitored systematically.

The number of overweight and obese children has increased worldwide, primarily in highly-developed countries (Jackson-Leach & Lobstein, 2006; Wang & Lobstein, 2006). Within Europe, the highest levels of childhood overweight (30–36%) can be found in Mediterranean countries; in the northern states the rate is about 10–20% (Jackson-Leach & Lobstein, 2006). Until now, only few studies (i.a. in Switzerland, France and Sweden) report stabilisation or decline in the prevalence of childhood overweight (Aeberli et al., 2010; Salanave et al., 2009; Sjoberg et al., 2008).

With this background, the purpose of this paper was the analysis of trends in overweight and obesity among preschoolers and school children in Liechtenstein based on a series of 4 cross-sectional studies from 2004 to 2010.

Methods

The data were derived from a current body mass index (BMI)-monitoring project undertaken by the Liechtensteinian public health department. Starting in 2004, this ongoing cross-sectional survey has been conducted at 2 year intervals as part of national screening examinations. For these paediatric investigations, all children aged 5 years (kindergarten), 10 years (primary school) and 14 years (secondary school) were invited to take part; participation was voluntary and free. The only inclusion criterion was the consensus of the parents. Anonymity and confidentiality were ensured. Since 2004, all in all 4855 children and adolescents have been invited to these screening examinations so far. The mean of participation rate (defined as the proportion of all children invited) was kindergarten 71.5%, primary school 64.6% and secondary school 51.5%.

Anthropometric data were obtained by doctors using standardised techniques. Height was measured barefoot using a stadiometer with an accuracy of ± 0.2 cm. Body weight was determined in underwear and barefoot using a calibrated digital scale exactly to ± 0.2 kg. From this data, BMI was calculated. The classification of overweight and obesity was based on age- and sex-specific BMI cut-off points as recommended by the International Obesity Task Force (IOTF; Cole et al., 2000) as well as on German reference values (Kromeyer-Hauschild et al., 2001). The IOTF criteria are used most frequently for international comparison. The German reference values (90th and 97th percentiles) are similar to the international criteria and more or less correspond to the adult BMI cut-off points of 25 and 30 kg/m^2. These cut-offs are preferably used in Germany and Austria; also the Swiss society of paediatrics recommends the German reference criteria (L'Allemand et al., 2006).

Statistical analysis was performed using SPSS (version 17). BMI-differences were analysed by using Mann-Whitney-U and Kruskal-Wallis-test; trends in overweight prevalence by using Chi-square-test, drawn at significant level of $p < 0.05$.

Results

The BMI results (mean ± standard deviation), stratified by sex, age and observation periods are summarised in *table 1*. Overall, the data set included 2978 children, of that 33.6% preschoolers, 36.9% primary school children and 29.5% children at secondary school age. The total gender ratio was balanced (50% girls; 50% boys). The prevalence of overweight and obesity is presented in *tables 2a* and *2b*.

Taking the observation period from 2010 (N = 773) into consideration and using the German reference values, the present data suggest that in Liechtenstein on average every 10th kindergarten child and about every 8th child aged 10 and 14 years was overweight (incl. obese). With the use of IOTF-criteria, the average values revealed that almost every 8th pre-schooler was affected by overweight (incl. obesity), at primary and secondary school level it was approximately every 6th child and adolescents. However this increase embracing the 3 school levels was neither significantly different between 5 and 10 year-olds (both references, $p > 0.05$) nor between 5 and 14 year-olds (both references, $p > 0.05$).

According to current data from 2010, the overall prevalence of overweight (incl. obesity) amounted to 11.5% (German) and 15.5% (IOTF), respectively. Compared with the baseline survey in 2004 (N = 733), this meant a slight, but only among girls and using German reference values statistically decrease of overweight prevalence, while the obesity rate remained at a stable level. Regardless of the reference used and without reaching statistical significance (due to the low number of cases), the proportion of overweight and obesity among 14 year-olds tended to be in decline since 2004. Also among the 10 year-old primary school children the overweight prevalence was declining, whilst the prevalence of obesity increased by 2010. Among the preschoolers the proportion of obesity (primarily girls) had doubled since 2004.

Discussion

Over the past 6 years, the prevalences of overweight and obesity remained at a stable level. No statistical difference could be detected between boys and girls, except in the combined prevalence among 10-year-olds in 2004 and using IOTF-references.

Comparing the 2 standards used, the IOTF criteria produced a higher prevalence in overweight and a lower prevalence in obesity than the German references because the international recommendations are less strict in their definition of overweight and more strict in the definition of obesity. The choice of the basic reference system therefore not only influences the figures of prevalence but eventually the comparability with other surveys, too.

In general, the observed distribution in this study is comparable with the prevalence of 10 - 20% in Northern European countries (Jackson-Leach & Lobstein, 2006). The comparison with our neighbouring countries is of particular interest. According to current findings (Freisling & Elmadfa, 2007; Kurth & Schaffrath-Rosario, 2007) 12.6% of all children and adolescents in Austria (3 to 15 year-olds) and 15.0% in Germany (5 to 17 year-olds) can be regarded as overweight (incl. obesity) based on German reference values. Despite the fact that these studies include unequal age groups, the overall prevalence for Liechtenstein is seen to be at a similar level as the one in Austria but lower than in Germany. In Switzerland (Aeberli et al., 2010), the overall prevalence (overweight and obesity) in 6 to 12 year-olds is currently at 18% (using the BMI references from the US Centers for Disease Control and Prevention [CDC]: 85th = overweight, 95th= obesity). A comparison with our data on the basis of the CDC-reference system is rather difficult.

