

Economic Burden of Obesity: A Systematic Review

Abstract

Obesity imposes considerably high economic costs on the health-care system. It is proposed that 10% of health-care costs belong to direct and indirect effects of obesity. Taking measures to prevent, manage, and treat obesity is costly. However, some benefits can be obtained by reducing economic costs and by improving health in the future. This study aimed to systematically review the costs caused by obesity. We systematically searched the English language literature indexed in PubMed, Scopus, and Web of Science databases (January 2000 to September 2017). Articles were included if direct and indirect costs of obesity were assessed among participants at the age of more than 18 years. Key terms including economic burden, medical cost, nonmedical cost, and obesity were used for this search. From a total of 20 studies, 9 papers found to be relevant for reviewing. According to these papers, obesity accounts for 31.8% of direct costs (health-care costs related to obesity) and 68.1% of indirect costs (costs related for reducing productivity and production value). Therefore, obese people spend 32% more for medical costs compared to people with normal weight. Due to great number of short-term and long-term complications of obesity and its potential economic impact, efforts are needed to be taken to facilitate health interventions and social policies. Nationally, as obesity imposes high costs on people and health-care system which should fund most of these costs, developing plans to decrease these costs are needed.

Keywords: Direct and indirect cost, obesity, systematic review

Introduction

Prevalence of obesity is increasing in the world dramatically^[1] and it becomes a serious health problem in the world.^[2] Obesity is both health problem and economic phenomenon.^[3] Obesity is considered as a disease in the modern world caused by diet of people and new civilization and industrial life.^[4] However, the number of people suffering from obesity or overweight is different in various countries. Kuwait and Bangladesh have the world's highest and lowest percentage of obese people, respectively. Iran ranked 77 in the Forbes ranking in terms of obesity. According to the Forbes magazine's report, approximately 53% of Iranians suffer from overweight, which 43% of them are male and 57% of them are female.^[5] In addition, the number of people suffering from obesity or overweight is different from one city to another city, Tehran and Mazandaran Provinces have the highest rate of obesity, while Kerman and Sistan Provinces have the lowest rate of obesity in Iran.^[6]

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The main roots of obesity in the world are immobility and the change in the diet of people. The food consumed by people in the world is richer and its calorie is being increased. As food calorie increases, the need for mobility increases, but mobility is reduced with industrialization growth in communities. In addition, access to food among people has become easier with development of technology and economy. Technological development is also the major cause for reduced mobility.^[7] Other major factors that influence obesity are stress, drugs, the environment, and urbanization growth. In general, it could be claimed that new lifestyles lead to obesity.^[8]

As the prevalence of obesity increases, the prevalence of diseases related to obesity including diabetes type 2, cardiovascular diseases, and different types of cancers (endometrium, postmenopausal breast, kidney, and colon cancer), musculoskeletal disorders, sleep apnea, and diseases related to the gallbladder is also being increased.^[9]

Based on the World Health Organization statistics, obesity accounts for 60% of the deaths among the Iranian people (21,000 per year) and it is the fifth

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Hasan Yusefzadeh¹,
Ali Rashidi²,
Bahlol Rahimi²

¹Department of Health Management and Economics, School of Public Health, Reproductive Health Research Center, Urmia University of Medical Sciences, ²Department of Health Information Technology, School of Allied Medical Sciences, Urmia University of Medical Sciences, Urmia, Iran

Address for correspondence:

Dr. Bahlol Rahimi,
Department of Health Information Technology, School of Allied Medical Sciences, Urmia University of Medical Sciences, Urmia, Iran.
E-mail: bahlol.rahimi@gmail.com
com

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cause of death in the world. Based on this organization, approximately 2.8 million adults die annually because of obesity or overweight in the world. In addition, 44% of diabetes burden, 23% of cardiovascular disease burden, and 7%–41% of specific cancers burden in the world are related with obesity and overweight.^[10]

Difficulties related to overweight and obesity are the leading cause of economic costs for people and government as well as health problems. Overweight reduces physical and social activity leading to psychological problems. For this reason, it can be hard for an obese person to get a good job. In this regard, if an individual finds his desired job, his productivity in that job will not be as much as normal people.^[11] Accordingly, overweight and obesity cause much costs on health-care system and cause problem for workforce and economy of a country. Based on a report released by the McKinsey Global Institute, obesity imposed cost equivalent to 2 billion dollars to the world economy in 2012. These costs included health-care costs, loss of productivity, and other costs spent for reducing the impacts of this problem, and its value was 2.8% of world's gross domestic product.^[12]

