Saudi Journal of Medical and Pharmaceutical Sciences **ISSN 2413-4929 (Print)**
Scholars Middle East Publishers **ISSN 2413-4910 (Online)**
Dubai, United Arab Emirates
Website: https://saudijournals.com/

Obesity as a Risk Factor for Sudden Death: A Systematic Review

Abdullatif Mohammed Al Joher[1*], Abdullah Mohammed Aljasim[1], Ahmed Abdullah Alsayed Alhashim[1], Meath Saud Alhamed[1]
[1]Family Medicine Physician, King Abdulaziz Hospital, Al Ahsa, Saudi Arabia

Original Research Article

***Corresponding author**
Abdullatif Mohammed Al Joher

Article History
Received: 11.12.2018
Accepted: 22.12.2018
Published: 30.12.2018

DOI:
10.36348/sjmps.2018.v04i12.020

Abstract: ***Objectives*:** To summarize and critically evaluate the body of research on the connection between obesity and sudden cardiac death (SCD) risk. ***Methods*:** To locate research that met the inclusion criteria, a thorough computerized search of relevant databases was carried out. A comprehensive search was carried out on PubMed, SCOPUS, Science Direct, Cochrane Library, and Web of Science to locate relevant material. ***Results*:** Our data included seven trials with 104,697 participants and 68,738 (65.7%) were males. The prevalence of SCD among obese patients ranged from 0.05% to 37.1%, with a total prevalence of 1111 (1.1%). Five studies stated that as BMI rises, so does the chance of SCD. Obesity in the early stages of life and obesity and overweight throughout adulthood are risk factors for SCD [13, 15]. Many studies highlighted the interplay between obesity and cardiovascular comorbidities, such as hypertension, coronary artery disease, and heart failure, in increasing the risk of sudden death. ***Conclusion*:** The results of this comprehensive review offer strong evidence that obesity poses a substantial risk of sudden death, with the risk rising as obesity severity increases. In those who have pre-existing cardiovascular problems and significant obesity, the relationship is very high. Subsequent investigations have to concentrate on improving comprehension of the correlation between obesity and unexpected mortality, as well as creating practical methods to lower this risk in medical settings.

Keywords: Body mass index, Obesity, Sudden cardiac death, Systematic review.

INTRODUCTION

Sudden cardiac death (SCD) is described as an individual who experiences unexpected death naturally from a cardiac cause within a short period of time, usually less than an hour from the onset of symptoms, and who does not exhibit any earlier warning symptoms that would indicate a deadly condition [1]. This occurs despite attempts at resuscitation. SCD is linked to severe morbidity and impairment, making it a major global public health issue [2]. Though most guidelines advocate implantable cardioverter-defibrillators for those at the highest risk of SCD [3, 4]. Merely 25–30% of SCD patients overall are these people [5, 6].

Over 650 million persons were categorized as obese in 2016 alone, according to the World Health Organization (WHO), which states that the prevalence of obesity has nearly tripled globally since 1975 [7]. Numerous harmful health effects, such as heart disease, type 2 diabetes, and different types of cancer, are linked to obesity. Even more concerningly, research from the past several years has shown that obesity is a substantial risk factor for unexpected death, especially in people with underlying cardiovascular diseases [8].

Given the increased incidence of obesity and its link to potentially fatal illnesses like sudden cardiac arrest, the relationship between obesity and sudden mortality is especially concerning. A number of physiological and metabolic disorders, such as insulin resistance, dyslipidemia, and hypertension, are exacerbated by obesity and together increase the risk of cardiovascular events [9]. Though the amount of data is mounting, little is known about the precise pathways by which obesity leads to unexpected mortality. Furthermore, a thorough synthesis of the literature is required in order to determine any potential gaps in the literature and gain a deeper understanding of the scope of this relationship. By compiling the available data on obesity as a risk factor for sudden death, this systematic review aims to meet these objectives by enhancing our understanding of the public health consequences and offering guidance for future studies and clinical practices. This systematic review aims to summarize and critically evaluate the body of research on the connection between obesity and SCD risk.

