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Brief original article

Differences in the prevalence of diagnosis of overweight-obesity in Spanish children according to the diagnostic criteria set used

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ABSTRACT

Objective: To examine relevant differences in the prevalence of overweight and obesity in children aged 2-15 years according to different sets of criteria (Orbegozo Foundation, International Obesity Task Force and World Health Organization), and how their use affects the trends in obesity recorded for both sexes between 1995 and 2011 in Spain.
Method: Cross-sectional study, a population between 2 and 15 years. Three diagnosis criteria of overweight and obesity were be used.
Results: The boys according to the three criteria, showed higher values of overweight and obesity compared to the girls. The lowest levels of overweight and obesity were observed using the Orbegozo tables.
Discussion: The prevalence of overweight and obesity varies significantly according to the criteria used to define overweight and obesity. The percentiles of the Foundation Orbegozo gave the lowest estimates and the standards of growth of the World Health Organization were higher.

Diferencias en la prevalencia del diagnóstico de sobrepeso-obesidad en los niños españoles según el tipo de criterio utilizado

Palabras clave:
Obesidad pediátrica
Diagnóstico

RESUMEN

Objetivo: Evaluar si existen diferencias relevantes entre los valores de prevalencia de sobrepeso y obesidad infantil en función de los tipos de criterios utilizados (Fundación Orbegozo, International Obesity Task Force, Organización Mundial de la Salud), y el modo en que su uso afecta a las tendencias sobre obesidad registradas para ambos sexos en España entre 2005 y 2011.
Método: Estudio transversal, en una población de entre 2 y 15 años de edad. Se usaron tres criterios diagnósticos de sobrepeso y obesidad.
Resultados: Los niños, según los tres criterios utilizados, presentaron valores superiores de sobrepeso y obesidad en comparación con las niñas. Las cifras más bajas de sobrepeso y obesidad se observaron al emplear las tablas de Orbegozo.
Discusión: Las prevalencias de sobrepeso y obesidad varían de manera significativa según los criterios utilizados para definir sobrepeso y obesidad. Los percentiles de la Fundación Orbegozo proporcionan las estimaciones más bajas, y los estándares de crecimiento de la Organización Mundial de la Salud las más altas.

Introduction

Obesity, which the World Health Organisation (WHO) refers to as a '21st century epidemic', is an increasingly important problem worldwide. Early diagnosis is vital in the prevention of its associated morbidity.

Despite their limitations, growth curves based on body mass index (BMI) are the tools most often used in epidemiological studies and screening programmes for determining childhood overweight-obesity. Indeed, their use is recommended by different expert groups.[1] However, no consensus exists that might allow the establishment of unified diagnostic criteria for childhood obesity.

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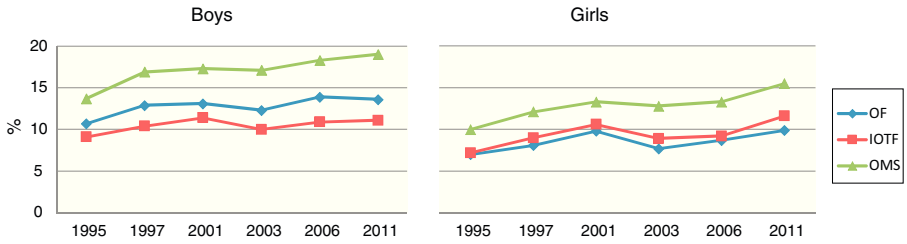

Figure 1. Prevalence of obesity in Spanish children according to sex and year depending on the diagnostic criteria set used. IOTF: International Obesity Task Force; OF: Orbegozo Foundation; WHO: World Health Organization.