The prevalence of maternal obesity in world is estimated between 2% and 25%. Obesity has short- and long-term health effects for pregnant women and infant during pregnancy. Thus, health risk factors have been increased and demand for additional cares and to use health service resources are being increased.^[13]

This systematic review is designed at creating valuable information about the costs of obesity internationally through looking for answers to the following questions: what are the direct, indirect, and total costs related to obesity? Any planning, prevention, and treatment need to estimate the exact statistics on cost of obesity, so assessing these costs will be useful in identifying effective strategies that might be helpful in preventing the obesity.

Methods

Search strategy

This research was carried out by systematical reviewing of papers that have been published between 2000 and 2017. For this purpose, all papers published in English language since 2000 were derived by researchers by conducting a search in medical databases of MEDLINE, PubMed, ISI, EMBASE, Cochrane, and EconLit commerce database and using a strategy to search papers with keywords obtained from MeSH, including BMI, overweight, obesity, employment, income, direct medical costs, indirect medical costs, and reduced productivity. Their combinations also done by AND and OR search operators. After reviewing the title and abstract of the papers, duplicate and irrelevant studies were eliminated. In the next step, the full text of the papers was reviewed and those papers that met the inclusion criteria were included to be reviewed.

Inclusion criteria

Studies were included if (1) referring to direct costs of obesity, (2) referring to indirect costs of obesity, and (3) studies carried out since 2000 onward.

It is important to note that the minimum inclusion criteria were used to increase the sensitivity in selection of papers. However, to achieve the most relevant and high-quality studies, exclusion criteria were selected as follows: (1) unrelated studies based on the study design and research subject (any study with subject of obesity but without investigating the economic effects), (2) studies that did not provide adequate information (lack of reports of obesity costs), and (3) low quality of studies based on scores obtained from the checklist. This checklist included 12 sections covering various sections of a report. Score 1 was given for each section, but higher scores were given for some other sections that were more important [Table 1]. The minimum score was 12, and the maximum score was 15 in this checklist. Ultimately, the papers that obtained the minimum score (Score 12) were included in the study and they were reviewed.^[14] According to what was explained in the first step, 20 papers were obtained in systematic search

Table 1: Checklist developed to select studies that are related to subject of research

	<i>n</i>	Suggestion
Title and abstract	1	A. Using common words, refer to type of study in title or abstract section B. Provide an useful summary of the method of study and results obtained
Background/reason for selection	2	Explain the scientific background and reasoning for conducting the current study
Objectives	3	State the specific objectives of study including predetermined hypotheses
Study type	4	Provide the key components of type of study in initial parts
Research environment (time and location)	5	Describe the study implementation environment
Variables	6	Define all outcomes clearly
outcomes data	7	Report the outcomes events or its summarized sizes over time
Other analyses	8	Report analyses performed such as sensitivity analyses
Key results	9	Summarize important and key findings, while referring to research objectives
Limitations	10	Refer to study limitations considering the probable resources of bias or reduced accuracy
Interpretation	11	Considering objectives, limitations, and results of similar studies and other related evidence, provide a general interpretation of results
Generalizability	12	Discuss on study results on generalizability (external validity)

of database, which 9 papers among them were selected after eliminating the abstract section of papers and repeated papers related to our desired criteria [Figure 1].

Synthesis of data

The main information was obtained from selected studies and summarized in Table 1 that considers the following data: country, type of study, estimation method, and amount of direct and indirect costs. Then, the studies were compared using the above information.

Results

Reviewing the 9 papers in this study revealed that the lowest and the highest direct costs (the cost spent merely on medical care by those who have obesity) and indirect costs of obesity (reduced economic productivity of obese people or their premature death because of obesity complications) were related to a study conducted in China with 12% and 88%, respectively, while the highest and lowest direct and indirect costs were found 49% and 51%, respectively, in a study conducted in Germany. Table 2 provides the characteristics of the papers reviewed on the costs of obesity during 1 year around the world.

