

# Trends in Morbid Obesity and in Bariatric Surgeries Covered by the Brazilian Public Health System

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## Abstract

**Background** Obesity is an increasingly serious public health problem on a global level. Morbid obesity, defined as a body mass index greater than 40 kg/m<sup>2</sup>, is associated with increased mortality and a high burden of obesity-related morbidities.

**Methods** To study the prevalence of morbid obesity in Brazil, three national anthropometric surveys were reanalyzed. Data about bariatric surgeries were obtained from the Ministry of Health Hospital Information System, which is available online.

**Results** A 255% rise in the prevalence of morbid obesity was observed, starting at 0.18% in 1975–1976 and growing to 0.33% in 1989 and 0.64% in 2002–2003. There was a higher rate in the South in the first two surveys, but the prevalence in the Southeast rose steadily, reaching 0.77% in 2002–2003 and overtaking the South. Since 1999, the

Brazilian Unified Health System has covered surgical treatment for morbid obesity. From 2000 to 2006, there was a sixfold increase in the number of surgeries, which topped the 2,500 mark in 2006. The geographic distribution of these surgeries is heavily concentrated in the Southeast, the most developed region of Brazil, where there is also the highest prevalence of morbid obesity. This was followed by the Southern region.

**Conclusions** The figures for the rise in morbid obesity in Brazil are startling, especially the increase among men. This is a situation that calls for further study, alongside measures to encourage the adoption of healthy lifestyles. Preventive measures aimed at slowing down or reversing the obesity epidemic are urgently required.

**Keywords** Morbid obesity · Bariatric surgery · Unified Health System · Brazil

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## Introduction

Obesity today is no longer only a problem for the so-called developed countries; rather, it is increasingly affecting growing portions of the most underprivileged population strata [1, 2]. Sedentary lifestyles and the consumption of inappropriate diets are two of the key determining factors for this. The nutritional transition in Brazil from a more traditional dietary pattern to a Western dietary pattern has been associated with an increase in the overall prevalence of overweight and obesity [2, 3], which is consistent with trends seen in many other countries. Obesity affects health in a number of ways and is of itself an independent risk factor for increased mortality. It leads to a predisposition for a number of cardiovascular risk factors, including hypertension, high cholesterol, impaired glucose tolerance, and

other obesity-related disease risks, such as sleep apnea, osteoarthritis, increased anesthetic risk, and reproductive abnormalities.

The body mass index (BMI) is an easily obtainable and relatively reliable indicator of overweight and obesity in adults. The current international diagnostic criterion for obesity in adults is based on epidemiological data and is set at a BMI  $\geq 30$  kg/m<sup>2</sup>. Morbid obesity, extreme obesity, or class III obesity occurs when the BMI  $\geq 40$  kg/m<sup>2</sup>. Because morbidity and mortality increase gradually with excess BMI, it is common practice to set the diagnostic criteria not only for obesity but also for overweight individuals, i.e., 25.0 to 29.9 kg/m<sup>2</sup> [4, 5].

On a global level, the World Health Organization estimates that there are 1.6 billion overweight adults and approximately 400 million obese adults (aged 15 or above). There are no estimates for the global prevalence of morbid obesity [6].

Data from the 1999–2002 US National Health and Nutrition Examination Survey found that there was a 4.9% rate of morbid obesity among Americans of both sexes aged 20 or over. This was distributed unevenly, ranging from 2.9% among Mexican American men to 13.5% among non-Hispanic black women [7]. Another country with national figures is England, where morbid obesity afflicts 2.0% of the population [8].

Three national population-based studies have been conducted in Brazil to date, collecting anthropometric data for adults: the National Household Budget Survey (ENDEF) in 1974–1975 [9], the National Survey on Health and Nutrition (PNSN) in 1989 [10], and more recently, the Family Expenditure Survey (POF) in 2002–2003 [11], all conducted by the Brazilian Institute of Geography and Statistics (IBGE). These studies have shown a steady increase in obesity (BMI  $\geq 30$  kg/m<sup>2</sup>) from 4.4% in 1974–1975 to 8.2% in 1989 and 11.1% in 2002–2003. When the data were analyzed according to gender, it was found that the obesity rate among men was 5.1% in 1989, rising to 8.8% in 2002/2003, which represents a 4.1% increase per year. Meanwhile, the prevalence of obesity among women was 12.4% in 1989 and 13.0% in 2002/2003 or a 0.4% increment per year [11]. The growth rate of obesity among Brazilian men is rising, while obesity among women is slowing down. In 2006, the first national telephone survey sponsored by the Ministry of Health (VIGITEL) showed that 43% of the Brazilian adult population was overweight and 11% obese, based on self-reported weight [12].

