



Review

Obesity and cancer: “Dangerous friendship”[☆]Carlos A. González Svatetz^{a,*}, Alberto Goday Arnó^{b,c}^a Unidad de Nutrición, Ambiente y Cáncer, Instituto Catalán de Oncología (ICO), L'Hospitalet de Llobregat, Barcelona, Spain^b Servicio de Endocrinología y Nutrición, Hospital del Mar, Departament de Medicina, Universitat Autònoma de Barcelona, Barcelona, Spain^c Centros de Investigación Biomédica en Red (CIBER) Fisiopatología de la Obesidad y Nutrición, Instituto de Salud Carlos III, Madrid, Spain

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ABSTRACT

Obesity and cancer are one of the most important health problems in Spain. Between 23 and 28% of the adult population in Spain are obese, 39% are overweight and 36% have abdominal obesity. The association between obesity and type 2 diabetes mellitus, hypertension, dyslipidemia and sleep obstructive apnea is well known. On the contrary, the association between obesity and cancer is less known, because the recent evidence on it. Several prospective studies have shown during the last years the strong relationship between obesity and cancer of colon, breast in post-menopausal women, endometrial, kidney and pancreas as well as esophageal adenocarcinoma. Furthermore there is recent evidence showing that liver, gallbladder, thyroid and ovarian cancer as well as leukaemia, multiple myeloma and Hodgkin lymphomas are probably associated with obesity, yet more studies are needed. A better knowledge of the relation between cancer and obesity will allow improving the prevention strategies against cancer, a more efficient early detection, and a more suitable treatment of obesity and overweight. Although the mechanisms of carcinogenesis of obesity are not well established, avoiding overweight and obesity are considered one of the best approaches to reduce the risk of cancer. Therefore the general population must be aware that cancer is one of the most important hazards associated with the current obesity epidemic in our society.

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Obesidad y cáncer: «las amistades peligrosas»

RESUMEN

Obesidad y cáncer son 2 problemas sanitarios de primera magnitud en España. La obesidad afecta al 23–28% de la población adulta española, y el sobrepeso y la obesidad abdominal al 39 y 36%, respectivamente. Es bien conocida la relación entre obesidad y diabetes mellitus tipo 2, hipertensión arterial, dislipidemia, y apnea obstructiva del sueño. Menos conocida es en cambio la asociación con el cáncer, porque la evidencia es más reciente. Numerosos estudios prospectivos han demostrado en los últimos años, con un alto grado de evidencia científica, una asociación clara entre la obesidad y los cánceres de colon y recto, mama en mujeres pos-menopáusicas, endometrio, riñón, esófago y páncreas. Esta asociación es también probable con los tumores de hígado, vesícula biliar, cardiaca, tiroidea, y hematológicos, para los que se requieren más estudios. Un mejor conocimiento de la relación entre obesidad y cáncer puede permitir mejorar las estrategias de prevención del cáncer, así como una más eficiente detección precoz, y un tratamiento más adecuado de la obesidad y el sobrepeso. Aunque los mecanismos por los cuales la obesidad induce los distintos tipos de cánceres no son suficientemente conocidos, evitar el

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sobrepeso y la obesidad es hoy una de las medidas más efectivas para reducir el riesgo de cáncer, por lo que es necesario concienciar a la población general sobre uno de los mayores peligros que entraña la actual epidemia de obesidad.

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Obesity in Spain

Obesity and cancer are 2 major health problems.^{1–3} While they may seem unrelated, scientific evidence shows a very strong relationship between obesity and cancer, which clearly establishes what we could call a “*dangerous friendship*”. When considering the comorbidities associated with excess weight, we generally include prevalent processes such as type 2 diabetes (DM2), hypertension and dyslipidaemia (classic cardiovascular risk factors⁴), arthropathy and obstructive sleep apnoea syndrome, among others. Cancer is rarely included in this association, if at all.⁵

Obesity is considered to be a 21st-century epidemic.¹ Weight status analyses in the various population studies conducted in the last 35 years show a gradual increase in mean sample weight,⁶ and indicate that the Spanish population has not been immune to this global pandemic either.^{7,8} The evolution of the prevalence of obesity in Spain, according to data from the national health survey, is shown in Fig. 1. It shows a gradual, steady increase in levels, rising from 7.7% in 1987 to 13.6% in 2001, over all age groups and in both sexes.⁹

One of the most alarming facts comes from analysing trends in the prevalence of the various grades of obesity. During the period from 1993 to 2006, grade 1 obesity (body mass index [BMI] 30–34 kg/m²) increased by 50%, grade 2 (BMI 35–39 kg/m²) by 110%, and morbid obesity (BMI ≥ 40 kg/m²) by 240%.¹⁰ The number of obese individuals in Spain is therefore growing, as is the number and proportion of individuals with extreme levels of overweight.