In general, in 9 studies met the inclusion criteria and published between 2017 and 2000, direct obesity costs were 31.8%, while indirect costs of obesity were 68.1% annually.

The financial burden accumulation of total obesity costs among studied countries is presented in Chart 1. Total cost of obesity in these countries is illustrated in the horizontal

axis, and the density of countries in terms of the mentioned indicator is illustrated in the vertical axis. The density point of total cost of obesity is about 18000 dollars.

As seen in Chart 2, the density point of indirect cost of obesity is about 11000 dollars.

The density point or accumulation of treatment costs related to obesity, as shown in Chart 3, is approximately 8000 dollars in the countries studied.

Chart 4 illustrates the total cost of obesity (direct and indirect costs) in different countries. While studies have been carried out at different times with volumes of samples, this chart illustrates the perspective and an important picture of the treatment and economic effects of obesity on the studied countries. As illustrated in this chart, the highest cost of obesity belongs to the United States and China and the lowest cost of obesity belongs to countries of Scotland and Sweden.

Discussion

The present study was carried out to assess the economic burden of obesity around the world. To the best of our knowledge, no systematic review has been carried out so far to examine both direct costs and indirect costs. Comparison of medical costs of obesity among obese and overweight people reveals that obese people spend annually medical costs 32% more compared to those who have normal weight.

A review study carried out by Katzmarzyk and Janssen in Canada in 2001 revealed that annual direct and indirect costs of obesity are 39% and 61%, respectively.^[15] The annual direct and indirect costs of obesity in the Scottish Government in 2010 were reported to be 40% and 60%, respectively, per year in 2010.^[16] In a review study conducted by Borg *et al.* in Sweden in 2005, direct and indirect costs of obesity were reported to be 42% and 58%, respectively.^[17] In a study conducted by Finkelstein

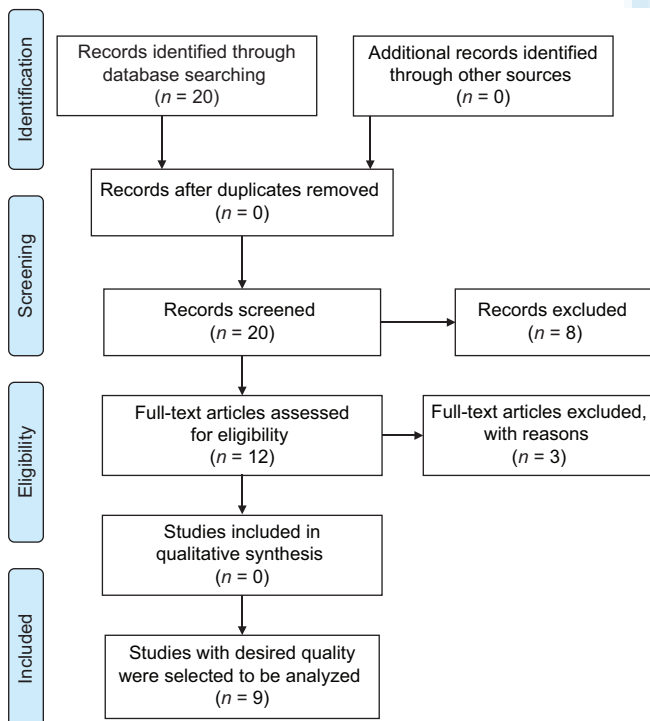


Figure 1: Inclusion steps of studies for systematic review

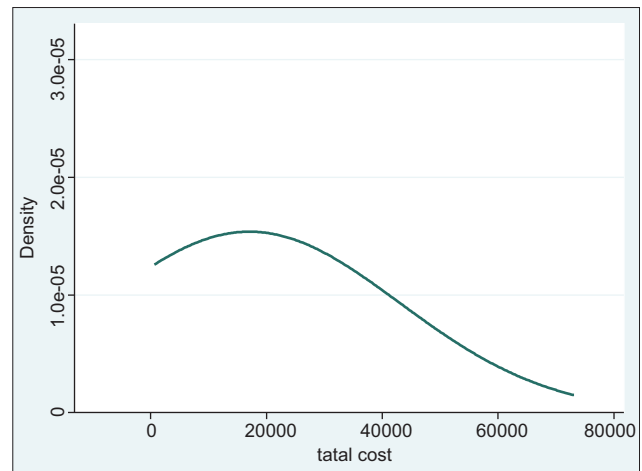


Chart 1: Financial burden accumulation of total obesity costs among studied countries