Indeed, several institutions have established cut-offs in the hope of reaching agreement. The choice of reference curve is, of course, of great importance; a child of a particular sex, age and BMI might be classified as obese by one, but not by another[2] Two of the most commonly used sets of criteria for establishing obesity are those of the International Obesity Task Force (IOTF)[3] and the 2006 and 2007 criteria of the WHO for children aged 0-5 years and 5-19 years respectively.[4] Another criteria is Orbegozo Foundation (OF), used in Spain.[5,6]

The aim of the present work was to examine the differences in the prevalence of overweight and obesity in children aged 2-15 years arising from the use of different sets of criteria (OF, IOTF and

Table 1
Prevalence of overweight and obesity in Spanish children according to the set of diagnostic criteria used.

		OF			IOTF			WHO		
					1995					
		N	%	(95%CI)	n	%	(95%CI)	n	%	(95%CI)
Total	Overweight	131	7.2	(2.8-11.6)	224	12.4	(8.1-16.7)	260	14.4	(10.1-18.7)
	Obesity[b,c]	161	8.9	(4.5-13.3)	147	8.1	(3.7-12.5)	215	11.9	(7.6-16.2)
Boys	Overweight	65	7	(0.8-13.2)	112	12.1	(6.1-18.1)	149	16.1	(10.2-22)
	Obesity	99	10.7	(4.6-16.8)	84	9.1	(2.9-15.3)	127	13.7	(7.7-19.7)
Girls	Overweight	66	7.5	(1.1-13.9)	112	13	(6.5-18.9)	111	13	(6.4-18.8)
	Obesity	62	7	(0.6-1.4)	63	7.2	(0.8-13.6)	88	10	(3.7-16.3)
1997										
Total	Overweight[b,c]	138	7.8	(3.3-12.3)	236	13	(9.0-17.6)	249	14	(9.8-17.3)
	Obesity[b,c]	187	11	(6.1-14.9)	172	9.7	(5.3-14.1)	258	15	(10.2-18.8)
Boys	Overweight	73	8	(1.4-14.2)	128	14.1	(8.1-20.1)	130	14.3	(8.3-20.3)
	Obesity	117	12.9	(6.8-19)	94	10.4	(4.2-16.6)	143	16.9	(10.8-23)
Girls	Overweight	65	7.5	(1.1-13.9)	108	12	(6.2-18.6)	119	14	(7.5-19.9)
	Obesity	70	8.1	(1.7-14.5)	78	9	(2.6-15.4)	105	12	(5.9-18.3)
2001										
Total	Overweight[b,c]	598	11	(8.6-13.6)	1038	19	(16.8-21.6)	1243	23	(20.7-25.3)
	Obesity[b,c]	544	10	(7.6-12.6)	510	9.4	(6.9-11.9)	812	15	(12.5-17.5)
Boys	Overweight	309	11	(7.6-14.6)	548	20	(16.4-23.0)	683	25	(21.4-27.8)
	Obesity[b,c]	341	12	(8.8-15.8)	277	10	(6.5-13.5)	475	17	(13.7-20.5)
Girls	Overweight	289	11	(7.4-14.6)	490	19	(15.2-22.2)	560	21	(17.9-24.7)
	Obesity	203	8	(4.0-11.4)	233	8.9	(5.2-12.6)	337	13	(9.2-16.4)
2003										
Total	Overweight[b,c]	598	11.1	(8.6-13.6)	1038	19.2	(16.8-21.6)	1243	23	(20.7-25.3)
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	Obesity[b,c]	203	7.7	(4.0-11.4)	233	8.9	(5.2-12.6)	337	13	(9.2-16.4)
2006										
Total	Overweight[a,b,c]	677	11	(8.9-13.7)	1225	20	(18.1-22.7)	1430	24	(21.6-26.0)
	Obesity[a,b,c]	680	11	(8.9-13.7)	604	10	(7.7-12.5)	953	16	(13.6-18.2)
Boys	Overweight	366	11.9	(8.6-15.2)	645	20.9	(17.8-24)	788	25.6	(22.6-28.6)
	Obesity[b,c]	427	13.9	(10.6-17.2)	335	10.9	(7.6-14.2)	564	18.3	(15.1-21.5)
Girls	Overweight	311	11	(7.3-14.1)	580	20	(16.7-23.1)	642	22	(18.8-25.2)
	Obesity[b,c]	253	8.7	(5.2-12.2)	269	9.2	(5.7-12.7)	389	13	(9.9-16.7)
2011										
Total	Overweight[b,c]	443	12	(8.8-14.8)	723	19	(16.4-22.2)	839	22	(19.6-25.2)
	Obesity[b,c]	445	12	(8.9-14.9)	425	11	(8.3-14.3)	652	17	(14.5-20.3)
Boys	Overweight	265	13	(9.1-17.3)	418	21	(16.9-24.7)	494	25	(20.8-28.4)
	Obesity[b,c]	272	14	(9.5-17.7)	222	11	(7.0-15.2)	381	19	(15.1-22.9)
Girls	Overweight	178	10	(5.8-14.6)	305	18	(13.2-21.8)	345	20	(15.6-24.0)
	Obesity[b,c]	173	10	(5.4-14.4)	203	12	(7.2-16.0)	271	16	(11.2-19.8)

