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SHORT COMMUNICATION

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# Short- and long-term mortality in a prevalent cohort of morbidly obese patients in Italy

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**Summary** *Background* Morbid obesity has been associated with increased mortality. *Aim of the study* We evaluated the risk of short- (2 years) and long-term (10 years) mortality in two consecutive series of Italian morbidly obese patients hospitalized in a Metabolic Unit. *Methods* The vital status of 569 patients (435 females and 134 males, BMI 44.4 kg/m$^2$, age 46.1 years), first admitted for clinical treatment in two separate periods (1988 and 1996), was ascertained in 1999. *Results* Twenty-seven deaths were identified and compared with expected deaths according to mortality rates in the Italian population, to estimate the standardized mortality ratio (SMR). In the first two years after admission only 3 deaths were observed and the SMR tended to be reduced (SMR = 0.5, 95 % CI 0.1–1.5). In contrast, the long-term follow-up showed a significantly elevated risk of death (SMR = 1.6, 95 % CI 1.1–2.4). *Conclusions* The follow-up of this Italian prevalent cohort confirm that morbid obesity is associated with increased mortality. The observed SMR might have been attenuated by inclusion in our study of subjects with relatively good health conditions, who are possibly more representative of the general obese population than subjects affected by important obesity-related complications, observed in other studies. The excess risk was not evident in the first two years after clinical treatment.

**Key words** obesity – mortality – standardized mortality ratio – follow-up

## Introduction

Prospective studies have shown a positive relationship between obesity, measured as body mass index (BMI), and mortality from different causes, especially cardiovascular diseases (CVD) and cancer [1–3]. The effects of race, sex, age, and smoking habits are not completely clear [4, 5]. Data on Mediterranean populations including Italian subjects are scarce. Recently, the RIFLE project, based on the pooling of nine different large-scale studies in Italy, reported the lowest mortality rate for subjects included in a category of BMI (between 27 and 30) usually considered overweight and already at risk [6]. A small prospective study in a rural area of southern Italy, with 8 years of follow-up, showed a significantly elevated risk of death for subjects with BMI levels above 30 [7].

In the largest prospective study of morbidly obese patients conducted so far, risk ratios for patients with BMI ≥40 were 3.05 in men and 2.31 in women [8]. Little data are available on the Italian population [9, 10], and the results do not give a clear answer on this important topic.

We had the opportunity to assess the vital status of a prevalent cohort of 569 severely obese patients who had been treated in a Metabolic Unit in Northern Italy with a clinical program. Both short- and long-term mortality was evaluated.

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## Research methods and procedures

All patients admitted for the first time to the Metabolic Unit of a specialized hospital (Ospedale San Giuseppe, Istituto Auxologico Italiano, Piancavallo, Italy) from January to December 1988 and in the second half of 1996 were included in the study. Patients suffering from obesity related to endocrine diseases (e. g., Cushing disease, hypothyroidism, etc.) were excluded; the distribution of co-morbidity, similar in the two groups, is 47 % cardiovascular diseases, 14 % diabetes, 3 % respiratory problems, 26 % orthopedic affections. Vital status of subjects admitted in 1988 was individually ascertained through municipal registries of residents. Those admitted in 1996 were contacted and interviewed by telephone, to gather additional data for a specific study: the vital status of non-responders (18 subjects among 290) was ascertained with the same procedure used for the 1988 subjects. For all deceased subjects, the cause of death was provided by the local health authorities, and coded according to the International Classification of Diseases, Ninth Revision (ICD–9).

The total mortality observed in our series was compared with the general mortality expected on the basis of 5-year age group-, sex- and calendar-time specific mortality rates in the Italian population. The degree to which general mortality in this series of patients differs from that of the general population was measured by the ratio of observed-to-expected cases. This ratio is known as the standardized mortality ratio (SMR), a reliable estimate of the relative risk of dying of these patients in comparison with the general population; the 95 % confidence intervals (95 % CIs) were calculated assuming that the observed deaths follow a Poisson distribution [11]. SMRs for the first two years of follow-up (short term) were computed on the whole cohort, while the risk of long-term mortality (not less than 10 years) was evaluated only on the cohort of patients first admitted in 1988.

## Results

Overall 569 patients (279 admitted in 1988 and 290 in 1996) were identified and followed up from the date of admission to our clinic, until death or until December 31, 1999. Only six patients (1 %) were lost to follow-up.

