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The Role of Obesity Surgery in Obesity Treatment in Turkey

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Abstract- Obesity is defined by the World Health Organization (WHO) as "abnormal or excess fat accumulation that may impair health." To define obesity, the patient's body weight in kilograms is divided by the square of height in meters to calculate the body mass index (BMI). In Turkey, it has been reported that 34.8% of the population are overweight, 44.2% are of normal weight, and 3.9% are lean in 2012. With respect to gender, 20.9% and 30.4% of the women are obese and overweight, respectively. The aim of this study was to determine the role of obesity surgery in Turkey. Materials and Methods: This study was conducted during the period February 2013–April 2014. The Task Force under Department of Health Technologies Assessment, General Directorate of Health Research, Ministry of Health, and specialists performed this study in accordance with the Basic Model Submission Assessment Component Format for Medical and Surgical Interventions of EUnetHTA. Results: Obesity is a major disorder that threatens world populations, and governments are developing many strategies to fight this disease. It has been shown that medical treatment is ineffective and that obesity surgery may be useful, especially in patients with a high BMI plus comorbidities. Conclusion: Obesity surgery is both clinically effective and cost-effective; however, its ethical, social, and organizational aspects should also be evaluated and taken into consideration when deciding on the correct patient, the correct surgeon, the correct center, and the correct surgical method.

Keywords- obesity surgery, cost-effectiveness, economic value, obesity, obesity treatment

1. Introduction

Obesity is defined by the World Health Organization (WHO) as “abnormal or excess fat accumulation that may impair health.” To define obesity, the patient’s body weight in kilograms is divided by the square of height in meters to calculate the body mass index (BMI) (WHO, 2015). An individual is determined to be obese if the BMI > 30 kg/m^2. Unlike the waist-to-hip ratio (WHR) or subcutaneous fat measurement, the BMI cannot provide information about the body’s fat distribution; however, use of the BMI to determine obesity is an easy, valid, cost-effective, and repeatable method. Thus, it is widely accepted and has become the most common parameter for assessing obesity in epidemiologic studies (Onat & Sansoy, 2009).

Obesity, an important and common health problem for all populations, has become a global epidemic. Today, the most common cause of obesity is the availability of high-energy food combined with a sedentary life-style. At the same time, an unbalanced diet, insufficient physical activity, various endocrine disorders, and drug use are among the disease’s etiologies. High-risk factors for obesity include cardiovascular diseases, coronary artery disease, peripheral vascular disorders, type 2 diabetes mellitus (DM), and sleep apnea (Turkey Public Health Agency, 2013).

Obesity is a chronic condition that, when left untreated, reduces an individual’s lifespan, impairs quality of life (QoL), and negatively affects tissues and organs. Age, gender, education status, marital status, number of births and intervals between deliveries, feeding habits, smoking, alcohol use, sociocultural and socioeconomic status, and genetic factors are among the risk factors for obesity. In addition, complications may include cardiovascular system disorders, neurologic disorders, metabolic-hormonal complications, respiratory system diseases, digestive system disorders, genitourinary system diseases, integumentary diseases, surgical complications, cancer (especially hormone-specific cancers), mechanical complications, and psychosocial complications (Turkey Public Health, 2013).

Based on OECD reports prior to 1980, as many as one in 10 persons were obese. After 1980, this ratio either doubled or tripled in 19 of 34 OECD countries (Table 1). Of the adult populations of OECD countries, an average 17% are obese (Graphic 1). Prevalence based on country is the highest in the United States (OECD Obesity Report, 2014). Moreover, obesity rates for individuals aged 5–17 years appear to be increasing in OECD countries (Graphic 2). According to OECD estimations, the increase in the rate of overweight and obese populations will continue until 2020, when overweight (BMI ≥ 25 kg/m^2) people will represent approximately 70% of the populations in the United States, the United Kingdom, and Australia. The rate of obesity has also increased in conjunction with the increase in overweight (Graphic 3) (OECD Obesity Report, 2014).

In Turkey, it has been reported that 34.8% of the population are overweight, 44.2% are of normal weight, and 3.9% are lean. With respect to gender, 20.9% and 30.4% of women are obese and overweight, respectively. The rates for men are 13.7% and 39.0%, respectively (Table 2). In Turkey, the obesity rates in 2003, 2008, 2010, and 2012 were 12.0%, 15.2%, 16.9%, and 17.2%, respectively (Graphic 4) (Turkey Public Health Agency, 2013).

The lifetime of an obese individual may be 8–10 years shorter than that of an individual with a normal body weight. Health service expenses of an obese patient may be 25% more than those of a patient with a normal weight. Obesity-related health expenses constitute 1–3% and 5–10% of total health expenses in OECD countries and in the United States, respectively. Data from OECD countries and Turkey reveal that the number of obese and the related economic burden will increase (OECD 2010 Report, 2010).

According to a 2010 OECD report, almost half the populations of OECD countries are either obese or pre-obese, and this rate is expected to increase. It is estimated that two-thirds of the population will be obese within the next 10 years (OECD, 2010).

The increase in obesity has also increased the obesity disease load and the importance of surgery in Turkey and throughout the world.

Cohort studies conducted in the United States have demonstrated that 300,000 people die each year as a result of obesity-related problems. The general mortality rate has been reported to be 17% in patients with a BMI higher than 30 kg/m^2. Of the deaths in patients with this BMI, 80% are obesity-related. The mean life expectancy is reduced by 2–4 years and by 8–10 years in subjects with a BMI of 30–35 kg/m^2 and 40–45 kg/m^2, respectively. Bariatric surgery may reverse these risks in 2 years (Sjöström, 2013; Christou et al., 1999; Christou et al., 2004). The long-term complications of morbid obesity may be reduced with a minimum 50% loss of excess weight in 5 years by techniques and technologic methods. Type 2 DM, hypertension, obstructive sleep apnea, and metabolic complications are also included in these complications (Christou et al., 2004).

Medical and surgical options are available in the treatment of obesity. Obesity surgery, which requires advanced technology and is used in the treatment of morbid obesity, was first used during the mid-twentieth century and has been performed on obese patients and via gold-standard laparoscopic surgical techniques for more than 10 years. Robotic surgery has also been launched in certain centers. Short and long-term results of various methods are known, and surgery is an approved treatment method (Kothari, 2012).

The World Health Organization (WHO) recommends obesity surgery for patients with a BMI ≥ 35 kg/m^2 and comorbidity, or in patients with WHO Classes III and IV obesity (Table 3) (WHO, 2000). Various references describe morbid obesity as a BMI ≥ 35 kg/m^2 plus comorbidity (e.g., coronary artery disease and DM) or a BMI > 40 kg/m^2; obesity surgery is also recommended for these patients (Haslam & James, 2005; Kushner, 2007).

Bariatric surgery is also feasible for adult patients with a BMI > 35 kg/m^2 and a metabolic or systemic complication and for patients with a waist circumference higher than NHMRC guidelines and with or without complications, as well as for those with a BMI ≥ 40 kg/m^2 (NICE, 2006; SAGES, 2008). Patients with a BMI lower than 30 kg/m^2 should be treated via medical or other methods. Guidelines for type 2 DM patients recommend directly surgery if the BMI ≥ 35 kg/m^2 and other methods if the BMI ≤ 30 kg/m^2. Furthermore, surgery should be considered in patients whose medical treatment or other methods have failed (Kushner, 2007; NICE, 2006; SAGES, 2008).

In Turkey, patients with a BMI above 40 kg/m^2 and who have failed to lose weight with other methods (e.g., diet, exercise, behavioral therapy, and drug therapy) or patients who show recurrence after weight loss are appropriate candidates for laparoscopic bariatric surgery, which is covered by social insurance. However, even with the use of all these treatment methods (e.g., surgery and endoscopy), including technologic infrastructure, only 1/1000 of morbid obese patients can be cured (Tatar, 2013).

Obesity surgery may be performed on pediatric patients as well as on adults. In children, the BMI is sufficient for classification and diagnosis; in adult patients, however, muscle mass and fat mass may not be distinguished via the BMI. Therefore, NHMRC guidelines for adults with a BMI under 35 kg/m^2 recommend that waist circumference be used as an additional criterion. In women, the risk begins with a waist circumference of 80 cm, and metabolic risks reach the maximum when the waist circumference is 88 cm. This limit is 94 cm in men, whose high risk begins with a 102-cm waist circumference (National Health & Medical Research Council, 2003).

A study on the obesity disease load and a hypothetical analysis were conducted in Turkey. The "Turkey Disease Load Study," completed by the Ministry of Health in 2004, examined disability-adjusted life years (DALY) and developed a calculation model for estimation of the country's obesity disease load (Ministry of Health—Turkey, 2004). The hypothetical analysis was based on the 2004 study performed by the Ministry of Health (Tatar, 2013).

The present analysis is the first health technology evaluation study conducted by multi-centers in Turkey. The aim of this study was to determine the following:

- the current status of obesity surgery in our country
- the current use of health problem and technology

- technological definition and technical properties
- clinical efficacy
- safety
- costs and economic evaluation
- organizational aspects
- ethical aspects
- social aspects
- legal aspects

2. Materials and Methods

This study was conducted during the period February 2013–April 2014 by the Task Force of Health Technologies Assessment, General Directorate of Health Research, the Ministry of Health, and specialists in accordance with the Basic Model Submission Assessment Component (EUnetHTA-Tibbi ve Cerrahi Mudahaleler icin Saglik Teknolojileri Degerlendirme Ana Model) Format for Medical and Surgical Interventions (EUnetHTA, 2012). A systematic review and economic assessment of obesity surgery were conducted by a multidisciplinary task force. Subgrouped teams obtained the results for different timelines and shared them with the whole team in two workshops.

Literature Search

In order to create a reference database for obesity surgery, Pubmed, The Cochrane Library, NHS – Health Technology Assessment Programme, DARE, and Public Health Agency of Canada search engines were explored by using predefined keywords and without time limitations. Selected publications were evaluated for title, summary, and subject.

In addition to a clinical systematic search, an additional search was performed using the following terms:

- “current use of obesity surgery”
- “technical properties of obesity surgery”
- “safety”
- “clinical efficacy”
- “costs and economic evaluation”
- “organizational aspects”
- “ethical aspects”
- “social aspects”
- “legal aspects”

All search activities were performed between December 19, 2013 and 21 January 21, 2014 and aimed to include all studies specific to Turkey. International guidelines, as well as reports on obesity surgery and its complications, were also searched. All available studies were examined by title and abstracts, and a subelimination was performed.

A detailed data analysis was performed on the selected articles. The full text of all included articles was examined and summarized on a form in terms of author, publication year, country, abstract, conclusion, and references. Summarized data were subjected to a qualitative analysis to evaluate the feasibility, limits, contributions to health, and applicability to conditions in Turkey.

The “current use of obesity surgery” was classified into three groups: “current status of obesity surgery”; “obesity surgery in cases of morbid obesity”; and “reimbursement and obesity surgery” (Figures 1–3). The articles on “obesity technical properties” were classified into two groups: “technical properties of obesity surgery” and “obesity surgery centers” (Figures 4–5). The “safety” articles were grouped under “risk management in obesity surgery” and “complications of obesity surgery” (Figures 6–7). The articles on “clinical efficacy” were grouped under “obesity-surgery-related mortality,” “obesity-related comorbidity,” “clinical efficacy and health-related quality of life (HRQoL) in obesity surgery,” and “obesity surgery relationships” (Figures 8–11). “Costs and economic evaluation” articles were grouped as “comorbidity-related obesity” and “economic evaluation techniques” (Figure 12–13). To answer the questions related to “organizational aspects,” obesity surgery centers (university hospitals and education/research hospitals) were visited, and all information and records were accessed and examined. All steps of obesity surgery from admission to discharge were monitored on-site. Questions on "ethical aspects," "social aspects," and "legal aspects" were evaluated via general methods.

Assignment of Specialists and Other Procedures

Ten general surgeons at university hospitals and education-and-research hospitals in which obesity surgery is widely performed in Turkey, were invited to participate in the study, and even surgeons accepted. The study was conducted by specialists of Ministry of Health (General Directorate of Health Researches, General Directorate of Health Services, Turkish Public Health Association, Turkish Public Hospitals Association, Department of Laws), universities, Institute of Social Security, Health Policy and Economy Society, and medical device representatives. A Delphi panel, questionnaires, face-to-face interviews, and workshops were the methods used.

Information about the HTA process, study content, and expectations was provided to the study specialists via preparatory meetings, and a questionnaire was designed and e-mailed to them. After a 20-day response time, individually completed forms and literature data as evidence were returned. During the workshops, each participant discussed their own response conditions, and a consensus was reached.

Basic Economic Evaluation

After a systematic search, in order to develop a model specific to Turkey, a Delphi panel technique was used to address the aims of the obesity surgery coverage perspective and to determine economic value. The "Delphi panel" comprises a consensus of specialists and local specialists following a scientific consultation.