95%CI: 95% confidence interval; IOTF: International Obesity Task Force; OF: Orbegozo Foundation; WHO: World Health Organization.

[a] Significant difference between OF and IOTF results.

[b] Significant difference between OF and WHO results.

[c] Significant difference between IOTF and WHO results.

Significance was set at $p \leq 0.05$.

WHO), and how their use affects the trends in obesity recorded for both sexes between 1995 and 2011 in Spain.

Methods

Information in the Spanish National Health Survey (ENS, *Encuesta Nacional de Salud*) (1995, 1997, 2001, 2003, 2006 and 2011) was examined in this cross-sectional descriptive study. The ENS is a survey performed in Spain that gathers data on health and the factors that determine its quality. It provides information on perceived morbidity, lifestyle, habits related to risk factors, the use of health services, and preventive practices. It also allows data to be collected from people who have not recently used any health service. The surveyed population is selected by stratified multistage sampling.[7]

The present work examined data for the population aged 2-15 years between 1995 and 2011. Information was collected on the body weight, height and sex of the respondents, the BMI of each calculated, and the prevalence of overweight and obesity determined for girls (n = 11,663) and boys (n = 11,574) (with their 95% confidence intervals) according to three sets of criteria: *a)* OF tables for the body weight of Spanish children;[5] *b)* the IOTF criteria, used the percentiles values in children, with the aim of establishing pediatric breakpoints;[3] and *c)* the WHO growth standards for 2006/2007, which describe how much children ought to weigh between birth and adolescence.[4] The prevalence values obtained were then compared using the McNemar test. Significance was set at $p \leq 0.05$. All calculations were made using SPSS v.21.0 software for Windows.

Data were collected from secondary sources (public and anonymised data). It was not necessary to obtain the approval of Research Ethics Committee, according to Spanish law. Also, different national health surveys that were used as a secondary data source, had already obtained the permission of the Committee.

Results

Table 1 shows the results obtained. According to all three sets of criteria, overweight and obesity were nearly always more common among the boys (obesity 1995: 13.7%; 2011: 19.0%) than among the girls (obesity 1995: 10.0%; 2011: 16.0%). The lowest prevalence values for overweight were recorded when using the OF tables (OF 12.0%, IOTF 19.0%, WHO 22.0%), while the lowest for obesity were obtained when using the IOFT criteria (OF 12.0%, IOTF 11.0%, WHO 17.0%). The WHO criteria consistently returned significantly higher overweight and obesity prevalence values for both girls and boys.

Figure 1 shows all criteria sets to report a rising trend in obesity for both sexes between 1995 and 2003, then a small fall before rising again until 2011.