Diet therapy, with or without socio-psychological support, is reported to be relatively ineffectual in the long-term treatment of obesity. Additionally, at the present time, there are no truly effective pharmaceutical agents to treat obesity, especially morbid obesity [13]. The 1991 US National

Institutes of Health Consensus Development Conference on Gastrointestinal Surgery for Severe Obesity recommended that surgical treatment be considered for any patient with a BMI  $\geq 40$  kg/m<sup>2</sup> or for those with a BMI  $\geq 35$  kg/m<sup>2</sup> who had serious coexisting health problems.

Surgical treatment for morbid obesity (also called bariatric surgery) has been used for decades, and a large number of clinical series have demonstrated success in achieving substantial weight loss [13–20]. The basis for weight reduction and maintenance is either the restriction of food intake and/or the malabsorption of nutrients. The assumption is that eating behavior is modified as patients consume smaller quantities of food more slowly. In addition, patients must be encouraged to commit to daily exercise as part of a wider lifestyle change. A systematic review by Colquitt of 18 electronic databases showed that when compared with conventional treatment, surgery resulted in a significantly greater loss of weight after 2 years (23–28 kg more weight loss), and as a consequence, there were improvements in life quality and associated comorbidities. In one reviewed study, after 8 years of follow-up, the surgical group had lost an average of 21 kg, whereas the control group had gained weight. The longer-term benefits included a reduction in the prevalence of diabetes and high blood pressure [16].

Surgery should be undertaken only after a comprehensive, multidisciplinary assessment. Ideally, the team for the surgical management of obesity should include a range of healthcare professionals, such as psychologists, nurses, social assistants, physical therapist, a specialist (bariatric) surgeon, anesthesiologist, endocrinologist, and dieticians [17]. Surgery for morbid obesity should be considered a last resort after other conventional treatments (e.g., lifestyle changes, behavioral therapy, and medication) have failed; that is, obesity surgery is not recommended for persons with transient weight gain.

The short-term results of bariatric surgery are impressive. However, until recently, the long-term effects were less clear. A recent meta-analysis of the effectiveness of bariatric surgery among 22,094 patients found that there was an average 61% loss of excess weight, while diabetes mellitus, hypertension, and sleep apnea were resolved, and dyslipidemia was improved in most of the patients. However, the majority of the studies included in the meta-analysis were uncontrolled case series, and only a minority involved more than 2 years of follow-up [18]. The prospective controlled Swedish Obese Subjects Study (SOS) consisted of a comparison between obese subjects who underwent gastric surgery and conventionally treated obese control subjects. The subjects (mean age of 48 and mean BMI of 41) were enrolled for at least 2 (4,047 subjects) or 10 years (1,703 subjects). The rates of recovery from diabetes, hypertriglyceridemia, low levels of high-density lipoprotein cholesterol,

**Table 1** Trends in the prevalence and regional distribution of morbid obesity (BMI $\geq$ 40 kg/m<sup>2</sup>) in the Brazilian adult population (Brazil, 1974–2003)

Region	1974–1975 <sup>a</sup>		1989 <sup>b</sup>		2002–2003 <sup>c</sup>		1974–2003
	Percent	CI <sub>95%</sub>	Percent	CI <sub>95%</sub>	Percent	CI <sub>95%</sub>	Percent increase
North	0.10	0.03–0.17	0.37	0.17–0.58	0.51	0.36–0.67	410
Northeast	0.05	0.03–0.08	0.26	0.11–0.41	0.43	0.34–0.52	760
Southeast	0.20	0.16–0.25	0.33	0.15–0.50	0.77	0.57–0.96	285
South	0.34	0.26–0.42	0.48	0.31–0.64	0.75	0.56–0.95	120
Midwest	0.12	0.03–0.22	0.25	0.11–0.39	0.49	0.36–0.62	308
Brazil	0.18	0.15–0.22	0.33	0.23–0.43	0.64	0.55–0.74	255

<sup>a</sup>New analysis of ENDEF data, Brazil 1975–1975, Reference 9

<sup>b</sup>New analysis of PNSN data, Brazil 1989, Reference 10

<sup>c</sup>New analysis of POF data, Brazil 2002–2003, Reference 11

hypertension, and hyperuricemia were more favorable in the surgery group than in the control group, whereas recovery from hypercholesterolemia did not differ between the groups [19]. In 2007, another publication derived from the SOS showed the long-term benefits of bariatric surgery [20]. There are no studies of a similar nature in Brazil.