The Delphi technique is used to make future estimations, to uncover specialist opinions, and to reach a consensus, which is the output of this process. The technique is commonly used under medical conditions in which empirical (experimental) data is lacking; it has been used increasingly during the past 30 years in the field of health when sufficient data is absent. It systematically evaluates specialist opinions and represents a literature-based, scientific technique. In this study, the Delphi panel method was used through the steps described in the following paragraphs (Brown, 1968).

Preparation of the Questionnaire

Panel questions were prepared to address source utilization and calculation of treatment costs. The questionnaire contained questions about obesity comorbidities and source localization for obesity surgery methods, based on a literature search for Class III obesity. Questions included, to some extent, the "Costs and Economic Evaluation" in Section 5 of the EUnetHTA Main Model Submission Assessment Component for Medical and Surgical Interventions (EUnetHTA'nın Tibbi ve Cerrahi Mudahaleler icin Saglik Teknolojileri Degerlendirme Ana Model). Instructions for completion of the form were provided on the first page of questionnaire. The second page included general questions about the treated patient and about obese patients in Turkey. Comorbidity rates of obese patients with a BMI of 30–34.9 kg/m^2 and pre- and postoperative rates were addressed on page 3. Similarly, these questions were repeated on the fourth and fifth pages for patients with a BMI of 35–39.9 kg/m^2 and 35–39.9 kg/m^2, respectively.

Based on the literature search, the most common methods for performing obesity surgery include open banding , closed banding, open sleeve, closed sleeve , open bypass and closed bypass were assessed in terms of preoperative, operative, and postoperative source utilization for 1, 2, 3, and 5 years.

Assignment of Specialists

Of the surgeons who perform this surgical procedure in Turkey, 10 were invited to participate in the study. The panel procedure continued with the seven surgeons who agreed to participate. Again, one specialist joined the study to monitor DM, hypertension, and cardiovascular chronic disorders related to the drugs used. In addition, experts from the Institute of Social Security were also invited for auditing and examination purposes.

Preparatory Briefing

The panel content and expectations were shared with participants.

Figure 1: Systematic literature search to identify the current status of obesity surgery

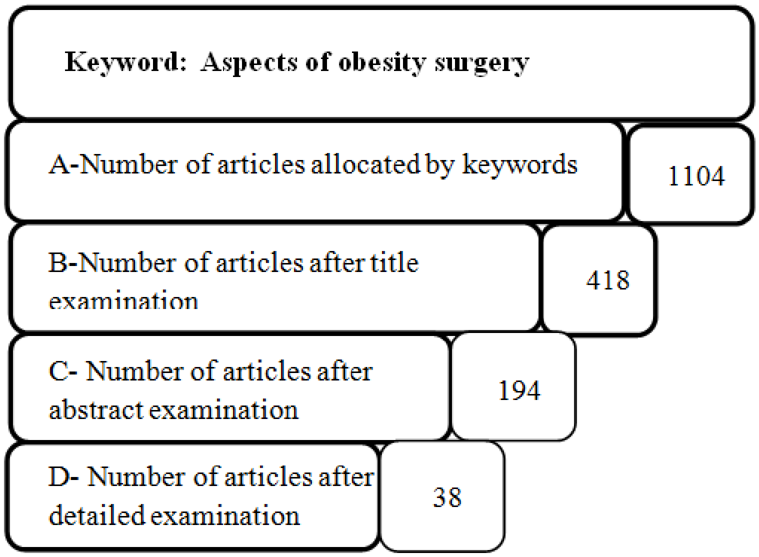


Figure 2: Systematic literature search to identify obesity-related comorbidities

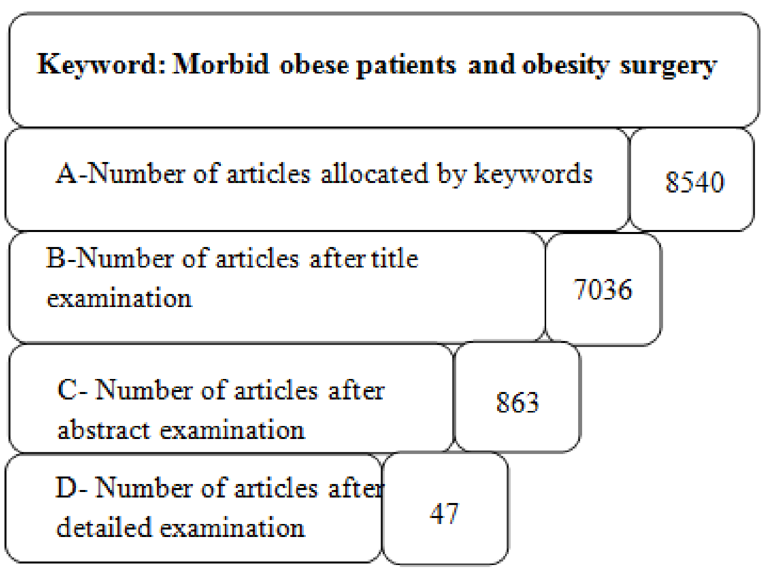


Figure 3: Systematic literature search to identify reimbursement and obesity surgery

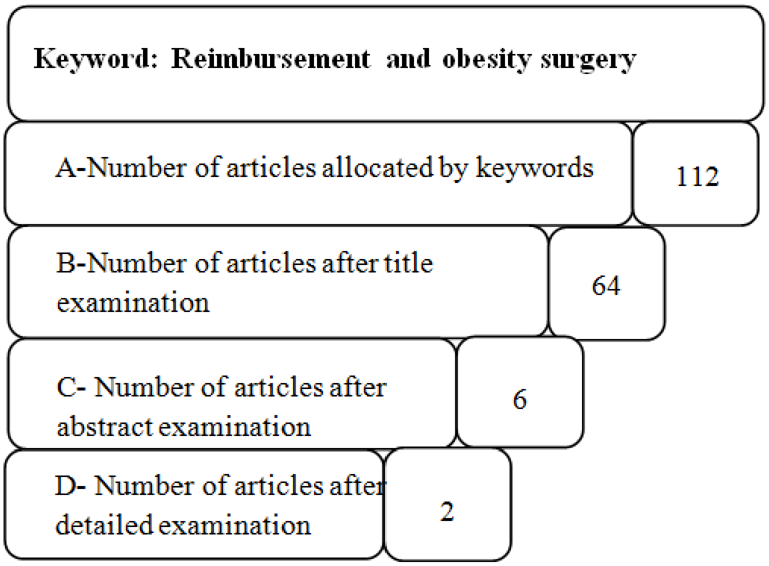


Figure 4: Systematic literature search to identify technical characteristics of obesity surgery

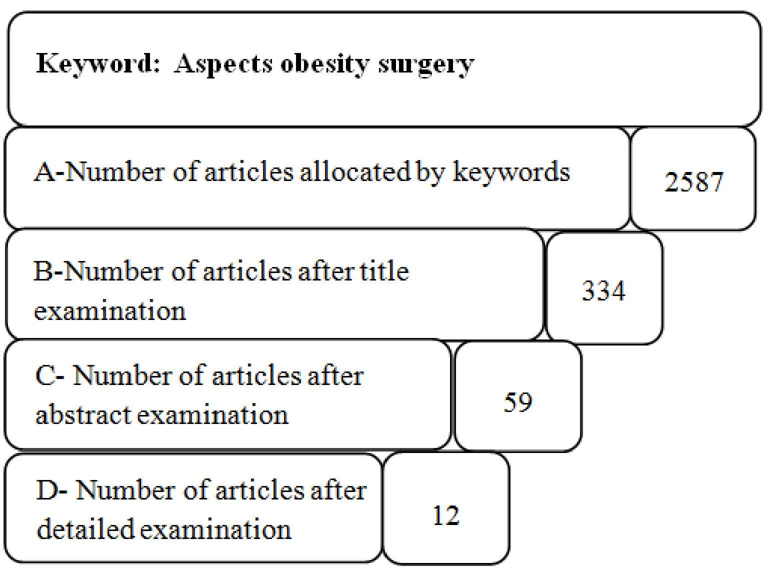


Figure 5: Systematic literature search to identify characteristics of obesity surgery centers

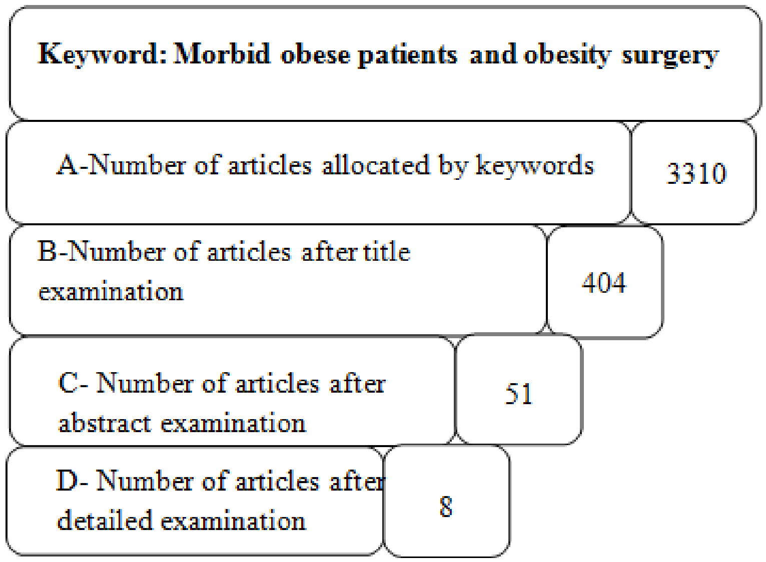


Figure 6: Systematic literature search to identify technical characteristics of obesity surgery

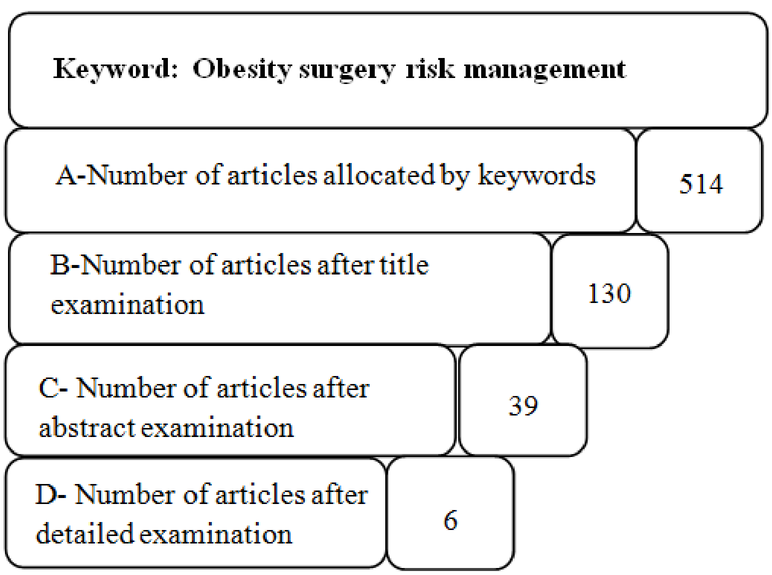


Figure 7: Systematic literature search to identify complications of obesity surgery

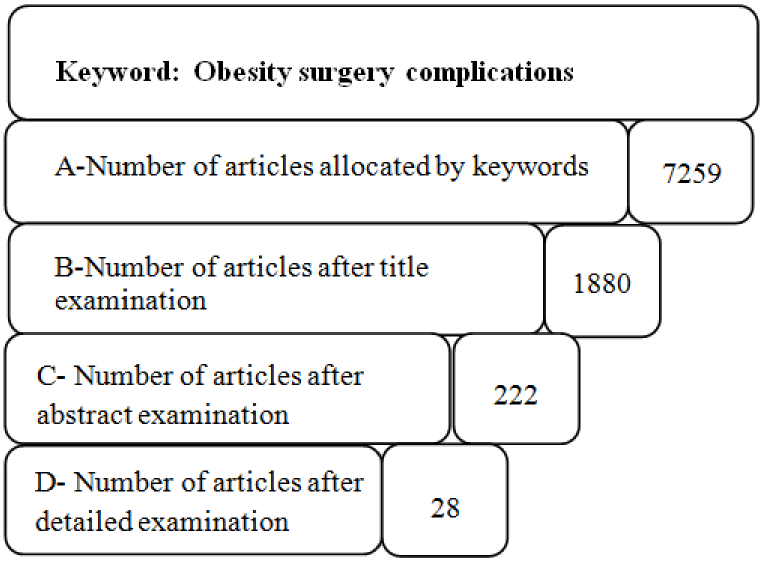
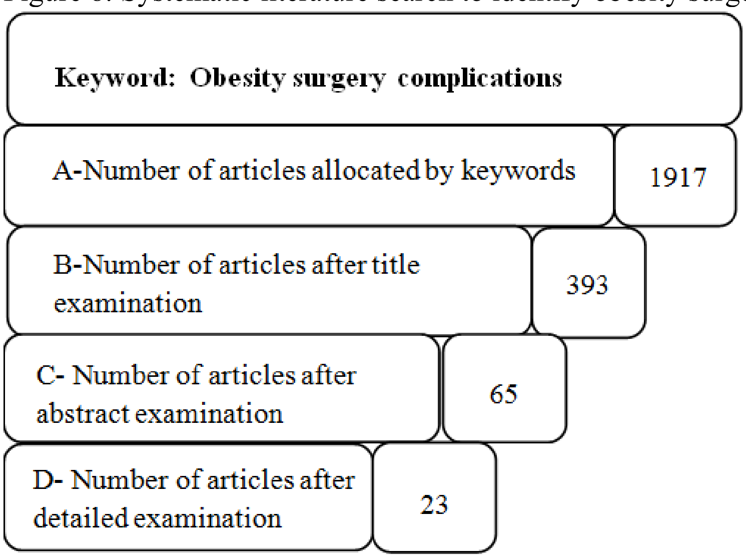