Information from health surveys, together with various regional and local studies in Spain had estimated the prevalence of obesity through direct anthropometry; pooling data from some of these studies enabled this prevalence to be analysed (SEEDO).^{11,12} These data were the most widely used reference for many years, in the absence of specific national studies.

Recent epidemiological studies have provided data with direct measurement of weight and height in broad samples representative of the entire Spanish population (Table 1). The ENRICA study analysed a population sample of 12,883 individuals over the age of 18 between 2008 and 2010.¹³ The estimated prevalence of obesity was 22.9% (24.4% in men and 21.4% in women), and abdominal obesity—defined as a waist circumference over

102 cm or 88 cm—was 36% (32% in men and 39% in women). A gradual increase was observed in the prevalence of general and abdominal obesity with age, affecting 35% and 62% of persons aged over 65 years. The Di@bet.es study,¹⁴ a population study of 5072 individuals over the age of 18 carried out in Spain between 2009 and 2010, found a prevalence of obesity of 28.25% (28.9% in men and 27.5% in women) by directly measuring weight and height. Both the ENRICA¹³ study and the Di@bet.es¹⁴ study showed a higher prevalence of obesity in men in the under-60 age groups only, while it was more common in women after that age.

More recently, investigators in the DARIOS study, consisting of pooled analysis of data from 11 Spanish studies on cardiovascular risk factors conducted between 2000 and 2010 with a sample of 28,743 people aged between 35 and 74 years, also determined a prevalence of obesity of 28% in men and 28.3% in women.¹⁵

Both local/regional and national studies^{13–15} show significant heterogeneity in the prevalence of obesity in Spain, in that it is clearly higher in the south, specifically in Andalusia¹⁶ and the Canary Islands,^{17,18} than in the north.¹⁹

The prevalence of overweight for men and women in the 3 national studies was as follows: 46.4% and 32.5%, respectively, in the ENRICA study; 47.5% and 34% in the Di@bet.es study; and 50.7% and 35.6% in the DARIOS study. The prevalence of abdominal obesity (defined as previously) for both sexes combined in the 3 studies was 36%, 35.7% and 36%, respectively.

Specific studies in the active working population, including younger, healthy individuals, have detected lower levels of obesity (17% in men and 7.7% in women), but alarmingly similar levels of overweight, especially in men (44.8% in men and 21.3% in women).²⁰ A gradual increase in the prevalence of obesity was also observed over the 4 years studied.

The prevalence of obesity is clearly associated with DM2, hypertension and dyslipidaemia.¹⁵ Obesity is also associated with low levels of physical activity,²¹ low socioeconomic status and education level, and unhealthier eating habits.²²

Obesity and cancer

Various international committees of experts have conducted a systematic review of the epidemiological evidence. In 2002, the International Agency for Research on Cancer (IARC)²³ concluded that colon, breast, renal and endometrial cancer and oesophageal adenocarcinoma could be prevented by avoiding weight gain. A more recent report from an international committee of experts evaluating the evidence up to 2006²⁴ confirmed these associations and added to the list. They concluded that there is sufficient convincing evidence (Table 2) of a positive causal association between general obesity and colon and rectal cancer, breast cancer in postmenopausal women, renal, endometrial and pancreatic cancer and oesophageal adenocarcinoma, and between abdominal obesity and colorectal cancer (CRC). General obesity is probably positively associated with gallbladder cancer and negatively associated with breast cancer in premenopausal women, while abdominal obesity is probably positively associated with pancreatic, endometrial and breast cancer in postmenopausal women.

Finally, in another systematic review and large meta-analysis of prospective studies,²⁵ a strong positive association was found

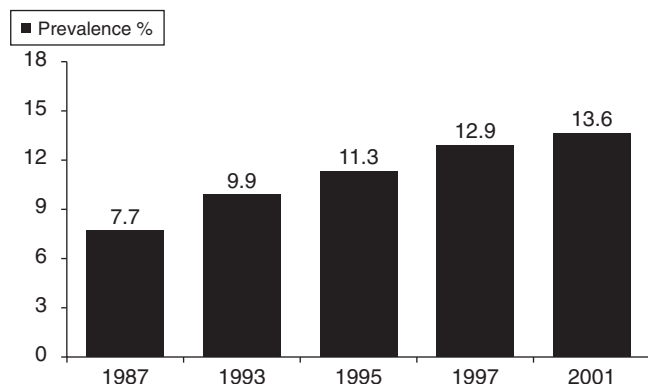


Fig. 1. Evolution of the prevalence of obesity in Spain according to national health survey data.

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