Between 1999 and 2001, the Brazilian Ministry of Health established 22 National Bariatric Surgery Reference Centers across the country. On June 28, 2007, the Brazilian public health system, the Unified Health System (SUS) introduced a new regulation for bariatric surgery through Government Directive no. 1569/GM [21]. The legislation considers surgery to be a medical necessity, as before, for those with morbid obesity (BMI $\geq$ 40 kg/m<sup>2</sup>) who have attempted to lose weight for at least 2 years without any successful long-term results. Additionally, those with a BMI $\geq$ 35 kg/m<sup>2</sup> with serious comorbidities such as arthritis, back or disk disease, diabetes, hypertension, hiatus hernia, gallbladder disease, coronary heart disease, obstructive sleep apnea, fatigue, elevated serum cholesterol, or disability are eligible.

Despite its impressive results, surgery for morbid obesity is a major procedure with an inherent risk of significant early and late morbidity and perioperative mortality. The

contraindications for obesity surgery in SUS are: clinical conditions like perioperative risk of cardiac complications, poor myocardial reserve, significant chronic obstructive airway disease or respiratory dysfunction, severe hiatal hernia/gastroesophageal reflux, hepatic cirrhosis, chronic kidney failure, psychological disorders of a significant degree that a psychologist/psychiatrist could deem to be exacerbated by or interfere with the long-term management of the patient after surgery, significant eating disorders, alcohol or drug addiction, and noncompliance with medical treatment.

This study aims to describe trends in morbid obesity and bariatric surgery covered by the public health care system in Brazil.

## Materials and Methods

Databases derived from three national surveys of adults were obtained from the IBGE. The data were reanalyzed, taking into account the complex sample design, to calculate the prevalence of morbid obesity according to international criteria (BMI $\geq$ 40 kg/m<sup>2</sup>) [4, 5].

Data about bariatric surgeries were obtained from the DATASUS System, which is available on the Ministry of

**Table 2** Distribution of morbid obesity (BMI $\geq$ 40 kg/m<sup>2</sup>) in the Brazilian adult population according to gender (Brazil, 1974–2003)

Gender	1974–1975 <sup>a</sup>		1989 <sup>b</sup>		2002–2003 <sup>c</sup>		1974–2003
	Percent	CI <sub>95%</sub>	Percent	CI <sub>95%</sub>	Percent	CI <sub>95%</sub>	Percent increase
Female	0.32	0.26–0.38	0.66	0.46–0.86	0.95	0.79–1.11	197
Male	0.04	0.02–0.06	0.08	0.02–0.14	0.32	0.22–0.42	700
Prevalence ratio	8.0		8.2		3.0		

<sup>a</sup>New analysis of ENDEF data, Brazil 1975–1975, Reference 9

<sup>b</sup>New analysis of PNSN data, Brazil 1989, Reference 10

<sup>c</sup>New analysis of POF data, Brazil 2002–2003, Reference 11

**Table 3** Number of bariatric surgeries covered by the Public Health System (SUS) according to the region and year (Brazil, 1999–2006)

Region	1999	2000	2001	2002	2003	2004	2005	2006	Total	
									Number	Percent
Southeast	3	285	365	601	812	940	944	1,200	5,150	49.7
South	10	20	56	251	542	588	840	820	3,127	30.1
Northeast	50	45	23	69	208	182	285	260	1,122	10.8
Midwest	–	–	–	27	158	112	131	167	595	5.7
North	–	3	53	60	58	50	66	81	371	3.6
Total	63	353	497	1,008	1,778	1,872	2,266	2,528	10,365	100.0

Health website. The Hospital Information System (SIH/SUS) is a national database covering all hospital services provided and financed by the public health system. The SIH is based on hospital authorization forms, which describe the main hospital procedures. They authorize the hospitalization of patients for any clinical or predefined surgical procedure, identify the patient, register all medical procedures, diagnostic services, and therapies applied, and are used as an invoice by the health service provider. In this study, all the surgeries recorded under number 33.022.04-6, which is the code for bariatric surgery for morbid obesity, were analyzed by year and region.

## Results and Discussion

The prevalence of morbid obesity in adults is presented in Table 1. There was a 255% increase in morbid obesity across the country between 1974 and 2003, starting at 0.18% in 1975–1976 and reaching 0.64% in 2002–2003. In the same period, however, the rise in the prevalence of obesity was much lower, climbing from 4.4% to 11.1% or a 152% increase. The 0.64% adult morbid obesity rate in Brazil is modest if compared to the US figure of 4.9% [7] or the 2.0% rate in England [8].

In the first two surveys conducted in Brazil, morbid obesity was more prevalent in the South, but it rose unevenly in the other regions and in 2002–2003 the Southeast reached 0.77%, overtaking the South. The Northeast, the poorest region in the country, has traditionally presented higher rates of malnutrition. Though it had the lowest level of morbid obesity of all the regions in 2002–2003, the Northeast displayed by far the fastest rise, growing by 760% over the period analyzed.