Figure 8: Systematic literature search to identify obesity surgery-related mortality



Karadayi, B., Kockaya, G., Yenilmez, F.B., Sene, O., Beyan, A. (2016). The Role of Obesity Surgery in Obesity Treatment in Turkey, Eurasian Journal of Health Technology Assessment, Vol. 1(1), 20-62

Figure 9: Systematic literature search to identify obesity surgery-related comorbidity

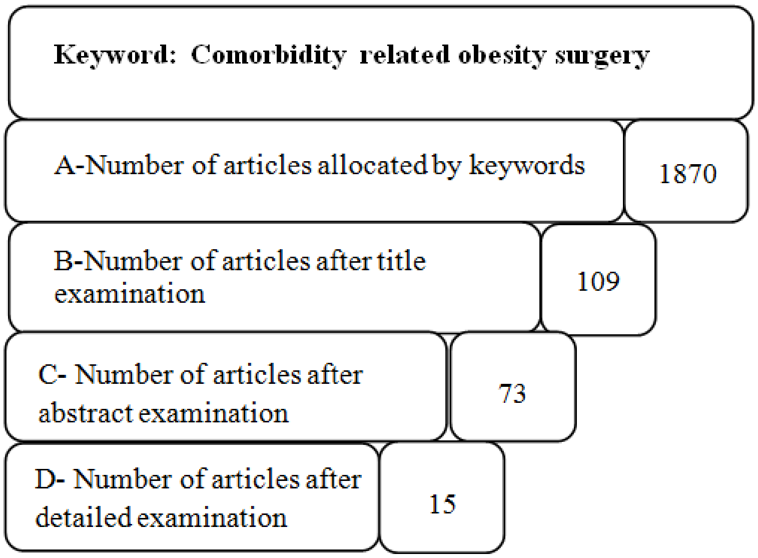


Figure 10: Systematic literature search to identify clinical efficacy of obesity surgery

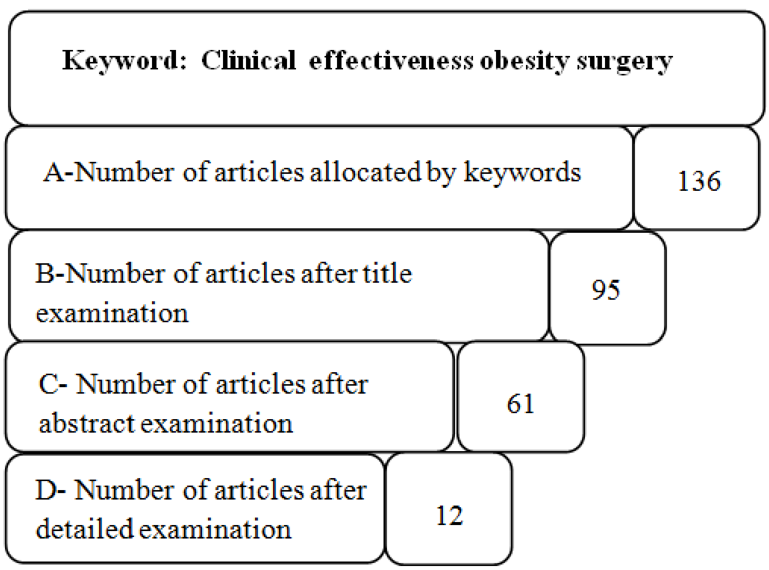


Figure 11: Systematic literature search to identify the relationship between health-related quality of life and obesity surgery

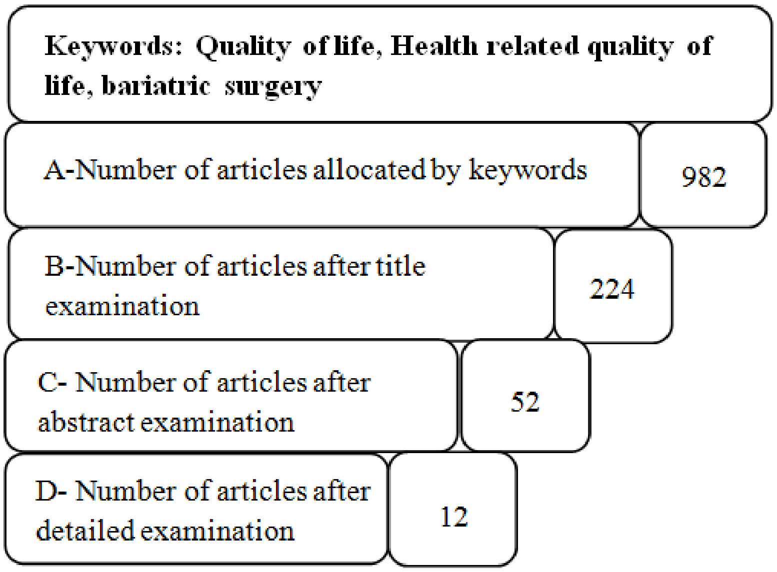


Figure 12: Systematic literature search to identify obesity comorbidities

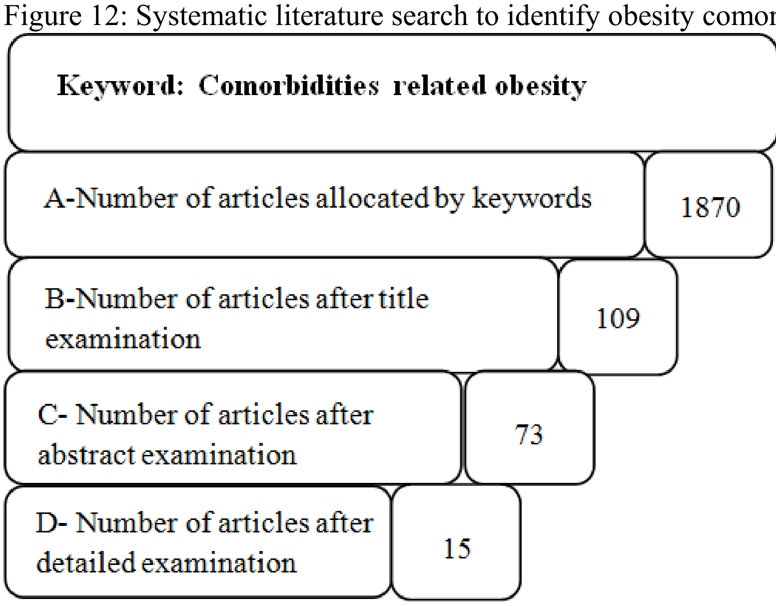
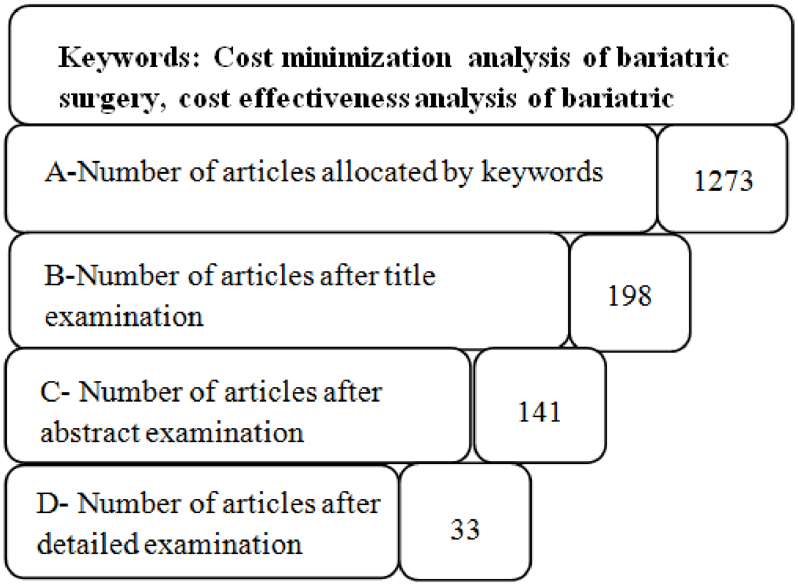


Figure 13: Systematic literature search to identify economic evaluation techniques of obesity surgery



Transfer of Questions and Response Period

Questions were sent via e-mail to the participants, and a 10-day response period was given. Each expert completed the form and sent it back. They were not aware of other expert opinions. It was determined that questions about open banding, open sleeve, and open bypass could not be answered, as these methods have not been used in Turkey.

Analysis of Responses

The mean or median values of all questions answered by experts were recorded.

Face-to-Face Interviews

During this session, all experts met to review the study goals, details, and action plan. The questionnaires, including the mean and median values, were reviewed. Each participant saw her/his own response with reference to the mean response and discussed it with other participants. The aim was to reach a consensus for each response. Any participant who disagreed with the mean value could insist on her/his own response by explaining the reason.

Panel Outputs

The results were obtained following the face-to-face interviews. When determining the public prices of certain sources, we used the Institution of Social Security Price List of Health Budget Law Appendix-3 and Appendix-2 lists, Institution Discount List, Public Procurement Authority (Kamu Ihale Kurumu) Medical Device Purchase Instructions, and Drug Price List of Turkish Drug and Medical Device Administration. All medical equipment was accepted as nonreturnable or disposable. The final results were shared by panel participants via electronic media. Their opinions and recommendations were requested again.

2. Face-to-Face Interviews

The second face-to-face interviews was made by participation of study experts. The first panel outputs were shared. The model used to calculate the economic burden of obesity was discussed by the experts, who shared their opinions. A portion of the model inputs were taken from the panel outcome, and other portions were taken from national statistics and studies. This was the final face-to-face session, during which a consensus was reached as to the model.

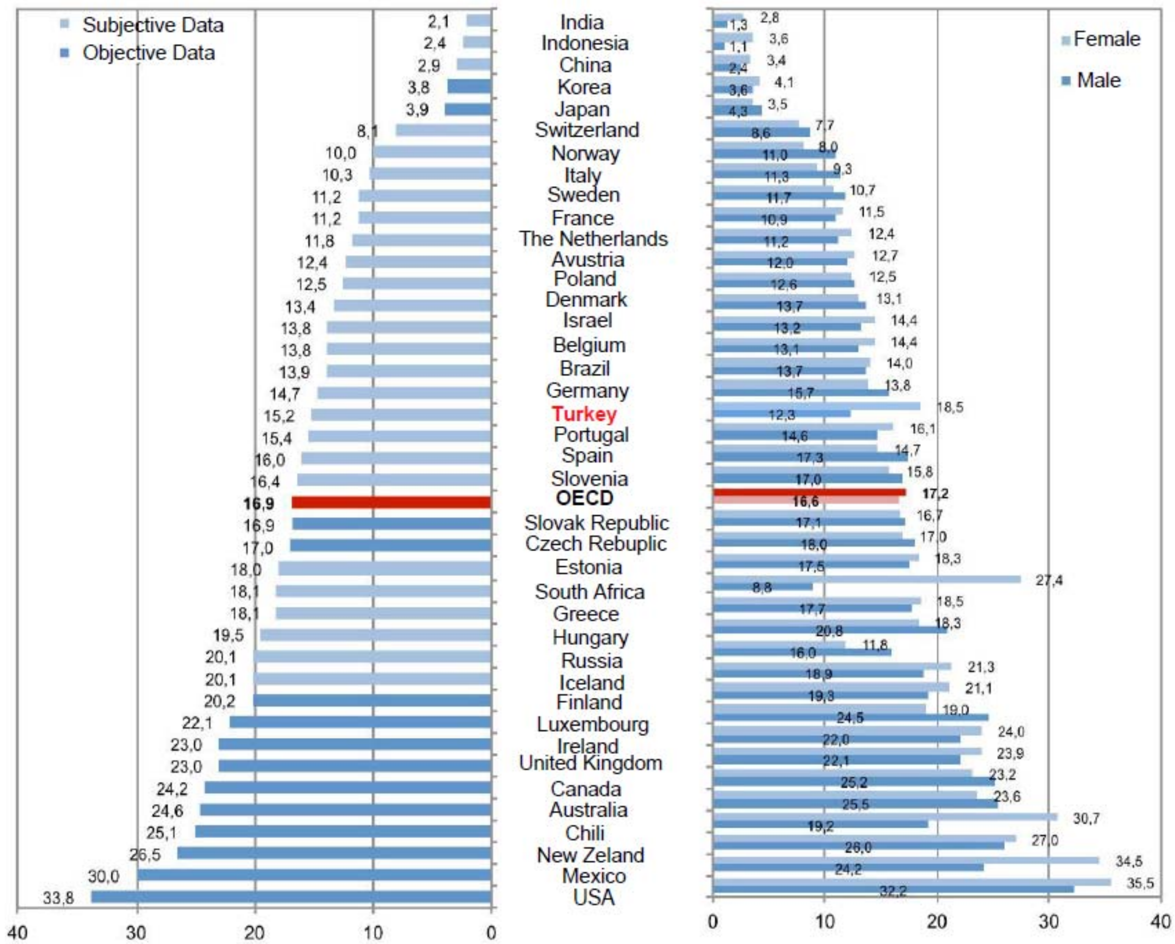
Model Development and Inputs

The calculation model, which was developed to determine the economic value of obesity surgery, was taken from an existing analysis (Tatar, 2013). The inputs of the model are the results of the 2004 report, "Turkish Disease Load Study," conducted by the Ministry of Health (2004), Turkish economic and demographic data (TUIK, 2014), and the results of the Delphi panel.