Table 2: Characteristics of papers reviewed on the costs of obesity in the world (direct and indirect costs of obesity)

Study	Location of study	Year of study	Type of study	Direct costs	Indirect costs	Direct results	Indirect result	Overall result	Percentage of indirect results (%)
Medibank	Australia	2010	Cross-sectional	Obesity-related medical care	Reduced productivity as a result of absenteeism and premature death	1300 million dollars	6400 million dollars	7700 million dollars	83
Katzmarzyk <i>et al.</i>	Canada	2001	Cross-sectional	Medical obesity costs	Reduced economic production caused by obesity	1600 million dollars	2700 million dollars	4300 million dollars	61
Borg <i>et al.</i>	Sweden	2005	Longitudinal cohort	Hospital treatment costs	reduced value production	269 million dollars	367 million dollars	636 million dollars	58
Finkelstein <i>et al.</i>	America	2010	Cross-sectional	Total medical costs	Value of lost productivity including absenteeism caused by obesity	30,300 million dollars	42,800 million dollars	73,100 million dollars	59
Konnopka <i>et al.</i>	Germany	2011	PAF	Outpatient and hospitalization and rehabilitation costs and nonmedical costs (management and research)	Absenteeism due to disease, early retirement and death using a human capital approach	52,909 million dollars	54,707 million dollars	107,616 million dollars	51
NAO report	England	2001	Cross-sectional	Obesity treatment and its outcomes	Loss of income because of disease and premature death	6394 million dollars	28,681 million dollars	35,075 million dollars	82
The Scottish Government Report	Scotland	2010	Cross-sectional	Obesity treatment and its outcomes	Loss of income because of premature death and diseases related to obesity	2496 million dollars	3761 million dollars	6258 million dollars	60
Kang	Korea	2011	PAF	Outpatient and hospitalization and drug costs	Reduced productivity because of premature death and hospitalization care .	1081 million dollars	2493 million dollars	3574 million dollars	70
Popkin <i>et al.</i>	China	2006	Cross-sectional	Medical cares	Costs of disability, deaths caused by obesity	5862 million dollars	43,555 million dollars	49,417 million dollars	88

PAF: Population attributable fraction

et al. in 2010, they reported that annual direct and indirect costs of obesity in the US are 41% and 59%, respectively.^[18] In addition, in a review study performed by Konnopka *et al.* in 2011, the annual direct and indirect costs of obesity were reported to be 49% and 51%, respectively.^[19] In a study conducted by Popkin *et al.* in China in 2006, they reported annual direct and indirect obesity costs 12% and 88%, respectively.^[20] According to the study conducted by Medibank in Australia in 2010, he reported the annual direct and indirect costs of obesity 17% and 83%, respectively.^[21] According to the National Audit Office report in England in 2010, the annual direct and indirect costs of obesity were reported 18% and 88%, respectively.^[22] In the study conducted by Kang in Korea in 2011, the annual direct and

indirect costs of obesity were reported 30% and 70%, respectively.^[23]

In this regard, policy-makers used high annual cost of obesity as justification for intervention of government. The lowest direct cost of obesity was related to Popkin's study with 12%, while the highest direct cost of obesity related to Konnopka's study with 42%.

According to the Forbes magazine, approximately 53% of Iranian people are overweight, and it ranked 41 among these countries with having 14.2% of the obese population. Thus, health-care planners should pay more attention for prevention and treatment of this metabolic disorder. Otherwise, the obesity prevalence will raise and it will lead to great economic crises.