METHODS

We implemented this systematic review in line with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) [10] criteria. An internet-based search was performed on PubMed, Web of Science, SCOPUS, Cochrane Library, and Science Direct to find English-language studies on the connection between obesity and SCD risk. The search technique in these cases made use of pertinent

keywords. To assess the quality of the included study, several reviewers sifted through the search results, chose relevant papers, collected data, and used the appropriate evaluation methods. These reviewers ensured that trustworthy studies and data were chosen for additional evaluation and summary in this systematic review by independently extracting pertinent material and critically assessing the included research's quality using established assessment processes.

Eligibility Criteria

Inclusion criteria:

1. Studies that reported the prevalence of SCD in obese patients.
2. Studies that investigated the connection between obesity and SCD risk.
3. Research that is printed in publications with peer review.
4. Studies available in the English language.
5. Research conducted on human subjects.

Exclusion criteria:

1. Studies that did not report a quantitative prevalence of SCD.
2. Studies not available in the English language.
3. Animal or in vitro studies.
4. Reviews, case reports, editorials, and opinion pieces.

Data Extraction

The search results were verified for correctness using Rayyan (QCRI) [11]. To determine if the titles and abstracts of the search results were relevant, the inclusion and exclusion criteria were used. Papers meeting the inclusion criteria were subjected to a thorough review by the study team. To settle disagreements, consensus was used. Key study data were recorded using an established data extraction form, including study titles, authors, year of publication, country, participant demographics, obesity cut-off point, prevalence of SCD, and main outcomes. To investigate the probability of bias, a neutral evaluation instrument was developed.

Strategy for Data Synthesis

A qualitative review was made possible by the descriptions of the research findings and features that were created using data from pertinent studies. The best strategy to guarantee the utilization of the data from the included studies was identified following the completion of the data collection for the systematic review.

Risk of Bias Assessment

To assess the caliber of the research included in this analysis, the Joanna Briggs Institute (JBI) [12] critical assessment criteria created for studies reporting prevalence data will be used. This tool consists of nine questions, the responses to which are ranked as (1) positive, (0 being the lowest score), uncertain, or irrelevant. Study categories will be poor, moderate, and high quality, based on total scores that are below 4, between 5 and 7, and above 8. To ensure agreement and accuracy in the quality assessment process, researchers will evaluate the studies they conduct independently, and any disputes in the evaluations will be resolved through cooperative conversation.

RESULTS

Systematic search outcomes

Following the removal of 292 duplicates, a systematic search yielded 716 study papers. After 424 studies' titles and abstracts were reviewed, 388 papers were rejected. Out of the 36 reports that needed to be obtained, 2 articles were not found. 34 articles passed the full-text screening procedure; 13 were dismissed as the study results were erroneous, 9 because the type of population was incorrect, 3 were editor's letters, and 3 were abstracts. The eligibility requirements were satisfied by six research publications that have been incorporated in this systematic review. Figure 1 depicts a diagram of the approach used to select the literature.