The "Turkish Disease Load Study"(TDLS) (Ministry of Health—Turkey, 2004) was also used as the basis for determining the obesity disease load. In TDLS, disability-adjusted life years (DALY) were calculated. The purpose of DALY is to evaluate the disease load (years lost due to disability, or YLD), stemming from premature deaths for various reasons (years of life lost, or YLL) and diseases that lead to long-term disability and to a loss of function, in a single parameter. "One DALY" represents one lost year of healthy life. Briefly; it is calculated as follows: DALY = YLL+YLD.

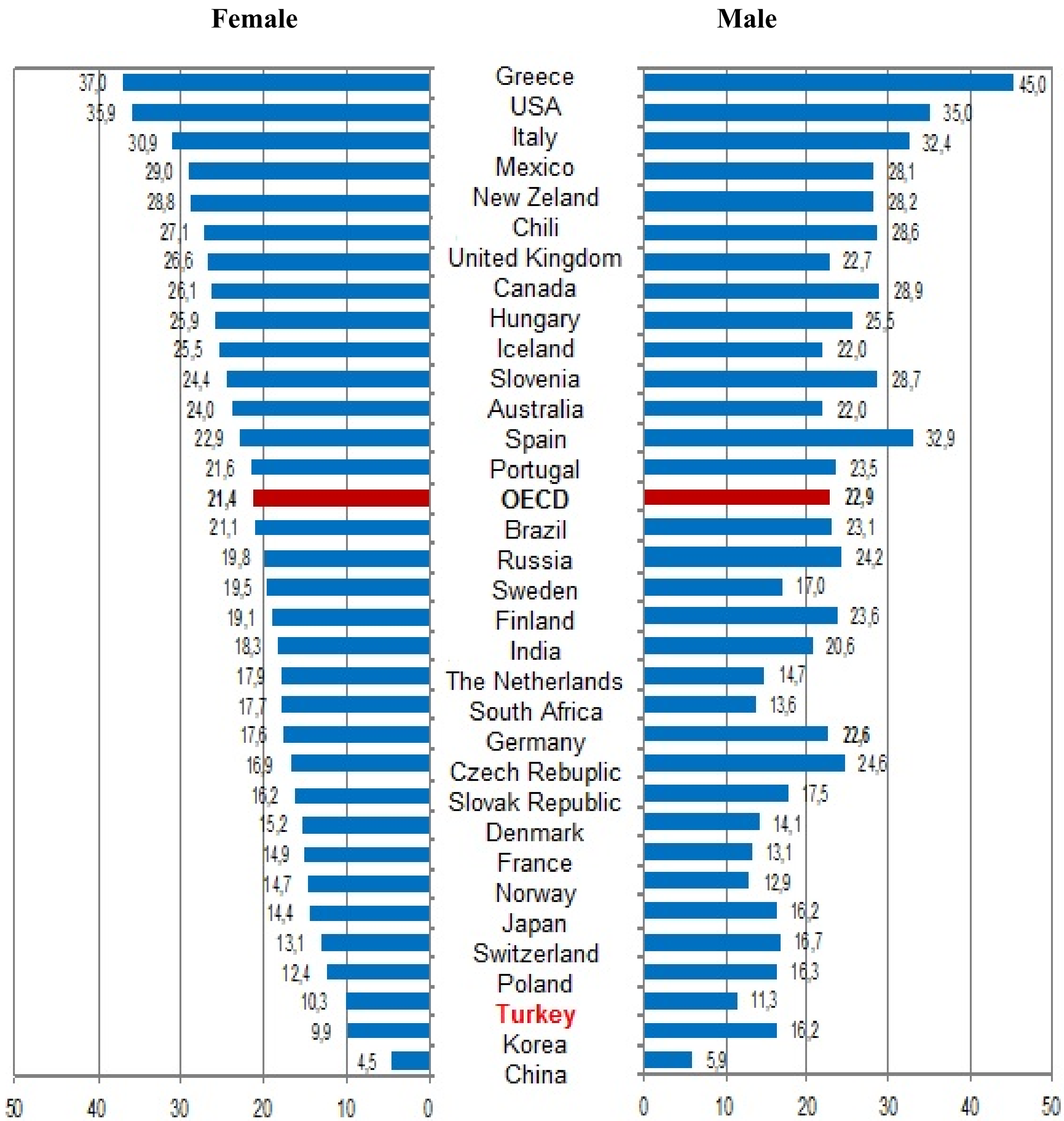
In the Turkish Disease Load Study, the disease load calculation method developed by Lopez and Murray (1998) was used and the DALY attributed to obesity was also calculated for populations older than 30 years of age. The data on Turkish economics, population, obesity, and the DALY study were used to calculate the economic load of obesity and obesity surgery.

Graphic 1. Obesity prevalence in adults of different countries, 2009 (or the closest year)



OECD: The Organisation for Economic Co-operation and Development
Source: Adapted from Health at a Glance 2011: OECD Indicators, http://dx.doi.org/10.1787/888932523994 International Association for the Study of Obesity (2011). OECD OBESITY UPDATE 2012.

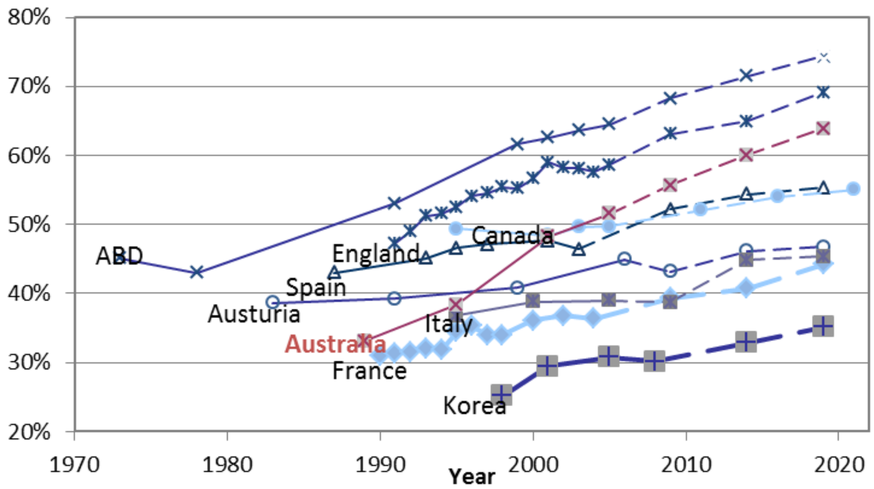
Graphic 2. Rate of obesity between 5–17 years of age in various countries (%) (the most current estimation)



OECD: The Organisation for Economic Co-operation and Development

Source: Adapted from Health at a Glance 2011: OECD Indicators, http://dx.doi /10.1787/888932523994 International Association for the Study of Obesity (2011). OECD OBESITY UPDATE 2012.

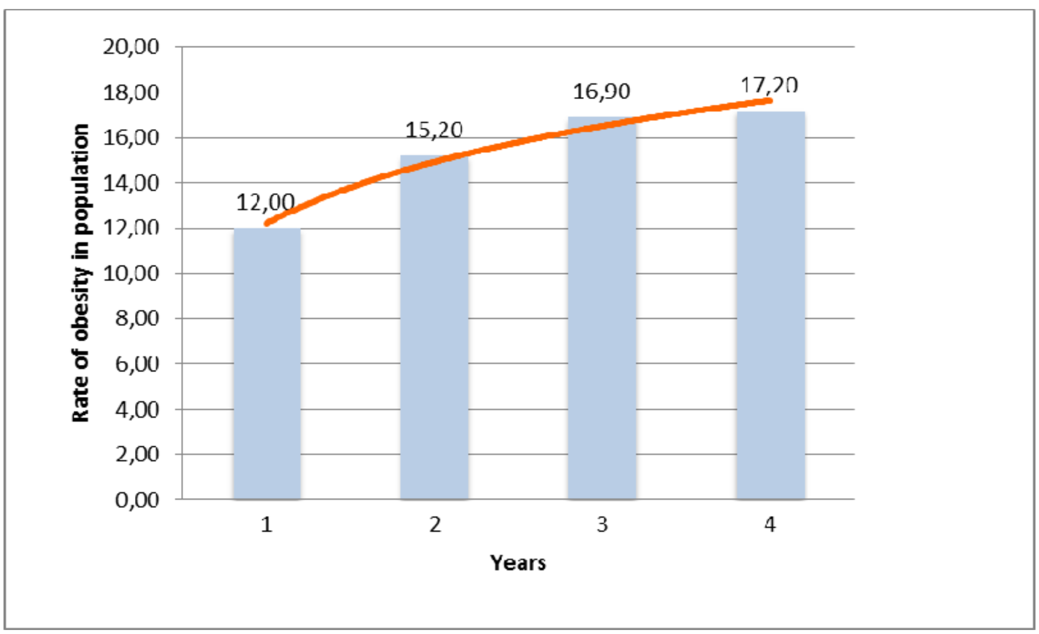
Graphic 3. OECD overweight (BMI ≥ 25 kg/m^2) projection



OECD: The Organisation for Economic Co-operation and Development

Source: OECD analysis of national health survey data.

Graphic 4. Obesity rates for individuals over 15 years of age in Turkey



Source: 2003 year http://www.docstoc.com/docs/141716921/OECDHealthData2012FrequentlyRequestedData-Updated-October, years 2008, 2010, and 2012 www.tüik.gov.tr

Table 1. Classification of BMI-based leanness, overweight, and obesity in adults.

Classification	**BMI (kg/m²)**	
	Main Crossing Points *	**Developed Crossing Points ***
Lean (Low weight)	**< 18.50**	**< 18.50**
Excessive leanness	< 16.00	< 16.00
Moderate leanness	16.00-16.99	16.00-16.99
Mild leanness	17.00-18.49	17.00-18.49
Normal	**18.50-24.99**	**18.50-22.99**
		23.00-24.99
Overweight	**≥ 25.00**	**≥ 25.00**
Pre-obese	25.00-29.99	25.00-27.49
		27.50-29.99
Obese	**≥ 30.00**	**≥ 30.00**
Obese I. Degree	30.00-34.99	30.00-32.49
		32.50-34.99
Obese II. Degree	35.00-39.99	35.00-37.49
		37.50-39.99
Obese III. Degree	≥ 40.00	≥ 40.00

Source: Global Database on Body Mass Index (BMI), World Health Organization (WHO)

** Crossing points are based on the relationship of BMI with mortality and disease risk factors in European populations. Depending on ethnical properties, the relationship of BMI and body fat percent changes. WHO recommends a healthy BMI of 23 kg/m2 for Asians, and prevent weight gain between 23.00–24.99 kg/m² of BMI. They are accepted as pre-obese when they have a BMI higher than 25 kg/m² (34).*

Table 2. The distribution of body mass index (BMI) of Turkish subjects according to gender and inhabitation place, 2012 (15 ≥ year)

Gender and localization		Total	Lean	Normal weight	Excess weight	Obese
Gender	Total	100.0	3.9	44.2	34.8	17.2
	Male	100.0	2.7	44.7	390	13.7
	Female	100.0	5.1	43.6	30.4	20.9
Urban	Total	100.0	4.0	44.5	34.6	17.0
	Male	100.0	2.7	44.7	39.4	13.3
	Female	100.0	5.3	44.2	29.7	20.8
Rural	Total	100.0	3.5	43.4	35.2	17.9
	Male	100.0	2.4	44.7	38.1	14.8
	Female	100.0	4.7	42.2	32.1	21.1

Source: TÜİK: Türkiye İstatistik Kurumu, Turkish Health Investigation, 2012. http://www.tuik.gov.tr/PreHaberBultenleri.do?id=13490. Note: Sum of the figures may not give 100 due to rounding of numbers. Lean: BMI < 18.50 kg/m$^{2;}$ Normal: 18.50 ≤ BMI < 25.00; Overweight: 25.00 ≤ BMI < 30.00; Obese: BMI ≥ 30.00 kg/m^2

Table 3. BMI-based weight distribution; World Health Organization Classifications

BMI (kg/m2)	Classification
< 18.5	Lean
18.5–24.9	Normal
25.0–29.9	Overweight
30.0–34.9	Class I obesity
35.0–39.9	Class II obesity
≥ 40.0	Class III obesity
≥ 50.0 Class IV	Class IV obesity (Super obesity)

Source: Global Database on Body Mass Index (BMI), World Health Organization (WHO)

3. Results and Discussion

Technological Definition and Technical Properties

Obesity surgery is used in the treatment of metabolic disorders as well as in the treatment of obesity. Bariatric surgery is defined as all the invasive or minimally invasive techniques that have been developed to prevent and to treat obesity. On the other hand, metabolic surgery comprises all interventions to treat various organs or organ systems for a certain outcome (Kothari, 2012). Obesity surgery, or bariatric surgery, is basically divided into two types:

1) Preventive (restrictive) interventions
- Adjustable stomach band
- Stomach tube
- Gastroplasties (vertical or horizontal band)

2) Malabsorptive interventions
- Gastric bypass (Roux-n-Y, mini bypass),
- Biliopancreatic diversion (BPD) and/or duodenal switch

Mortality rates are higher in technically difficult interventions and vary from 0.03–1%. In terms of frequency, gastric bypass is the most commonly used technique, whereas BPD is the least used technique (Kothari, 2012).