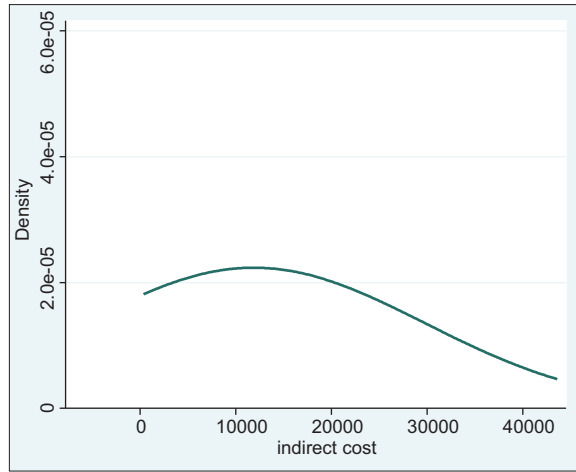


Chart 2: Financial burden accumulation of indirect costs of obesity among studied countries

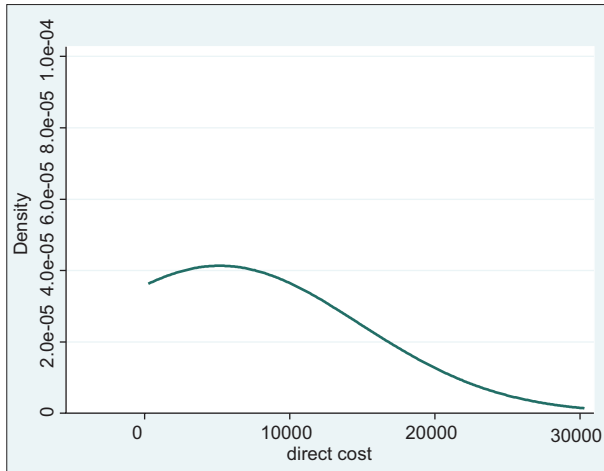


Chart 3: Financial burden accumulation of treatment costs related to obesity among studied countries

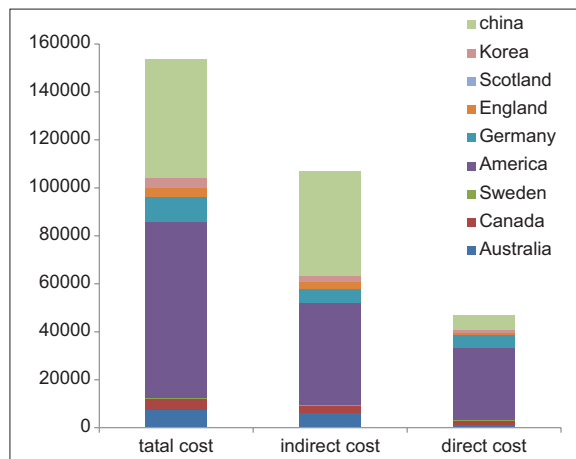


Chart 4: Direct, indirect, and total costs in different countries

Considering the changes in lifestyle of people and the changes in the environment of people occurred during the 30 years, it is increasingly difficult for people to maintain the healthy weight. If this trend continues, the prevalence

of obesity will increase certainly. To maintain healthy weight in recent decades was not so difficult for most people, while it is very difficult for people to maintain their healthy weight nowadays. Even with having full knowledge on advantages of the physical activity, the nutritional value of foods, and the health effects of obesity, a part of the population will be involved in lifestyle naturally, leading to weight gain. As major parts of costs imposed by obesity are funded by taxpayers, decisions made on physical activity and food consumption of these people are not considered natural from a broad social perspective. It suggests that the role of government in reducing obesity should be considered. Many people believe that information-based interventions or other interventions that do not influence the costs or benefits of decisions on physical activity and food consumption might not be so effective. According to some people, additional stimuli might be required in order to encourage them to lose weight.

Government plays vital role in developing strategies to prevent obesity, and it is obliged to execute strategies (diet, physical activity, and health) to combat obesity.

However, findings of studies reveal that interventions should be multifaceted in order to have greater chances to be successful. In other words, coordinated efforts of people, staff, and the government will be required to reduce the rate of obesity and costs related to obesity in the future, according to the current trends.

This systematic review suffers from some limitations that they should be considered. Lack of access to all papers and reports can be considered as the most important limitation of this study. In addition, the descriptive nature of this systematic review makes it difficult to understand and interpret the causal relationships, while it will be useful to develop hypothesis for next studies.

Conclusion

In this systematic review, we concluded that increased obesity increases medical and nonmedical costs of obesity. Thus, the prevalence of obesity in the community can be reduced by providing educational programs and considering the culture of people in each region.

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Nil.

Conflicts of interest

There are no conflicts of interest.

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