Discussion

The results show that the diagnostic criteria used to determine the prevalence of overweight and obesity can strongly affect the values obtained. The same child might be deemed of normal weight by one set of criteria, yet obese by another. If different sets of criteria are used, confusion can arise when examining trends over time or differences between regions or countries. Certainly, there are more than the three sets of criteria used in the present work, including those developed in the Enkid study,[8] those reported by Carrascosa,[9] and the two sets provided by the OF (1988[5] and 2011[6]). OF 1988 was used to monitor the growth and detect changes in its evolution. Moreover, the study is longitudinal as the WHO and IOTF criteria. FO 2011 criteria brings data from a cross-sectional study. So, the comparison of the results is difficult. In the USA, the criteria issued by the Centers for Disease Control are those most commonly used, but the information on which they are based is not representative of all countries; they cannot, therefore, be safely used outside the USA. Certainly, children deemed obese in some countries would be thought of normal weight in North America.[10]

Attempts have been made to solve the problems this causes in epidemiological studies when comparing countries with different ethnic and geographical characteristics. Indeed, in an initial proposal, the IOTF criteria were suggested for wider use,[3] followed by the candidacy of WHO criteria.[4] However, no international consensus exists regarding which criteria are best, and when nations use their own, home-developed rules, the complications only become worse.[11,12] Recently, the ALADINO study undertaken by the *Agencia Española de Consumo, Seguridad Alimentaria y Nutrición* also reported large differences in the prevalence values obtained when using different criteria for overweight and obesity.[13,14]

It is therefore important that consensus be reached regarding the criteria defining overweight and obesity in children. If none is reached, it will remain very difficult to compare the results of different studies and even come to decisions regarding the interventions that may be required.[15]

All the criteria sets examined in the present work showed a rise in the prevalence of obesity over the study period. According to the WHO criteria, which consistently returned the highest results, the prevalence of childhood obesity was lower between 1995 and 2003, at 11.9% and 15% respectively, rising to 17% by 2011. The results of the World Obesity Federation[15] agree with this finding. For example, Australia experienced a rise in childhood obesity from 11% in 1985 to 21% in 2008; in England, 9% of children were obese in 1974 compared to 25% in 2002; in Iceland, a rise was seen from 9% in 1969 to 24% in 1998; and in Scotland an increase was recorded from 9% in 1974 to 24% in 2010.

So, the WHO criteria are better than OF or IOTF because their international applicability and their methodological quality.

The use of different criteria may produce negative consequences at individual and institutional level. An increased in morbidity is produced if the diagnosis and treatment delayed. In relation to public policies would increases consumption of human and material resources.

In conclusion, the prevalence values for overweight and obesity in children may vary widely depending on the criteria used to define these conditions. The present work showed the WHO criteria set to return the highest values for both variables, both in boys and girls. This hinders the comparison of different studies, highlighting the need to formulate consensus criteria. Between 1995 and 2011, Spain experienced a trend towards a greater prevalence in childhood obesity (as shown by all criteria sets), highlighting the need to control this 21st century epidemic.

Editor in charge

Laura I. González Zapata.

Transparency declaration

The corresponding author on behalf of the other authors guarantee the accuracy, transparency and honesty of the data and information contained in the study, that no relevant information has been omitted and that all discrepancies between authors have been adequately resolved and described.

What is known about the topic?

Obesity has reached epidemic proportions in many parts of the world; the WHO refers to it as a 21st century epidemic. Studies on the prevalence of child overweight and obesity in Spain have suggested different results may be returned depending on the criteria used to define these conditions.

What does this study add to the literature?

This work confirms that the use of different criteria sets for overweight-obesity can significantly affect the prevalence values obtained for these conditions. The criteria set proposed by the WHO was found to consistently return higher prevalence values for both conditions than those proposed by the International Obesity Task Force or Orbegozo Foundation. The use of different criteria sets makes it difficult to compare the results of different studies and different populations.

Authorship contributions

All authors participated in the conception and design of the study. Ajejas Bazán MJ, Jiménez Trujillo MI, and Pérez Farinós N performed the analysis and interpretation of the data. Wärnberg J and Domínguez Fernández S conducted a critical review of the results obtained and data analysis. All authors participated in the drafting of the manuscript and approved its final version.