Obesity reduces an individual’s expected lifespan significantly and increases treatment costs. Efforts to treat morbidly obese patients by initiating lifestyle changes (e.g., medical/nutrition treatment, exercise, and behavioral therapies) are worrisome, both in terms of health-problem solutions and costs. Therefore, bariatric surgery for this patient group may lead to much more effective outcomes.

This type of treatment has been used throughout the world for more than 50 years. Following the first laparoscopic placement of adjustable gastric band in 1993, this method has become popular again. Moreover, studies conducted during the last two decades have verified the efficacy of bariatric/metabolic surgery (H. Buchwald & J.N. Buchwald, 2002, H. Buchwald & J.N. Buchwald, 2007). Today, all bariatric interventions may be performed via a laparoscopic approach (Kothari, 2012).

These operations should be performed by surgeons experienced in obesity and metabolism surgery and who have completed their theoretical and practical education in laparoscopic procedures (especially advanced laparoscopic techniques in gastrointestinal surgery) in a laparoscopic obesity surgery center. Additionally, the surgeon’s relevant education should be documented (SAGES, 2008).

Centers for bariatric surgery should be second- and third-step reference centers, such as education and research hospitals and/or university hospitals. The surgical team should be multidisciplinary (i.e., representing general surgery, endocrinology, cardiology, pulmonology, psychiatry, anesthesia-intensive care, and nutrition). Private health institutions with experienced surgical teams should perform these techniques. Assignment and certification of centers and reimbursement protocols should be governed by independent boards with adequate representation. Finally, all activities should be monitored and controlled by the Ministry of Health.Safety
A systematic literature search revealed no study focusing on the complications of obesity surgery; an additional general search was performed. Based on the expert opinions in Turkey, the potential complications of obesity surgery performed using the most common three methods are (Picot et al., 2009):

Gastric Bypass: Potential complications include insufficiency related to the stapler, leakage from the junction between the stomach and the intestines, acute gastric dilatation, and retardation of gastric emptying due to spontaneous or secondary blockage of efferents. Superimposed stapler lines may form due to stapler line weakness, gastric transection (stapler line was divided and dissection was closed by suturing), or scar formation along the stapler line. Other complications after surgery include stoma narrowing and vomiting due to scar tissue formation, stretching that can be restored by endoscopic balloon dilatation as a one-day case, wound hernia and intestinal obstruction, anemia due to iron malabsorption, B12 deficiency, and calcium deficiency.

Gastric Banding: Possible complications include spleen injury, esophageal injury, wound infection, band shift, band erosion, and migration, deflation/leakage of the reservoir, intractable/persistent vomiting, failure in weight loss, and acid reflux. Some studies have reported re-operation rates (revision or band removal) due to complications in more than 20% of the patients during a 5-year follow up. Expert opinions state that the band failure rate may exceed 30%.

Sleeve Gastrectomy: Complications are reduced, as digestion is not affected, but the patients are at risk for vomiting due to excess eating and leakage because of the new stomach form. As in all surgical procedures, there are risks of postoperative complications, such as postoperative bleeding and intestinal obstruction. This is a relatively fast procedure and may reduce the risk of complications compared to other methods. Patients are hospitalized for 1 or 2 days under normal conditions.

Complication rates may vary in terms of patient safety. These complications range from bleeding to micro and macro nutrient deficiencies. These complications may be affected by operation method, patient-related factors, comorbidities, and BMI. The decision to operate should be based on a detailed evaluation of risks and the benefit/harm ratio. Bariatric surgery should not be performed on high-risk patients.

With respect to mortality, cohort studies conducted in the United States have shown that 300,000 subjects die due to obesity-related problems each year and that 80% of the deaths are related to obesity in patients with a BMI > 30 kg/m^2. Obesity surgery reverses these risks in 2 years. Moreover, obesity reduces a lifespan, on average, 6–7 years, whereas surgery reverses this effect (Sjöström, 2013; Whitlock et al., 2009).

Mortality rates associated with difficult techniques are higher and vary from 0.03–1%. In terms of frequency, the most common surgical method is gastric bypass, and the least common method is biliopancreatic diversion. General mortality rate is 0.03–2.5% (Buchwald & Oien, 2011; Smith et al., 2011). (Table 5) (Table 6)

Every material used in obesity surgery should meet the standards as defined by the EU and Ministry of Health; package instructions should also be followed. Complication rates may decrease after a certain number of procedures have been completed patients. Learning curves should be determined by an experienced team in accordance with national criteria.

In terms of employee safety, in addition to ergonomic problems associated with laparoscopic surgery, surgeons may have problems such as rapid fatigue, visual problems, joint and tendon problems (especially in the wrist and elbow), neck-low back hernia, and psychologic problems due to the characteristics of this patient group and associated operations. Besides problems related to patients and relatives, health authorities, reimbursement authorities, and industry, legal ramifications connected to complications may affect the QoL and work motivation of a surgeon. Surgical instruments used in bariatric surgery should meet certain criteria and have approval. In order to reduce safety risks, the following standards are important to consider:

- Bariatric surgery centers should undergo certification and accreditation.
- Physician certification should meet certain criteria.
- Assistant personnel should be educated and certified in the field of bariatric surgery.
- Patients, together with physicians, health workers, and support groups, should be educated pre- and postoperatively.
- The appropriate operation must be selected to adequately treat the patient.

Clinical Efficacy

A study conducted in Europe examined patients with a BMI > 40 kg/m^2 or a BMI > 35 kg/m^2 with a severe comorbidity. A cost-effectiveness analysis of all obesity processes showed that surgery, compared to nonsurgical treatments, leads to better results in patients with comorbid obesity. Weight loss as a consequence of surgery increased the QoL for these patients (Sauerland et al., 2005).

Laparoscopic gastric bypass (LGBP) is a safe and cost-effective alternative to open gastric bypass (GBP). Despite a lengthy operation time, patients who have the GBP operation experience less blood loss, shorter hospitalization periods, and faster recoveries. Laparoscopic GBP patients have a comparable weight loss in 1 year, but improvement in QoL is faster than that occurring after open GBP (Nguyen et al., 2001). After obesity surgery, comorbidities show a gross decline. Patients experience weight loss and an improved HRQoL; in addition, the mortality rate is eventually reduced (Charuzi, Lavie, Peiser, & Peled, 1992; Friedman et al., 1995; Frigg, Peterli, Peters, Ackermann, & Tondelli, 2004; C. D. Sjöström, Lissner, Wedel, & Sjöström, 1999; Sugerman et al., 1999), the disease severity is decreased, and/or the patient is entirely healed (Tatar, 2013). Although bariatric surgery may lead to morbidity, it also reduces it by treating comorbidities related to obesity (Friedman et al., 1995) (Table 4). Meanwhile, this type of surgery increases QoL by removing disease complications and symptoms (Campos et al., 2011; Mohos, Schmaldienst, & Prager, 2011) (Tables 5–9).

In general, both physical/psychosocial comorbidities and QoL improve due to better psychosocial functions after bariatric surgery. However, these results may conflict with studies of patients having no healing or psychosocial problems and thus return to baseline levels. The variability in results may arise from different measurement criteria, variable outputs, or different time periods. Patient satisfaction is generally quite high.

Costs and Economic Assessment

In a study by Ross et al. (2009), there was a strong correlation between obesity and type 2 diabetes (RR = 3.92 (95% CI: 3.10–4.97) (Guh et al., 2009). Moreover, metabolic syndrome and snoring are more prevalent among obese patients than among nonobese patients (Ross et al., 2009).

In a study conducted by Baser, Huang, Li, and Wang (2013), indefinite hypertension (26.61%), type 2 DM (19.02%), and indefinite hyperlipidemia (9.36%) were the most frequently diagnosed comorbidities in obese patients. Almost all the patients were followed up as outpatients (99.97%), and only 10.58% of them were hospitalized. The mean hospitalization cost per patient was $3,164; the mean outpatient treatment cost was $6,700; the cost of a visit was $6,277; and the cost of drugs was $1,296; finally, the emergency-room cost was $192 (Baser et al., 2013).

In a study by Picot, Jones, Colquitt, Loveman, and Clegg (2012), the ratio of cost-effectiveness (ICER) in obese patients with type 2 DM who underwent LAGB decreased to £20,159, £4,969, and £1,634 after 2, 5, and 20 years, respectively. The ratio of cost effectiveness differs especially based on BMI reduction. In addition, low operation performance and expenses for diabetes affect cost-effectiveness. In conclusion, obesity surgery was clinically effective and cost-effective in obese patients with comorbidities (Picot, Jones, Colquitt, Loveman, Clegg, 2012).

From a different point of assessment, in a U. S. study by Ewing, Thompson, Wachtel, and Frezza (2011), obesity cost 1,977 work days and led to a 13 million dollar annual loss in indirect work taxes. To allow obesity surgery may lead to a gain of 1.3 to 9.9 billion dollars in the United States, a net profit that comprises single prepayments of surgical treatment and continuous increases in worker productivity (Ewing et al., 2011).

Perryman and Gleghorn (2010) conducted a study with 9,400 participants and 4,700 LAGB candidates. While payers claimed that reimbursement of LAGB-related health costs occurred at around 23–24 months and that the annual profit after 5 years was 28.8%, employers claimed that the refunding of LAGB-related costs may take 17–19 months and that the annual profit after 5 years may be 45.5%. From the social perspective, it has been shown that a 195.3 million dollar profit may be gained from work-related expenses in the state of Texas (following 5 years) (Perryman & Gleghorn, 2010).

Although obesity surgery is advantageous in terms of cost reduction, the value of the expenditure is also reimbursed. The cost-effectiveness, here, varies according to actual past and possible postoperative future complications, as well as untreated morbid obesity (McEwen et al., 2010).

In another study conducted in the United States, a laparoscopic approach resulted in significant lower mortality rates and less need for intensive care and rehospitalization within the first 30 days. It also reduced morbidity, length of the hospitalization period, and all-cause costs (Tiwari, Reynoso, High, Tsang, & Oleynikov, 2011).

Along with the increasing obesity in the United States, obesity-related health expenses have also increased: Currently, costs are at around 92.6 billion dollars, which corresponds to 9.1% of total health expenses. In the present study, by using three different models and various perspectives, cost analysis in economic environments was addressed. Cost/QALY in obesity surgery was lower than $50,000 in two studies, while another study found obesity surgery to be $4,000 cost-reductive (Salem, Jensen, & Flum, 2005).

In the United States, 100,000 obesity surgeries were performed in 2003. The mean LRYGBP drug prescription cost was $368.65/month. In the calculation after 6 months, the annual cost was $119.10/month (a 68% decline). In the 1-year assessment, this figure decreased to $118.67 (a 68% decline); in the 2-year assessment, it decreased to $104.68. Obesity surgery reduces obesity-related morbidity; it also reduces drug use after 54 years of age. In a study by H. Buchwald and Buchwald, 78 patients had an annual cost reduction of $240,566 (2002). A U.S. study on laparoscopic gastric bypass ($19,794/case) led to the lowest hospital costs when compared to open gastric bypass ($22,313/case) and laparoscopic band ($25,355/case). Laparoscopic band interventions have lower costs due to a 1-day shorter hospitalization (Snow et al., 2004).

Chang, Stoll, and Colditz (2011) found obesity surgery to be cost-effective in patients with a BMI of 35 kg/m^2 or higher. The incremental cost-effectivity ratio (ICER) was less than $4,000. Surgery reduced the costs in patients with a BMI higher than 50 kg/m^2 plus at least one obesity-related comorbidity before surgery (Chang et al., 2011).

In Finland, the total annual cost of obesity is 260 million dollars, of which 190 million are expended on the health system. According to the study's basic case analysis, obesity surgery was more effective and less expensive than medical treatment. The mean costs were $33,870 and $50,495 respectively, and the QALY for both treatments were 7.63 (obesity surgery) and 7.05. Surgery performed in cases of morbid obesity increase the health-related quality of life and reduces the need for further treatment and total health service costs. According to this analysis, medical treatment costs were higher in the 5-year period following surgery in the Finnish health system (Mäklin et al., 2011).