Major strengths of this study are the 6 year observation period, the large national sample and the high participation rates (on average 61.3%), even though participation was voluntary. How far the 38.7% of those children, who did not participate, influence the generalizability of our findings cannot be answered precisely because no drop-out analysis was possible. A potential volunteer bias was possible, e.g. that some of the parents of overweight or obese children tended not to permit participation. No causal analysis or interpretation was possible because of the cross-sectional design of this study.

	2004		2006		2008		2010	
Age	N	BMI	N	BMI	N	BMI	N	BMI
5y								
Boys	99	15.6±1.3	152	15.7±1.8	118	15.7±1.8	148	15.8±1.5
Girls	110	15.5±1.8	144	15.6±1.5	99	15.9±1.7	131	15.6±1.8
10y								
Boys	150	18.2±3.1*	157	17.6±3.3	105	17.8±3.1	127	18.2±3.7*
Girls	150	17.5±2.5	153	17.7±2.8	135	17.5±2.8	122	17.4±2.8
14y								
Boys	108	20.9±3.3	102	20.5±3.5	93	20.6±3.8	131	20.0±3.2
Girls	116	21.2±3.6	126	21.0±3.6	88	20.5±2.8	114	20.7±3.8
All	**733**		**834**		**638**		**773**	

* Mann-Whitney-U-test: Significant gender differences ($p < 0.05$); Kruskal-Wallis-test: no significant differences between observation periods within age groups ($p > 0.05$).

Table 1: Body mass index (BMI, mean ± standard deviation) results of the Lichtenstein sample (n = 2978).

	German references (overweight+obesity)[a]			
Age	**2004**	**2006**	**2008**	**2010**
5y				
Boys	5.1 (2.0+3.0)	10.5 (7.2+3.3)	9.3 (5.1+4.2)	8.8 (5.4+3.4)
Girls	9.1 (7.3+1.8)	9.0 (4.9+4.2)	10.1 (4.0+6.1)	10.7 (4.6+6.1)
10y				
Boys	17.3 (12.7+4.7)	11.5 (7.0+4.5)	14.3 (7.6+6.7)	15.7 (10.2+5.5)
Girls	12.0 (9.3+2.7)	11.1 (5.2+5.9)	15.6 (10.4+5.2)	10.7 (4.1+6.6)
14y				
Boys	15.7 (10.2+5.6)	11.8 (6.9+4.9)	17.2 (11.8+5.4)	12.2 (9.2+3.1)
Girls	19.0 (9.5+9.5)	15.9 (11.9+4.0)	11.4 (8.0+3.4)	11.4 (6.1+5.3)
All				
Boys	13.4 (9.0+4.5)	11.2 (7.1+4.1)	13.3 (7.9+5.4)	12.1 (8.1+3.9)
Girls	13.3 (8.8+4.5)	11.8 (7.1+4.7)	12.7 (7.8+5.0)	10.9 (4.9*+6.0)

[a] overweight (> P90-P97); obesity (P > 97), Kromeyer-Hauschild et al. (2001)
* significantly different from 2004 ($p < 0.05$)

Table 2a: Overweight and obesity prevalence (%) in Liechtensteinian children by age and gender, using German reference criteria.

	IOTF references (overweight+obesity)[a]			
Age	**2004**	**2006**	**2008**	**2010**
5y				
Boys	6.1 (3.0+3.0)	12.5 (9.2+3.3)	11.9 (7.6+4.2)	10.1 (7.4+2.7)
Girls	11.8 (10.0+1.8)	15.3 (11.1+4.2)	17.2 (11.1+6.1)	13.7 (7.6+6.1)
10y				
Boys	24.0[b] (20.0+4.0)	13.4* (10.2*+3.2)	21.0 (16.2+4.8)	19.7 (15.0+4.7)
Girls	14.7 (12.7+2.0)	16.3 (11.1+5.2)	20.0 (17.0+3.0)	14.8 (11.5+3.3)
14y				
Boys	25.9 (22.2+3.7)	18.6 (14.7+3.9)	23.7 (19.4+4.3)	18.3 (16.0+2.3)
Girls	24.1 (19.0+5.2)	18.3 (15.9+2.4)	14.8 (13.6+1.1)	17.5 (14.0+3.5)
All				
Boys	19.6 (16.0+3.6)	14.4 (10.9*+3.4)	18.4 (13.9+4.4)	15.8 (12.6+3.2)
Girls	16.8 (13.8+2.9)	16.5 (12.5+4.0)	17.7 (14.3+3.4)	15.3 (10.9+4.4)

[a] cut-off points, extrapolated from a BMI of 25 kg/m^2 (overweight) and 30 kg/m^2 (obesity) at age 18, Cole et al. (2000)
* significantly different from 2004 ($p < 0.05$); [b] significant gender differences ($p < 0.05$)

Table 2b: Overweight and obesity prevalence (%) in Liechtensteinian children by age and gender, using international reference criteria.

Conclusions

A longterm monitoring assessment is of primary interest for overweight and obesity prevalence to be reliably assessed and estimated, as the present data illustrate. Over the focussed 6-year period, no significant changes in the prevalence of childhood overweight and obesity could be established. This study documented an apparent stabilisation in Liechtenstein, quite in contrast with the increasing trends in most surveys. This finding must not be regarded as an all-clear signal, but the development has to continue to be observed carefully.

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