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Conflicts of interest

None.

References

1. Ministerio de Sanidad y Consumo. Primera conferencia de prevención y promoción de la salud en la práctica clínica en España. Prevención de la obesidad infantil y juvenil. Aten Primaria. 2008; 40:639-40.
2. Kaufer Horwitz M, Toussaint G. Indicadores antropométricos para evaluar sobrepeso y obesidad en pediatría. Bol Med Hosp Infant Mex. 2008;65:502–18.
3. International Obesity Task Force data, based on population weighted estimates from published and unpublished surveys, 1990-2002 (latest available) using IOTF-recommended cut-offs for overweight and obesity. (Accesed 03/05/2016.) Available at: http://www.iotf.org.
4. Organización Mundial de la Salud. Patrones de crecimiento infantil. (Accesed 03/05/2016.) Available at: http://www.who.int/childgrowth/standards/es/.
5. Hernández M, Castellet J, García M, et al. Curvas de crecimiento (0-14 años). Instituto de Investigación sobre Crecimiento y Desarrollo. Fundación Faustino Orbegozo. Bilbao, España; 1988. (Accesed 03/05/2016.) Available at: http://www.fundacionorbegozo.com/wp-content/uploads/pdf/estudios_1988.pdf.
6. Hernández M, Castellet J, García M, et al. Curvas de crecimiento (0-14 años). Instituto de Investigación sobre Crecimiento y Desarrollo. Fundación Faustino Orbegozo. Bilbao, España; 2011. (Accesed 03/05/2016.) Available at: http://www.fundacionorbegozo.com/wp-content/uploads/pdf/estudios_2011.pdf.
7. Encuesta Nacional de Salud de España. 1995-2011. (Accesed 03/05/2016.) Available at: http://www.msc.es/estadEstudios/estadisticas/encuestaNacional/encuesta1995.htm.
8. Serra Majem L, Ribas Barba L, Aranceta Bartrina J, et al. Obesidad infantil y juvenil en España, Resultados del estudio enKid (1998-2000). Med Clin. 2003;121:725–32.
9. Carrascosa Lezcano A. Estudio transversal español de crecimiento 2008, Parte II: valores de talla, peso e índice de masa corporal desde el nacimiento a la talla adulta. An Pediatr. 2008;68:552–69.
10. Ogden CL, Flegal KM, Carroll MD, et al. Prevalence and trends in overweight among US children and adolescents, 1999-2000. JAMA. 2002;288:1728–32.
11. Aranceta Bartrina J, Serra-Majem L, Foz-Sala M, et al., Grupo Colaborativo SEEDO. Prevalencia de obesidad en España. Med Clin. 2005;125:460–6.
12. Marrodán Serrano MD, Mesa Santurino MS, Alba Díaz JA, et al. Diagnosis de la obesidad: actualización de criterios y su validez clínica y poblacional. An Pediatr. 2006;65:5–14.
13. Agencia Española de Seguridad Alimentaria y Nutrición. Ministerio de Sanidad, Servicios Sociales e Igualdad. Estudio ALADINO 2013 (Alimentación, Actividad física, Desarrollo Infantil y Obesidad). (Accesed 03/05/2016.) Available at: http://www.naos.aesan.msps.es/naos/investigacion/ALADINO/.
14. Agencia Española de Seguridad Alimentaria y Nutrición. Ministerio de Sanidad, Servicios Sociales e Igualdad. Estudio ALADINO 2015 (Alimentación, Actividad física, Desarrollo Infantil y Obesidad). (Accesed 03/05/2016.) Available at: http://www.aecosan.msssi.gob.es/AECOSAN/docs/documentos/nutricion/observatorio/Estudio_ALADINO_2015.pdf.
15. World Obesity. World map of obesity trends (boys and girls). (Accesed 03/05/2016.) Available at: http://www.worldobesity.org/resources/trend-maps/?map=trend-maps-girls-boys.