The distribution according to gender is shown in Table 2, revealing a higher prevalence among women in all three studies. At the time of the first two surveys, the female to male ratio was around 8:1, but this ratio had dropped to 3:1 by 2002–2003. Morbid obesity in men grew by 700% over this 30-year period as against a rise of less than 200% among women. Analyzing each period separately, the

number of women with obesity doubled from the first to the second survey, but the rate dropped to 1.4 times from the second to the third. The exact opposite was the case for men. From 1974 to 1989, the prevalence doubled, but from 1989 to 2002, it quadrupled. Meanwhile, the VIGITEL survey conducted in 2006 showed the first ever occurrence of a higher rate of obesity among men (47%) compared to women (39%), based on self-reported weight [12].

The increasing prevalence of obesity and the regulation of bariatric surgery by the SUS in 1999 have resulted in a steady rise in the number of procedures covered by the public health system (Table 3). There are year-long waiting lists of patients in many accredited hospitals. The greatest number of surgeries is performed in the Southeast region, followed by the South. Indeed, these were the two regions with the highest prevalence of morbid obesity in 2003 (Table 1). The number of surgeries performed in the Southeast rose fourfold between 2000 and 2006, whereas for the whole country, there was a sevenfold increase in the same period (Table 3). In the USA, there was a fivefold increase in the number of bariatric surgeries performed over the 6-year period beginning in 1997, bringing the annual total to more than 100,000 in 2003 [22].

Some authors have studied the impact of morbid obesity on medical expenditures on adults in the USA. Per capita healthcare expenditure on morbidly obese adults was 81% (95% confidence interval [CI<sub>95%</sub>] 48–121%) greater than for normal adults and 65% (CI<sub>95%</sub> 37–110%) greater than

**Table 4** Potential demand covered by bariatric surgeries compared to estimates of morbidly obese patients per region, Brazil 2003

Region	Estimated number of morbidly obese patients	Number of bariatric surgeries in 2003	Potential demand covered (%)
Southeast	314,254	812	0.26
South	105,547	542	0.51
Northeast	115,229	208	0.18
Midwest	32,945	158	0.48
North	38,460	58	0.15
Brazil	606,435	1,778	0.29

**Table 5** Average length of stay, number of deaths, and fatality rate of bariatric surgeries (Brazil, 1999–2006)

Year	Number of surgeries	Average days in hospital	Number of deaths	Fatality rate (%)
1999	63	6.9	0	0
2000	353	6.3	3	0.85
2001	497	7.4	2	0.40
2002	1,008	7.8	8	0.79
2003	1,778	7.5	11	0.62
2004	1,872	6.8	17	0.91
2005	2,266	6.7	12	0.53
2006	2,528	6.3	17	0.67
Total	10,365	6.9	70	0.69

for overweight adults. Excess costs among morbidly obese patients resulted from greater expenditures for office-based visits, outpatient hospital care, inpatient care, and prescription drugs [23].

If we take the IBGE projections for the Brazilian population for 2003 [24] and the rates of morbid obesity obtained in this study, it is feasible to estimate that there were around 606,000 Brazilian adults with morbid obesity in 2003 (Table 4), most of whom would be potential candidates for bariatric surgery covered by SUS. Table 4 also shows the potential demand for bariatric treatment that was covered by SUS in 2003 by comparing the number of surgeries performed with estimated numbers of morbidly obese patients per region. The potential demand covered by SUS was minimal in 2003 (0.29%) and also if one considers all surgeries performed up until 2006 (1.39%)

The efficacy of all therapeutic interventions must be balanced against their inherent risk, and bariatric surgery is no exception. The operative 30-day mortality rates of 0.1% for restrictive procedures, 0.5% for gastric bypass, and 1.1% for biliopancreatic diversion or duodenal switch found in a recent systematic review [13] compare favorably with the accepted operative fatality rate for other major surgical procedures, according to the authors. In our study, Table 5 shows the average number of days in the hospital, which was around 7 days, and the fatality rates approximately 0.7%; this value lies within an acceptable range.

## Conclusion

The figures for the rise in morbid obesity in Brazil are startling, especially the increase among men. Meanwhile, the rise in morbid obesity in women was somewhat curbed in the second period investigated. This is a situation that calls for further study to analyze the risk factor inherent to the observed trends, alongside measures to encourage the adoption of healthy lifestyles.

Bariatric surgeries covered by the SUS are on the rise. Considering the range and scope of the Brazilian public health system, the potential demand for bariatric surgeries is enormous. Preventive measures aimed at slowing down or reversing the obesity epidemics are urgently required.

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