In a payer-perspective evaluation on a patient group in Canada, obesity surgery was cost-reductive after 3.5 years in obese patients with type 2 DM when compared to pharmacologic treatment. Today, obesity surgery is performed in patients with a BMI > 35 kg/m^2 plus severe comorbidity and in patients with a BMI > 40 kg/m^2. From a payer's perspective, it provides a cost-effectivity ratio from $5,000 to $35,000 per QALY compared to pharmacological treatment. In the Canadian study, the life-time cost-effectivity ratio was $8,000–$10,000/QALY. Post-operative 5-year follow-ups revealed that 96% of the patients completed the period successfully (Padwal et al., 2010).

Another study in Canada demonstrated that the obesity rate increased in a 13-year period, from 5.6% in 1985 to 14.8% in 1998. In a study which included patients with a BMI < 35 kg/m^2, health service use and total direct health expenses were reduced with obesity surgery when compared to the control group. These findings are important in terms of social and health economics, since the costs of health services associated with the operation were added into the total surgery costs. Accordingly, the mean total direct-health cost for the 5-year period after surgery decreased by 45% in cases of morbidly obese patients. With respect to indirect costs, the total profit may be higher (Christou et al., 2004).

From 2000 to 2005, the U.S. obesity rate increased by 24%, and, on average, the cost of obesity surgery ranged from $17,000 to $26.000. Considering total costs, the neck-and-neck point was reached in 4 years for open surgery and in 2 years for laparoscopic surgery (Cremieux et al., 2008).

In a 5-year treatment cohort study conducted in France and in the United Kingdom, obesity surgery in state of traditional therapies led to a €5.03 million net profit for GBP in the United Kingdom and to a €3.59 net profit for AGB in France, meaning that the net profits for GBP and AGB were €5.88 million and €4.48 million, respectively. In the United Kingdom, a price elevation of €2.03 million for GBP and €1.98 million for AGB shows that in Germany, the worst scenario for type 2 diabetic patients is that GBP and AGB are methods with the biggest cost reduction during 5 years, and they are more cost-effective than traditional treatment. In France, GBP provided a cost reduction during 5 years and was more cost-effective than traditional methods. Although somewhat more expensive, AGB continues to be cost-effective. In the United Kingdom, GBP and AGB are more expensive but still more cost-effective (Ackroyd, Mouiel, Chevallier, & Daoud, 2006).

In a European study on patients with a BMI > 40 kg/m^2 or a BMI > 35 kg/m^2 plus a comorbidity, a cost-effectivity analysis resulted in a better cost for surgery than for nonsurgical treatment. In addition, surgery-induced weight loss led to increased QoL. (Sauerland et al., 2005).

In patients with a BMI ≥ 35 kg/m^2 plus type 2 diabetes, 5-year follow-ups in Austria, Italy, and Spain revealed that medical treatment, AGB, and GBP were clinically effective and safe as well as sufficiently cost-reductive from the perspective of the payer. This was based on a 5-year follow-up and an annual reduction rate of around 3.5%. In Austria and Italy, AGB and GBP are cost-reductive and better than medical treatment. In Spain, AGB and GBP lead to a reasonable cost increase but are cost-effective when the payment threshold is €30,000/year per QALY. Even in the worst opinion analysis, AGB and GBP are cost-reductive in Austria and Italy and cost-effective in Spain (Anselmino et al., 2009).

In a different analysis, LRYGB and LAGB in men and women were found to be negative in detail based on BMI values; however, considering weight loss and costs. they are effective when lower than $25,000/QALY. For men, according to the main scenario, the additional cost-effectivity ratio per QALY was $11,604 for LAGB (35 years of age and a BMI > 40 kg/m^2) and $14,680 per QALY. The additional cost-effectivity ratio for LAGB (male–female, age 35, 45, and 55 years, BMI 40, 50, 60) was lower than LRYGB. In a one-way sensitivity analysis, the additional cost-effectivity ratio of LAGB was affected by an increase in weight loss, operation costs, and frequent band removal. The LRYGB additional cost-effectivity ratio was most affected by the operative mortality rate, increased weight loss, and operation costs (Salem, Devline, Sullivan, & Flum, 2008).

In a study conducted in Australia, the treatment costs per patient for 2 years were 13,400 AUD for surgery and 3,400 AUD for conventional treatment. Outpatient costs were three times higher; on the other hand, drug costs were 1.5 times higher with conventional treatment. The additional cost-effectivity ratio of surgical treatment compared to conventional treatment was 16,600 AUD in patients with improving diabetes (Keating et al., 2009).

In a study conducted in England, patients with a BMI > 40 kg/m^2 and with a BMI > 35 kg/m^2 plus a severe comorbidity were studied. The surgical method in morbid obesity was clinically significant and cost-effective. Due to indefinite clinical and economic evaluations and the nature of evidence, it seemed difficult to make a selection from the surgical procedures. Economic assessments demonstrated that if the payment threshold is £30,000 and £11,000/QALY per additional QALY, surgical methods are more cost-effective than nonsurgical methods. Comparisons among the different surgical procedures led to ambiguous results. According to a one-way sensitivity analysis, surgery is more cost-effective than nonsurgical methods in a broader range of values (Clegg, Colquitt, Sidhu, Royle, & Walker, 2003).

Most of the studies on obesity surgery have shown a strong relationship with type 2 diabetes, and surgery has been reported to cure diabetes in obese diabetic patients. When type 2 diabetes accompanies a BMI ≥ 35 kg/m^2 and ≥ 40 kg/m^2, obesity surgery is superior to standard treatment. Germany’s Health Quality and Efficacy Institute recommends surgery for obese patients (BMI ≥ 35 kg/m^2) plus diabetes (Paxton & Matthews, 2005). It was concluded that obesity surgery in diabetic patients is cost-effective or cost-reductive with respect to standard obesity treatment (Chang et al., 2011).

Although some studies have compared laparoscopic methods and conventional methods, it is difficult to reach a conclusion as to which is superior, due to the small number of studies. For all common surgical interventions, laparoscopy seems superior to open surgery (Chang et al., 2011; Padwal et al., 2010; Perryman & Gleghorn, 2010; Ross et al., 2009; Salem et al., 2008, General Directorate of Health Researches: Turkey Nutrition and Health Research, 2010). In a study by Cremieux et al. (2008), all expenses were included, and the neck-and- neck point was reached in 4 years for open surgery and in 2 years for laparoscopic surgery. Some studies have concluded that surgical methods are more cost-effective than medical treatment under certain conditions (Anselmino et al., 2009; Guh et al., 2009; Tiwari et al., 2011). Obesity surgery is clinically significant and cost- effective in patients with a BMI > 40 kg/m^2, with a BMI > 35 kg/m^2 plus a severe comorbidity, and with a BMI ≥ 40 kg/m^2 when compared to nonsurgical methods (Anselmino et al., 2009; McEwen et al., 2010; Tiwari et al., 2011).
The New Zealand Ministry of Health published guidelines in 2010, and recommended obesity surgery in patients with a BMI > 40 kg/m^2 and with a BMI < 35 kg/m^2 plus a severe comorbidity (Salem et al., 2005). Canada published the "2006 Canadian Clinical Practice Guidelines on the Management and Prevention of Obesity in Adults and Children" (Canadian Medical Association, 2007.) The American National Institutes of Health (1999) obesity report, the Netherlands Institute of Healthcare Promotion (Seidell, de Beer, & Kuijpers, 2008) "obesity treatment guide" and Scottish interuniversities (Scottish Intercollegiate Guidelines Network; SIGN, 2010) "obesity guide" recommend obesity surgery in patients with a BMI > 40 kg/m^2 and with a BMI < 35 kg/m^2 plus a severe comorbidity. Obesity-related diseases include ischemic heart disease, hypertensive heart disease, DM, osteoarthritis, ischemic stroke, breast cancer, colon and rectum cancer, corpus uteri cancer, hyperlipidemia, and sleep apnea. These lead to a gross share of total health expenses (SIGN, 2010).

Economic Evaluation of Obesity and Obesity Surgery in Turkey

In this study, a calculation model was developed to find the obesity disease load in Turkey (Tatar, 2013). The basis of the model was the "Turkey Disease Load Study," published by the Ministry of Health (2004). Disability adjusted life years (DALY) were used. Table 10 shows the DALY attributable to BMI according to etiology.

As shown in Table 10, the prevention of obesity may lead to 787,184 DALY savings in Turkey. In the calculation model, aside from the disease load study, the national gross product for the years 2004 and 2012, the national gross product per capita (Table 11), and Turkish population data and obesity data (Table 12) were used (Tatar, 2013).

The economic load attributable to obesity was calculated from the data is presented in Tables 11 and 12, and the DALY is presented in Table 10. The disease reasons for the DALY were multiplied by $5,804 for 2004 and by $10,499 for 2012 to find the economic load per disease reason. Economic load per disease etiology was multiplied by 0.64 (the difference ratio of obesity above 30 years of age between the two years in Table 12) and added to the economic load of the year 2012. Table 13 shows the calculation results (Tatar, 2013).
As shown in Table 13, the total economic load attributable to obesity in 2004 was $4,568,668,076, which is 1.16% of the GSYIH for the same year. This rate was 1.73% for the year 2012 (Tatar, 2013).

In a study conducted in Turkey, there was significant efficacy difference between the treatment choices, and, as the quality of life data were lacking, the economic value of the comorbidities were estimated via the DALY. The model included patients maintaining obesity, patients treated after surgery, and improvement in clinical outputs related to comorbidities. The surgical technique was compared to the untreated condition. Analyses were performed from a public reimbursement perspective. Another analysis was performed to estimate the economic load of obesity related to comorbidities to the system after establishing scenarios (Tatar, 2013).

In order to adopt attributable DALYs, a model input, to the present day, the DALY per obese patient should be determined; therefore, the model included individuals who were over 30 years of age in 2004. The obesity rate in those 30 years of age (BMI ≥ 30 kg/m^2) was 12% (the data closest to those of 2004 were data from 2003). In 2004, the number of obese patients over 30 years of age was 3,964,078. In order to find the DALY per obese patient, "disease etiology total DALY" was divided by "the number of obese patients in 2004" (Table 14). Ischemic heart disease had the highest DALY per obese patient. The second highest DALY was for diabetes mellitus. In total, 0.20 DALY per obese patient was lost. Table 15 shows the comorbidities of obesity before and after surgery and the percent changes during years (Tatar, 2013).

The operation costs of obesity surgery were calculated as $1,717. The source utilization (drug, laboratory, control visits, etc.) of patients during the postoperative years (excluding complications) was found via the Delphi panel, and costs were calculated by KGO prices. The economic load of patients who had not undergone surgery was calculated by multiplying the disease reason DALY per obese patient and the national gross product per capita in 2012 ($10,499) (Tatar, 2013).

In obese patients (BMI ≥ 40 kg/m^2), the economic load of comorbidities is $2,035 if they continue to forego surgery. At the fourth postoperative year, the economic load of operation is removed, and the cost of the operation may be refunded (Tatar, 2013).

For obese patients over the age of 30 years (BMI > 40 kg/m^2) and having five comorbidities, obesity surgery carries an economic load because of operation costs; however, after 3 years, this economic load disappears, and by the fourth year, costs begin to decline (Tatar, 2013).

For obese patients over the age of 30 years (BMI > 35–39.9 kg/m^2) and having five comorbidities, obesity surgery carries an economic load because of operation costs; however, after 2 years, this economic load disappears, and by the third year, costs begin to decline. Obese patients with a BMI ≥ 35–39.9 kg/m^2 are not covered, but their cost-reduction is better than obese patients with a BMI ≥ 40 kg/m^2 (Tatar, 2013).

The economic evaluation study revealed that costs of surgical treatment in obese patients with a BMI ≥ 40 kg/m^2 were high in the operation year and in the first postoperative year. However, this cost gradually declined, and by the fourth year, it started to be economically advantageous due to reduced comorbidities. At the end of fifth year, the estimated total economic gain is around $1,218 per patient (Tatar, 2013).

The economic evaluation study scenario for patients with a BMI ≥ 35–39.9 kg/m^2 resulted in similar outcomes. The cost was high in the operation year and also at the end of the first year for this patient group. Again, due to reduced comorbidities, the economic gain begins by the third year. At the end of the fifth year, the estimated total economic gain is around $3,778 per patient (Tatar, 2013). As a result, it may be said that the economic gain in obese patients with a BMI ≥ 35–39.9 kg/m^2 (currently not covered) is better than that for patients with a BMI ≥ 40 kg/m^2 (Tatar, 2013).

The DALY calculation in the analysis with the public perspective puts forward an economic gain. Thus, the analysis included not only the reimbursement by the Public Reimbursement Authority but also the indirect health expenses. As in many other countries throughout the world, the obese population in Turkey has been increasing: In the nine years from 2003 to 2012, it has increased by 42%. Moreover, the results of this study showed that the economic load attributable to obesity was 1.16% of the total economic load in 2004 and 1.73% in 2012. Considering the increase in the obese population, it is obvious that the economic load will increase in the near future (Tatar, 2013).

