A prospective study of obesity and cancer risk (Sweden)

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Received 20 February 2000; accepted in revised form 7 August 2000

Key words: cohort, neoplasms, obesity.

Abstract

Objective: We evaluated the relation between obesity and the risks for various forms of cancer.

Methods: In a population-based cohort of 28,129 hospital patients (8165 men, 19,964 women) with any discharge diagnosis of obesity (9557 only diagnosis, 5266 primary, 13,306 secondary) during 1965–1993, cancer incidence was ascertained through 1993 by record linkage to the nationwide Swedish Cancer Registry. Cancer risk was estimated using the standardized incidence ratio (SIR, with 95% confidence interval), which is the ratio of the observed number of cancers to that expected.

Results: Overall, a 33% excess incidence of cancer was seen in obese persons, 25% in men and 37% in women. Significant risk elevations were observed for cancers of the small intestine (SIR = 2.8; 95% CI 1.6–4.5), colon (1.3; 1.1–1.5), gallbladder (1.6; 1.1–2.3), pancreas (1.5; 1.1–1.9), larynx (2.1; 1.1–3.5), renal parenchyma (2.3; 1.8–2.8), bladder (1.2; 1.0–1.6), cervix uteri (1.4; 1.1–1.9), endometrium (2.9; 2.5–3.4), ovary (1.2; 1.1–1.5), brain (1.5; 1.2–1.9), and connective tissue (1.9; 1.1–3.0), and for lymphomas (1.4; 1.0–1.7), with higher risk observed for Hodgkin’s disease only in men (3.3; 1.4–6.5) and for non-Hodgkin’s lymphoma only in women (1.6; 1.2–2.1). The association of obesity with risk of breast, prostate and pancreas cancers was modified by age.

Conclusions: Obesity is associated with more forms of cancer than previously reported.

Introduction

Because obesity is increasingly common among economically developed populations its associated morbidity deserves careful study. With prevalence rates approaching or exceeding 30% among older age groups in Europe and the United States [1–3], obesity has become a major public health problem in developed countries. Around the world the prevalence of obesity has increased over time and appears to affect all age groups, including children [4].

It is well documented that obesity predisposes to diabetes, cardiovascular disease, and various digestive and musculoskeletal disorders, and a positive association has been reported between increasing body mass index and overall mortality [5–8]. In contrast, the risks of site-specific cancers associated with obesity are less well established. Although numerous case-control and cohort studies have investigated the relation of relative body weight with selected major cancers [9], there have been few long-term studies of cancer incidence or mortality overall and by cancer site [5, 10, 11]. Indeed, for some forms of cancer the relation to obesity has not been adequately assessed.

Our aim was to study risk of total and site-specific incident cancers in relation to obesity by comparing cancer incidence in a large Swedish cohort of hospitalized patients with a discharge diagnosis of obesity and with virtually complete follow-up extending up to 29 years, with cancer incidence in the general Swedish population.
Patients and methods

Study cohort

In Sweden there is virtually no private inpatient treatment, thus hospital-provided medical services are population-based and referable to the county in which the patient lives. In 1964–1965 the National Board of Health and Welfare started collecting data on individual hospital discharges in the Inpatient Register. In addition to national registration numbers (unique personal identifiers assigned to all Swedish residents), each record contains administrative and medical data such as hospital department and up to eight discharge diagnoses. The diagnoses are coded according to the seventh revision of the International Classification of Diseases (ICD7) through 1968, the eight revisions until 1987, and the ninth revision thereafter. The number of hospitals delivering data to the register has increased steadily: the register covered 60% of the Swedish population in 1969, 75% in 1978, and 85% by the end of 1983 [12]. From 1987 the register attained complete nationwide coverage.

All patients recorded in the Inpatient Register with a discharge diagnosis of obesity (ICD7 = 287.00, 287.09; ICD8 = 277.99; ICD9 = 278A) were initially selected for inclusion in the study. A total of 36,159 unique IDs were registered at least once with a diagnosis of obesity between 1965 and 1993.

Validity of obesity diagnosis

To facilitate generalization of our findings we evaluated the validity of the register data using 239 patients randomly selected from the obesity cohort. The hospital records for these patients were reviewed for data on height, weight, and concomitant discharge diagnoses at the time of the first in-hospital diagnosis of obesity. Body mass index (BMI) was calculated as weight/height$^2$ (kg/m$^2$). Mean (±SD) and median of BMI was used to characterize the patients. As a measure of validity of the obesity diagnosis we calculated the positive predictive value. For men, according to the FAO/WHO/UNU Expert Consultation [13], a BMI higher than 30.0 kg/m$^2$ and for women BMI higher than 28.6 kg/m$^2$ were classified as obese; the corresponding values for overweight are 25.0 kg/m$^2$ and 23.8 kg/m$^2$.

Medical records were retrieved for 221 (92.5%) of 239 patients (155 in referral hospitals, 66 in local hospitals). At the time of the first obesity diagnosis, information on height and weight was available for a total of 165 patients, 86% of the men and 74% of the women. Table 1 presents BMI values by age for adult (>18 years) men and women. In the study sample, 15% of the men and 5% of the women had BMI values lower than the cutpoint for obesity, i.e. the positive predictive value of obesity diagnosis in our study was 85% in men and 95% in women. However, all patients were overweight.

We found no important differences in BMI between cases in which obesity was the single diagnosis or the first of several diagnoses. The median BMI was 35.3 kg/m$^2$ (range 27.5–50.8) among men assigned their first obesity diagnosis at departments of internal medicine, 38.1 kg/m$^2$ (31.4–42.4) at surgical departments, and 32.8 kg/m$^2$ (27.1–43.0) at a specialized obesity unit. For women the corresponding median BMIs were 36.1 kg/m$^2$ (24.1–48.8), 36.1 kg/m$^2$ (27.3–44.8), and 35.1 kg/m$^2$ (30.1–48.4). Table 1 also shows the most frequent accompanying diagnoses at first hospitalization in relation to the BMI values. Among 17.1% of the men and 28.9% of the women there was no concomitant hospital diagnosis.

Follow-up

Record linkage of the study cohort to the nationwide Register of Causes of Death allowed us to identify information on date of death among those deceased...