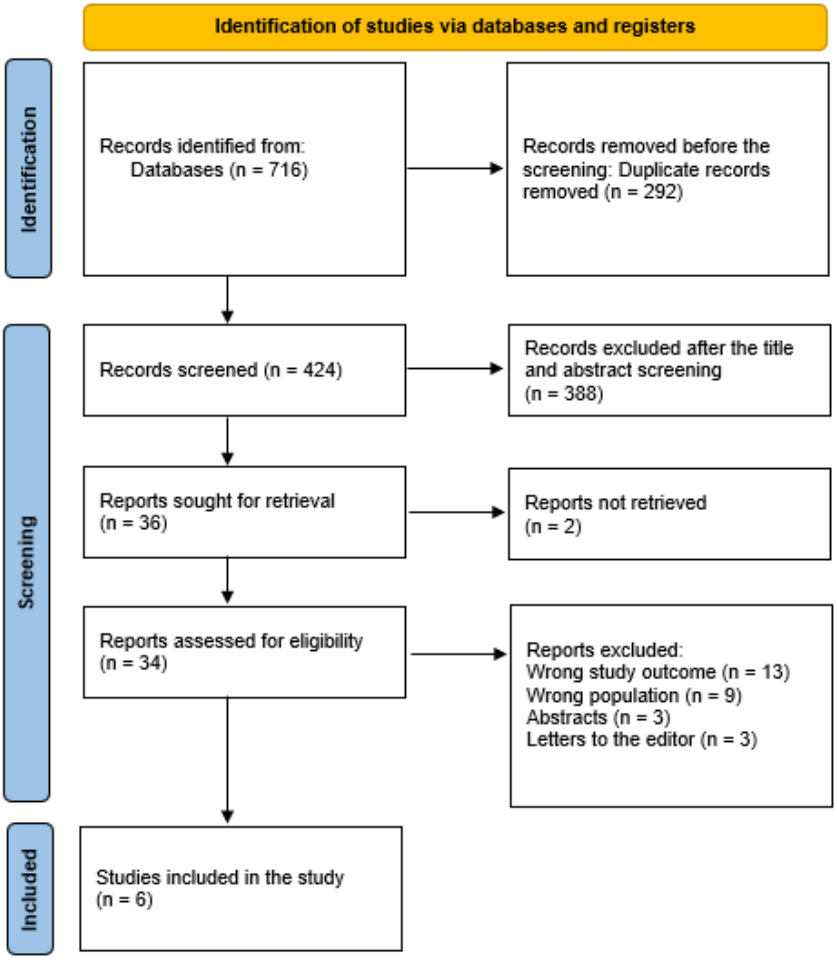

Figure 1: A PRISMA diagram is used to summarize the study decisions

Sociodemographics of the Comprised Participants and Studies

Table 1 displays the sociodemographic information from the research articles. Our data included seven trials with 104,697 participants and 68,738 (65.7%) were males. Four articles were prospective cohorts [13, 16-18] and two were retrospective cohorts [14, 15]. Two studies were conducted in the USA [13, 18], two in Finland [14, 16], one in Israel [15], and one in Poland [17]. The earliest study was conducted in 2011 [17] and the latest in 2016 [14-16].

Clinical Outcomes

The clinical data are presented in Table 2. The studies varied in design, population, and outcomes measured, but consistently demonstrated a positive association between obesity and an increased risk of sudden death. The prevalence of SCD among obese patients ranged from 0.05% [15] to 37.1% [14], with a total prevalence of 1111 (1.1%). Five studies stated that as BMI rises, so does the chance of SCD [13-16, 18]. Obesity in the early stages of life and obesity and overweight throughout adulthood are risk factors for SCD [13, 15]. Many studies highlighted the interplay between obesity and cardiovascular comorbidities, such as hypertension, coronary artery disease, and heart failure, in increasing the risk of sudden death.

Table 1: Sociodemographic parameters of the involved populations

Study	Study design	City	Participants	Mean age	Males (%)
Chiuve *et al.*, 2015 [13]	Prospective cohort	USA	445	47 ± 7	298
Eranti *et al.*, 2016 [14]	Retrospective cohort	Finland	1,445	47.4	530
Twig *et al.*, 2016 [15]	Retrospective cohort	Israel	86061	17.3 ± 0.4	59520
Kurl *et al.*, 2016 [16]	Prospective cohort	Finland	1466	53.7 ± 5.1	1466
Gastelurrutia *et al.*, 2011 [17]	Prospective cohort	Poland	339	64 ± 11	234
Adabag *et al.*, 2015 [18]	Prospective cohort	USA	14,941	54.1 ± 5.8	6690