The analysis had several limitations. As the DALY data of 2012 was lacking for the data from 2004 was used. Furthermore, the obesity rate and the number of individuals over 30 years of age were unknown for 2004; thus, we used data from the closest year (2003). The cost of obesity surgery complications could not be calculated. As there were no comorbidity reduction figures specific to Turkey, required figures were taken from the Delphi panel. Comorbidity follow-up was limited to 5 years due to limited information. The same time limit was used for the economic model. The Turkey Disease Load Study included 8 comorbidities; we could not add other comorbidities, such as sleep apnea and hyperlipidemia. When calculating the economic value of obesity surgery based on Delphi panel outcomes, we included ischemic heart disease, hypertensive heart disease, DM, osteoarthritis, and ischemic stroke as comorbidities of the Turkey Disease Load Study. Surgical methods included were band, sleeve, and bypass, as they are under reimbursement coverage. According to the Delphi panel, clinical outcomes of all operation techniques are the same; thus, a weighted operation cost was used to calculate comorbidities. The Turkish Public Hospitals Authority (Turkiye Kamu Hastaneleri Kurumu, TKHK) calculated the operation cost of sleeve gastrectomy and found 8,930,90 TL for one operation (Handbook for fight against obesity for primary care physicians, 2013). The public reimbursement rate for sleeve gastrectomy is 3,100 TL. However, the TKHK analysis included the data from only one center (one hospital) and one operation type. In addition, this analysis used a public reimbursement perspective. Thus, we used the reimbursement rates in practice rather than the TKHK estimated costs (Tatar, 2013).

Organizational Aspects

In the Health Technology Evaluation Reports, organizational aspects are usually not included in a study. In this study, however, we included organizational aspects such as process, infrastructure, management, and institutional culture in the evaluation. We think that this is important to widen the accessibility of obesity surgery parallel to public needs.

The center to which obesity patients are admitted is important in terms of organizational aspects. In the current healthcare system, obese patients are admitted to first-line healthcare centers (Family Health Centers/ASM) or different clinics of hospitals. These units should redirect such obese patients to obesity clinics. The effective use of obesity clinics is very important in patient evaluation: When obese patients are admitted to various clinics (e.g., orthopedics, physical rehabilitation, and nutrition) because of accompanying disorders, a multidisciplinary approach should be used after an initial detailed evaluation of presenting symptoms. Additionally, obesity, endocrinology, and general surgery clinics should work together to form a flow chart for the patient and to determine the treatments.

Obesity surgery may be divided into three phases: preoperative, perioperative, and postoperative. In the management of all these phases, coordination should be provided by caring for the safety of multidisciplinary team members and patients. From the beginning to the end, the surgeon, the internal medicine specialist/endocrinologist, the dietician, the psychiatrist/psychologist, and other team members are responsible for every kind of monitoring, as well as for the education of patient and relatives.

Patient follow-up is important, especially during the postoperative period. Follow-up schedules based on the guidelines of the American Society for Metabolic and Bariatric Surgery (ASMBS) should include visits every third month in the first year, every sixth month in the second year, and then every year. Interviews should address medical complaints, weight changes, anthropometric measurements, drug control, psychosocial problems, laboratory evaluations, and physical examinations. In the assessment of comorbidities, “complete healing” and “improvement” are important for operation success (Mechanick, Kushner, et al., 2013; Mechanick, Youdim, et al., 2013) (Table 14).

According to the American Academy of Surgery, an authority in obesity surgery, obesity surgery is different from other gastrointestinal surgeries in terms of adequate patient selection, evaluation of outcomes, and effects on patients’ lives. In contrast to other surgeries, aside from the technical performance of the operation, success depends on behavior and lifestyle adaptation, as well as medical treatment and follow-up. Surgeons who plan obesity surgery for a patient should also provide preoperative education and long-term postoperative follow-up and stable healthcare (Koslovski, 2000).

According to the American Academy of Surgery, obesity surgeons should provide all rational surgical options based on a preoperative evaluation. Postoperative patient care may be conducted by related departments; however, the surgeon is the lead coordinator of the team until all problems related to the operation are solved, and the risk of complications are removed (Koslovski, 2000) (Table 15).

Also according to the American Academy of Surgery, surgeons who are planning obesity surgery should have obtained certification in gastrointestinal and biliary surgery from an accredited institution, should have worked in a multidisciplinary center for morbidly obese patients, and should offer an institutional program for the prevention, monitoring, and management of early/late-period complications (Koslovski, 2000).

In the surgeon's work center, there must be a follow-up system to monitor reconstructive surgery patients (at least 50%) for at least 2 years and malabsorptive surgery patients (at least 75%) for at least 2 years. In addition, there should be another system for patients living abroad or in another city. To perform open (laparoscopic) surgery practice, a surgeon should (1) have completed obesity surgery training and (2) work together with an experienced surgeon who is an expert in advanced laparoscopic surgery and who has operated on 10 patients without reoperation (including acceptable perioperative complication rates).

To engage in laparoscopic surgery practice, a surgeon should have (1) certification in laparoscopic surgery and advanced laparoscopic surgery from an accredited institution; (2) assistance in laparoscopic bariatric surgery cases; and (3) the records and success rates of 15 patients who were operated on while the physician in practice was serving as primary surgeon (including acceptable perioperative complication rates) (Koslovski, 2000).

Centers for obesity surgery should be structured to have a system containing all steps of obesity surgery from admission to discharge, as well as follow-up after discharge. In order to provide expected results from obesity surgery and for maintenance, centers should have adequate standards. Patients should be evaluated via a multidisciplinary approach with a systematic follow-up. All the records should be kept. Decision making associated with obesity surgery, indications, comorbidities, and management can be performed using multidisciplinary inputs. Centers for obesity surgery should have organization, leadership, human resources, and physical resources. Center professionals should have adequate education, skills, and experience.

Ethical Analysis

The medical technology of obesity surgery is an ongoing, dynamic developmental area. The surgical treatment concept of obesity has been developed by observations of postoperative weight loss in patients who have undergone gastric or intestinal resection. The development and formation of bariatric surgery is parallel to the development and modification of gastrointestinal system surgery.

Postoperative short-term effects are similar to the effects of laparoscopic surgery, but some differences may occur after weight loss. The most important of these is adaptation to the new body form. Long-term obese patients require some time to adapt to a new body size. They continue old habits in their social lives and isolate themselves. In time, they buy new clothes and observe the difference before a mirror. During mid-term, efforts to maintain the new size are initiated. Eating and activity habits should be defined, and the social environment should be re-created to include supportive people. Eating disorders should be prevented during this period. The long-term body weight should be kept constant; plastic and reconstructive surgery may then be considered for deformations or bulging skin. Patients should reconcile with their bodies and engage in an active social life.

The evaluation of patients' short-, mid-, and long-term outcomes of obesity surgery and related technologies is important for treatment efficacy and standardization. It is difficult to evaluate the long-term outcomes of new technologies; some of the long-term problems are treatment failure (surgical failure or noncompliance), recorrection due to insufficiency of the selected surgical method, and new or different techniques used in the operation. Medicine requires the practice of "general scientific knowledge" on "a single patient," which makes it a kind of art. A method that may be ineffective on one patient may be effective on others. Therefore, an ineffective result does not make a method invalid or reduce its value (Berg, Appelbaum, Lidz, & Parker, 2001). Obesity surgery should be evaluated while using a patient-based approach. Patient compliance is also important.

Obesity surgery may seem problematic from religious, cultural, or moral points of view in certain environments. With respect to obesity treatment and obesity surgery, obesity should be accepted as a disorder or illness, and public awareness of this classification should be increased. The aim of this procedure was to prevent obesity-related diseases rather than to address aesthetic concerns. It encourages a kind of rehabilitation of obese individuals and brings them into society. Reduction of costs for secondary conditions is also important.

There is no detailed knowledge about the unforeseen problems following an obesity surgery. Therefore, there may be some potential legal responsibilities, and informed consent forms are very important to prevent such conflicts. In the years following surgery, unforeseen problems and health problems related to the operation carry some potential for legal issues, as they are not mentioned on the informed consent form.

The initial conditions of informed consent are free will and the patient's capacity to make his or her own decision. Providing information and confirming the patient's understanding should then take place. During the final step, the patient will decide to have or to reject the procedure. Giving wrong or incomplete information about obesity surgery or using difficult language full of technical terms is not appropriate from an ethical point of view. During the informed consent process, all treatment options should be explained to the patient, and consent should not be based on communication problems (Rouf, 2004). If there are some constraints with which a patient should comply, these issues should be explained before obtaining consent.

It is ethically necessary to protect vulnerable patient/human groups. Obtaining the informed consent of a vulnerable group member for a surgical intervention is critical. For an incompetent patient without adequate reasoning faculties, a legal guardian must give the consent. If there is transient unconsciousness, post-recovery personal consent should also be obtained from the patient (Rouf, 2004). To protect patients' rights, obesity surgery on patients in this group must comply with the highest ethical standards, meaning that the surgical team must "apply all ethical principles and standards." Violation of these standards or ethical rules should be explained on the basis of that particular example and must be rationalized.

In obesity surgery, both the general health condition of the patient and the complexity of invasive methods may pose unexpected risks. Such risks should be evaluated both for the short term (during surgery) and for the long term (during recovery). Patients state that they feel discredited due to obesity; however, in the long term, after they lose weight, they feel confident, join the community, and communicate with others.

One goal of informed consent is to reduce this asymmetry and to provide information balance. It is not honest to forego an operation in the presence of indication or to mislead the patients by giving them an inordinate amount of hope. Obesity patients are frequently stigmatized and/or isolated, which is a social problem. Two basic ethical problems are important to consider in obesity surgery:

1. Can we intervene to treat a patient's health against his or her will?
2. Is there a rationale for interventions that may harm an individual when public benefits are present (The European Charter of Patients' Rights Rome Declaration, Active Citizenship Network, 2002)?

Physicians should consider the benefit of their patients only and should not surpass their professional independence. Physicians may make decisions based on a risk-benefit ratio. Patients, healthcare professionals, third parties, and the community should together evaluate any harm that could potentially result from obesity surgery. The patient has the priority in terms of benefits. When the patient's benefits are combined with community benefits, this may be accepted as the strength side of a medical practice.

The balance between risks and benefits may be provided by forming an interdisciplinary board that constitutes basic medical specialties related to obesity surgery. Both the patient and the physician should participate on this board and try to make the best decision together.

Aside from the benefits of obesity surgery to the patient, it should be evaluated for its load on the community and on the reimbursement system. Health resources have always been limited; therefore, the focus should be on prevention rather than on treatment of the disease.

The justice principle requires a fair and frank dispensing of medical resources (e.g., technology, equipment, and services) based on real need. Not only routine health services, but also newly developed diagnostic and treatment methods should also be accessible for patients. According to t The European Charter of Patients' Rights Rome Declaration (Active Citizenship Network, 2002), each citizen has the right to take advantage of innovations, including diagnostic procedures, independent of economic or financial status (without reason) with international standards (The European Charter of Patients' Rights Rome Declaration, Active Citizenship Network, 2002). However, the utilization of expensive and limited technologies may negatively impact basic healthcare services for the population in general. As healthcare resources are limited, a transfer of sources from basic health services to expensive technologies may be controversial from an ethical point of view (Taskin, Zengin, Apaydin, & Unal, 2000).

In terms of obesity surgery, insufficient basic and preventive health services may lead to a vicious cycle via an increased prevalence of obesity. When considering obesity surgery, the patient and the physician make the decision together. The primary aim is to prevent secondary diseases, as well as negative effects on the individual's social and conscious states. Thus, it is a unique situation.

Being healthy and utilizing healthcare services are basic human rights that complete the right to survive, the basic human right. There are many national and international regulations on this issue. Healthcare services should be distinguished from qualities that may endanger the right to survive. Healthcare services should adhere to the same standards for each individual. There are many regulations with respect to healthcare utilization and the right to survive. According to Constitution article 90, international legal norms approved by TBMM are superior to national regulations. Turkey is obliged to comply with international regulations.

Social Aspects

Depending on the type of obesity surgery, the time when a patient returns to social life after the operation varies. As bariatric operations are laparoscopic interventions, patients stand up in the evening of the same day and, under normal conditions, may be discharged in 2 or 3 days. An early return to work and social life is an advantage of laparoscopic bariatric surgery without large abdominal incisions. Pain after open surgery may delay a return to work and to social life. In addition, a special diet with liquids in the first 1–2 weeks, puree in 3–4 weeks, and solid nutrients thereafter is applied (Taskin et al., 2000). Patients begin to feel the positive effects of obesity surgery on their social lives within the first month. With weight loss and increased physical mobility, patients are able to easily perform the activities of daily living.

In general, social effects comprise the leading problem for an obese person. Obesity has negative impacts on the patient's socialization abilities. The American Obesity Association has announced, "No disease, no prejudice, no health condition, and no public discrimination may threat health and social relationships of an individual as much as obesity." (Mechanick, Kushner, et al., 2013; Mechanick, Youdim, et al., 2013).