Characteristics of the subjects, overall and according to year of admission, are reported in Table 1. The whole cohort provided information for the 2-year follow-up, for which approximately 1,100 person-years at risk were available: three deaths were recorded in comparison with 5.8 expected (SMR = 0.52; 95 % CI 0.1–1.5). The 279 subjects recruited in 1988 provided 3,004 person-years for the long-term analysis (average follow-up = 10.8 years). Twenty-five deaths were observed (one in the first 2 years, 24 in the following period), with 15.5 deaths expected, suggesting a significantly increased general mortality risk at 10 years (SMR = 1.61; 95 % CI 1.1–2.4). We registered 8 deaths for cardiovascular diseases, 7 for metabolic diseases, 5 for cancer, 3 for respiratory diseases, 1 for gastric bleeding, and 1 for accidental intoxication; for 2 deaths the cause was not available.

## Discussion

It is currently estimated that the prevalence of severe obesity (BMI $\geq$40 kg/m$^2$) is about 1.8 % in men and 3.8 % in women in the United States [12], with a tendency to increase, as confirmed by recent results of the CARDIA study [13]. In Italy, in a representative sample of the population of Florence (age 40–64 years), the percent of subjects with a BMI of 40 or more kg/m$^2$ was 1.1 in both sexes [14]. In the present study, a 61 % increased risk of dying over at 10-year period is shown in a prevalent cohort of morbidly obese patients, as compared to the general Italian population.

Increased mortality related to overweight has been shown in several prospective studies, although direct comparisons of results are often difficult. To date, the largest cohort of obese subjects (n = 6,193), recruited from 1961 to 1994 in Germany, was described by Bender et al. [8]. In that study SMRs, referred to the general German population, appeared higher (SMR = 3.05, 95 % CI 2.47–3.73 in males and SMR = 2.31, 95 % CI 2.04–2.60 in females) than those found when we compared our subjects to the general Italian population. However, as commented by the authors, this large sample of obese patients cannot be considered representative of the

**Table 1** Characteristics of the 569 obese patients

| | 1988 | 1996 | Total |
|---|---|---|---|
| Number of patients (Females/Males) | 218/61 | 217/73 | 435/134 |
| Age in years, mean (std*) | 42.3 (14.1) | 49.7 (14.9) | 46.1 (15.0) |
| Length of hospitalization in days, mean (std) | 46.7 (17.1) | 29.4 (7.1) | 37.9 (15.6) |
| Baseline body mass index (BMI) in kg/m$^2$, mean (std) | 46.2 (5.4) | 42.6 (6.9) | 44.4 (6.5) |
| Discharge body mass index (BMI), kg/m$^2$, mean (std) | 40.9 (5.1) | 39.8 (6.4) | 40.3 (5.8) |
| Weight loss kg/week, mean (std) | 2.2 (1.3) | 1.8 (0.9) | 2.0 (1.1) |

* *Std* standard deviation

obese population in Germany, since these subjects were likely to have more symptoms associated to obesity than the remaining obese population living in the same area.

An Italian series of 264 obese subjects (mean age = 41.1 years and mean BMI = 47.2 kg/m$^2$) [9] showed an increased mortality when compared to the general population. The SMRs were 6.9 in women of 25–54 years of age and 3.5 in women aged 55–72 years, while SMRs were slightly lower in men (4.3 and 1.6, respectively). The study was based on obese patients referred to the Metabolic Unit of a general hospital from 1972 to 1985. The increased mortality reported by the authors was probably due to the inclusion of severely ill patients, a hypothesis supported by the excess CVD deaths. Due to the relatively small sample size of our study, we did not compute cause specific mortality rates. Patients referred to our hospital, which specifically treats obese patients, can not be considered representative of the Italian obese population. The clinical protocol includes diet-therapy, physical training and, since 1996, psychological tests: it is unlikely that severely ill patients would seek admission to our facility. In addition, hospitalization for a long period is usually requested: this selection could contribute to an underestimation of risk in our study. Findings from the American Cancer Society cohort [15] suggested a risk reduction in women that intentionally lost weight during the follow-up period: this effect could also help attenuating mortality rates.

Additional information about possible risk factors (smoking, waist/hip, body composition, blood pressure, biochemical indicators, etc.) could be useful in a larger sample of patients, but were not available for this cohort. The reduced mortality observed in the short-term follow-up, although not statistically significant, could be the result of the clinical training. Weight loss obtained during hospitalization, and probably maintained for a period after discharge, might have reduced general morbidity, with positive effects also on mortality.

In summary, although probably attenuated by the self-selection of patients admitted to our hospital, the present results confirm an increased risk of long-term mortality related to severe obesity in an Italian prevalent cohort. Appropriate public health strategies need to be developed to improve obesity prevention in the general population and, when needed, greater access of morbidly obese patients to specialized medical care should be encouraged.

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