After obesity surgery, a rapid weight loss starts within the first month, and the physical appearance starts to change. Thus, self-confidence increases and patients enjoy social life. Based on the type of surgery, patients may need the company of a relative from 3 days to 3 weeks. Mobility limitation due to obesity combined with the difficulty of movement resulting from the operation makes companionship/assistance necessary.

After the first month, patients start to bear responsibilities in their social lives, and increasing physical mobility enhances psychosocial goodness and relations with parents, siblings, and children. In addition, job performance increases, and physical improvement leads to psychological improvement. As comorbidities affect the psychosocial structure, obesity surgery increases QoL in every respect. Briefly, obesity surgery enables the individual to play his or her different social roles.

It is recommended that pregnancy should be avoided for 1.5 to 2 years after obesity surgery. This may affect the family; however, obesity may lead to fertility problems, and weight loss may solve these problems. Eventually, this type of surgery may support childbearing.

Psychologic support after obesity surgery is very important. As obesity surgery may be perceived as an aesthetic operation; patients usually communicate their problems with other subjects who can understand their situation. Social-sharing websites, societies, and information websites serve as meeting points for these patients as they support each other. Although social-haring websites are useful in increasing social interaction and development, they may have some risks and drawbacks. The patients' experience forms the major source of this particular body of knowledge.

From a scientific perspective, when health risks of an obese individual are compared to the risks of surgery, it is obvious that obesity is more dangerous and risky. However, public perception is contrary to that perspective and stresses that there is no need to take the risk of surgery. The most important reason for negative thoughts about obesity surgery is that obesity is accepted as an aesthetic concern that can be solved by diet and exercise. This public perception prompts patients and their relatives to run away from surgery or to consider surgery as a last solution. This delay may lengthen the treatment process.

Legal Aspects

As a legal requirement, informed consent forms should be prepared clearly and without the use of technical and medical terms. All treatment options and possible side effects should be explained in a simple way. Expected or unexpected results, conditions associated with the operation should be explained, and adequate information should be given. The approval or consent of the patient must be based on his/her free will. In order to do this, at least 24/48 hours should be given to the patient for decision making. A consent for the future is valid, if the patient was competent while giving consent.

As patient data are now kept on computer systems using software, patient privacy has become increasingly important. Therefore, access codes should be used to limit or to prevent data access by second or third parties. Any neglect on this issue may lead to legal ramifications. Since there will be significant physical change as the result of the operation, the patient's permission must be obtained before taking photographs and/or films to monitor the difference. Otherwise, legal issues may arise.

Decision making in obesity surgery is different and effective in terms of admission and follow-up processes. Considering that, to the physician, the admission is a conscious action, the social environment and cultural level of the patient may be important. Thus, all patients do not have equal access to medical services. In terms of health regulations, the acceptable BMI as criterion for the operation varies among the countries. There may be other problems, such as pre-evaluation before reimbursement, failure to exceed a certain part of the capacity of the healthcare system, inadequate design of instruments for obesity surgery, insufficient purchase, and a lack of an adequate number of physicians and other healthcare professionals. Public opinion holds that people put on weight voluntarily and that they can lose weight if they want to do so. To prevent this perception, it should be explained to the community that obesity is a disorder and that comorbidities are very important.

Although obesity surgery is under social coverage, it has reached significant out-of-pocket payment levels, indicating that high-income patient groups undergo this surgery without requesting to be added to the waiting list. This is debatable in terms of equal accessibility. To solve this problem, legal regulations are required.

Our country has some advantages, as this procedure is more cost-effective than the world standard and is performed in accordance with legal regulations. This is important for health tourism, as lower costs may increase its expectations. The establishment of national standards for obesity surgery will accelerate this process, as well as the demand. As this is a relatively new issue, there are no detailed regulations for obesity surgery practice on patients coming from abroad; legal regulations must first be established. There must be certifications of centers and surgical teams with feasible physical conditions. Legal regulations should be based on general laws. Equality and justice principles should be considered. All these efforts should be in accordance with the European community's laws and regulations. There is no private regulation at the moment, however, and the general laws are effective.

4. Conclusion

Obesity has become a leading disorder that threatens world populations. Governments are developing many strategies with which to fight obesity. It has been shown that medical treatment is ineffective and that obesity surgery may be useful, especially in patients with a high BMI plus comorbidities. In addition, cost-effectivity analyses from different countries have shown that obesity surgery is a cost-effective and sustainable treatment in certain patient groups. Economic analyses of Turkish data have resulted in similar outcomes. Obesity surgery is clinically effective and cost-effective; however, ethical, social, and organizational aspects should also be evaluated. These aspects should be taken into consideration when determining correct patient, correct surgeon, correct center, and the correct surgical method.

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Table 4. Comparison of mortality and morbidity in surgical procedures

Operation	*30-day mortality (%)*	*All complications (%)*	*Major complications (%)*
LAGB	*0.05-0.4*	*9*	*0.2*
RYGB	*0.5-1.1*	*23*	*2*
Laparoscopic BPD/DS	*2.5-7.6*	*25*	*5*
LSG	*0.3*	*11.2*	*4.7*

LAGB: Laparoscopic gastric bypass

RYGB: Roux-en-Y gastric bypass

Laparoscopic BPD/DS: Laparoscopic biliopancreatic diversion (BPD) with duodenal switch (DS)

LSG: Laparoscopic sleeve gastrectomy

Table 5. Comparison of characteristics in basic bariatric procedures

*/*** the worst and the best categories

Quality	**Gastric band**	**RYGB**	**Sleeve Gastrectomy**	**BPD ± DS**
Safety	***	**	**	*
Efficacy	**	**	**	***
Long term	***	***	?	***
Side effects	*	**	*	**
Reversible easily	Yes	No	No	No
Minimally invasive	***	**	**	*
Controllable/adjustable	Yes	No	No	No
Low revision rate	*	*	?	*
Follow-up	***	**	*	**

RYGB: Roux-en-Y gastric bypass

BPD ± DS:BPD/DS: Biliopancreatic diversion (BPD) with duodenal switch (DS)

Table 6. Comparison of quality in different bariatric procedures

*/*** the worst and the best categories

Procedure	**LAGB**	**RYGB**	**BPD**	**LSG**
Objective				
The least perioperative risk	***	**	*	**
The most effective permanent weight loss	*	**	***	?
The best comorbidity solution	*	**	***	**
The most reversible	***	*	*	*
The best procedure because of avoidance of reoperation				
Technical complications: early	***	**	*	**
Technical complications: late	*	**	**	***
Metabolic complications: late	***	**	*	***
The least probability of insufficient weight loss	*	**	***	?
Subjective				
The least requirement for visit	*	***	**	***
Poor monitoring of unwanted metabolic complications	***	**	*	***
Despite low patient compliance, long-term weight loss	*	**	***	?

LAGB: Laparoscopic gastric bypass

RYGB: Roux-en-Y gastric bypass

BPD: Biliopancreatic diversion

LSG: Laparoscopic sleeve gastrectomy

Table 7. Approaches to weight loss, related risks, side effects, lack of invasiveness, and costs

Risk order	Approach	Risk score
1	Lifestyle changes, food restrictions, more activity and exercise	1
2	Drugs and low-energy diets	2
3	Endoscopic approaches (e.g., intragastric balloon)	4
4	Gastric band	5
5	Sleeve gastrectomy	7
6	RYGB	8
7	Open BPD	9
8	Laparoscopic BPD	10

RYGB: Roux-en-Y gastric bypass

Laparoscopic BPD: Laparoscopic biliopancreatic diversion (BPD)

BPD: Biliopancreatic diversion (BPD)

Table 8. Improvement of comorbidities after bariatric surgery

Operation	Improvement in diabetes (%)	Improvement in hypercholesterolemia (%)	Improvement in hypertension (%)	Improvement in sleep apnea (%)
AGB	47.8	71.1	38.4	94.6
RGB	83.8	93.6	75.4	86.6
BPD ± DS	97.9	99.5	81.3	95.2
LSG	77.2	61.0	71.7	83.6

AGB: Adjusted gastric banding

RYGB: Roux-en-Y gastric bypass

Laparoscopic BPD/DS: Laparoscopic biliopancreatic diversion (BPD) with duodenal switch (DS)

LSG: Laparoscopic sleeve gastrectomy

Table 9. Comparison of RYGB, AGB, and LSG efficacy studies

RYGB and AGB

	RYGB	**AGB**
Early complications (%)	13-22	1.6-7.0
Late complications (%)	36.2	27.4
Mortality (%)	0.0-0.9	0.0-0.0
% EWL (4-5 years)	68-93	45-59
Treatment failure (%)	0-6	17-46
Comorbidity resolution	****	**
Improvement in quality of life	**	**
CV risk improvement	***	**
CV mortality reduction	***	**

Table 10. Cause-based distribution of DALY per obese (Turkey, 2004)

Cause	**Attributable DALY**
Ischemic heart disease	346.294
Hypertensive heart disease	61.796
Ischemic stroke	146.930
Diabetes mellitus	152.240
Osteoarthritis	61.035
Breast cancer	8.859
Colon and rectum cancer	7.300
Corpus uteri cancer	2.730
Total	**787.184**

DALY: Disability-Adjusted Life Years

Table 11. 2004 and 2012 National Gross Product (NGP) and National Gross Product Per Capita

Year	National Gross Product ($)	National Gross Product Per Capita ($)
2004	393.037.272.000	5.804
2012	786.293.000.000	10.499

Source: www.tüik.gov.tr, www.hazine.org.tr

NGP: National Gross Product

Table 12. Demographic parameters of Turkey

Parameters	Years	
	2004*	**2012**
Population	71.813.000	75.627.384
Population over 30 years of age	33.033.980	37.907.886
The rate of population over 30 years of age (%)	46	50
Rate of obese individuals over 15 years of age (%)	12	17
Number of obese individuals** over 15 years of age	8.617.560	13.007.910
Number of obese individuals** over 30 years of age	3.964.078	6.520.156
The ratio of difference in obese individuals over 30 years of age during the period 2004–2012*** (%)	64	

Source: population data www.tüik.gov.tr. Obesity rate 2003 year http://www.docstoc.com/docs/141716921/OECDHealthData2012FrequentlyRequestedData-Updated-October , 2012 year obese rate www.tüik.gov.tr

**As no information was found for the year 2004, population data from the year 2007 were used. As no information was found for the year 2004, obesity data from the year 2003 were used.*

***Number of obese individuals was calculated by obesity rate times population.*

****The difference in the number of obese individuals over 30 years of age between 2004 and 2012 years was found by division of the number of obese individuals in 2004.*

Table 13. DALY and Annual Economic Burden

Cause	DALY	Total Economic Burden (2004) ($)	Population Effective Total Economic Burden (2012) ($)
Ischemic heart disease	346.294	2.009.825.330	5.980.104.427
Hypertensive heart disease	61.796	358.652.377	1.067.146.798
Ischemic stroke	146.930	852.754.122	2.537.314.373
Diabetes mellitus	152.240	883.572.364	2.629.012.047
Osteoarthritis	61.035	354.235.676	1.054.005.191
Breast cancer	8.859	51.415.972	152.984.877
Colon and rectum cancer	7.300	42.367.829	126.062.716
Corpus uteri cancer	2.730	15.844.407	47.144.002
Total	**787.184**	**4.568.668.076**	**13.593.774.432**

DALY: Disability-Adjusted Life Years

Table 14. Data Processes

PREOPERATIVE	***PERIOPERATIVE***	***POSTOPERATIVE***
Demographics: age, gender, height, and weight	*Surgical technique, operation notes, and anesthesia*	*Late-term complications, re-hospitalizations and re-operations*
Ideal and excess weight, BMI	*Anesthesia-operation and recovery*	*Weight loss and co-morbidity recovery*
Anamnesis, clinical factors, comorbidities, used drugs, physical examination findings, body fat mass, pre-operative tests, consultations, final diagnosis	*Early-period (<30 day) mortality/morbidity and re-operation*	*General health status and changes in quality of life*
General health status and	*Financial data*	*Patient satisfaction*

changes in quality of life		
Evaluations of special diseases	*Recovery and time to returning back to work*	

BMI: Body mass index

Table 15: ASBS (American Society for Bariatric Surgery) Education Programs

EDUCATION LEVEL	***COURSE-A: Basic Obesity Surgery Education***	***COURSE-B: Completed Obesity Surgery Education***
	Includes a curriculum of basic bariatric procedures, such as AGB, which can be performed on young and moderately obese patients	*Includes all obesity surgery procedures and techniques and has a curriculum for management of all degrees of obesity*
Pre-medical education period	*Discussion of business management, economy, and accounting*	*Discussion of epidemiology, psychology, and behavioral sciences*
Year 1 and 2 of surgery residents' education	*Private surgery practice and internship*	*Research experience in basic or clinical sciences*
Year 3 and 4 of surgery residents' education	*Elective course of anesthesia or orthopedics or cardiothoracic surgery*	*Elective course of family medicine or nutrition or endocrinology or intensive care*
General surgery specialist	*Laparoscopic obesity-surgery-weighted program*	*Academic program of 2 years research internship*
Bariatric surgery assistant	*1 year laparoscopy-weighted program*	*2-year internship in a branch center of obesity surgery*

AGB: Adjustable gastric banding

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