Table 2: Clinical parameters and outcomes of the comprised research

Study ID	Vaccination type	Prevalence of hesitancy	Outcomes on hesitancy/ coverage	JBI
Chiuve *et al.*, 2015 [13]	>30	138 (31%)	This study offers fresh proof that obesity in the early stages of life and obesity and overweight throughout adulthood are risk factors for SCD.	Moderate
Eranti *et al.*, 2016 [14]	>30	387 (37.1%)	As BMI rises, so does the chance of SCD. Still, the risk for non-SCD rises in a comparable manner. Additionally, our findings imply that the performance of ECG anomalies as risk markers for SCD varies little across BMI categories.	High
Twig *et al.*, 2016 [15]	>95th percentile	115 (0.05%)	Even within the widely recognized normal range, a higher BMI in late adolescence was substantially linked to a higher risk of cardiovascular death in early adulthood or middle age. The participants in the group with BMIs between the 50th and 74th percentiles had a graded rise in the probability of dying from cardiovascular causes and all causes. Hazard ratios for sudden death were 2.9 in the obese group (BMI ≥95th percentile) as opposed to the reference group's 5th to 24th percentiles.	Moderate
Kurl *et al.*, 2016 [16]	>30	65 (4.4%)	Males who have metabolic syndrome are more likely to develop SCD. Obesity and conventional cardiovascular risk factors do not explain incident SCD related to the IDF/AHA interim criteria and metabolic risk clustering evaluated by a score.	Moderate
Gastelurrutia *et al.*, 2011 [17]	>30	153 (45%)	The paradox of obesity in heart failure impacts pump failure mortality and all-cause mortality, but not sudden death. This group of ambulatory HF patients had a similar risk of sudden death across BMI groups.	Moderate
Adabag *et al.*, 2015 [18]	>30	253 (1.7%)	In middle-aged, nonsmoking adults, general obesity is linke d to an elevated risk of SCD, which is mediated b y conventional cardiovascular risk factors. However, there are still unidentified mechanisms that link central adiposity to SCD separately.	Moderate

*NM=Not-mentioned

DISCUSSION

This review found that the prevalence of SCD among obese patients ranged from 0.05% [15] to 37.1% [14], with a total prevalence of 1111 (1.1%). Five studies stated that as BMI rises, so does the chance of SCD [13-16, 18]. Agbaedeng *et al.*, also found that even after controlling for comorbidities, there was a noteworthy 31% increase in the risk of sudden death associated with obesity. Obesity and a high ratio of waist to hips are linked to a higher risk of SCD [19].

We also found that obesity in the early stages of life and obesity and overweight throughout adulthood are risk factors for SCD [13, 15]. Since obesity has been linked to adverse metabolic abnormalities, which may indicate an indirect pathway controlled through risk factors like elevated blood pressure, insulin resistance [20, 21], impaired glucose metabolism, and detrimental plasma lipid or lipoprotein levels, cardiac remodeling [22], QT interval lengthening, and the formation of coronary and aortic atherosclerotic plaques [23], it may be harmful during adolescence [24].

The review's conclusions have significant therapeutic ramifications. Healthcare professionals should treat obese patients with regular cardiovascular risk assessments and acknowledge obesity as a major risk factor for unexpected mortality. To lower the risk of unexpected mortality, weight-loss interventions like lifestyle changes and, in certain situations, bariatric surgery should be taken into consideration. Additionally, especially in cases of extreme obesity or a history of cardiovascular illness, physicians should keep a close eye out for early indications of arrhythmias and cardiovascular disease in obese patients.

In order to overcome the shortcomings noted in this study, future studies should incorporate a wider range of demographics and utilize more accurate indicators of obesity, such as body fat percentage or waist-to-hip ratio. Furthermore, studies should examine how genetic and epigenetic variables influence an obese person's risk of sudden death and the effects of obesity-related comorbidities including diabetes and hypertension.

Limitations

There are various restrictions on this review. First, the generalizability of the results may be limited by the heterogeneity among the included studies, especially with regard to demographic characteristics and study methodology. Second, the majority of research used BMI as the only indicator of obesity, failing to take into consideration variations in body composition that could affect the chance of unexpected death, such as variances in muscle mass and fat distribution. Third, it is impossible to establish a link between obesity and sudden death because the included studies are observational in nature. Lastly, the review was restricted to works that were written in English, which could have introduced linguistic bias.

CONCLUSION

The results of this comprehensive review offer strong evidence that obesity poses a substantial risk of sudden death, with the risk rising as obesity severity increases. In those who have pre-existing cardiovascular problems and significant obesity, the relationship is very high. Subsequent investigations have to concentrate on improving comprehension of the correlation between obesity and unexpected mortality, as well as creating practical methods to lower this risk in medical settings.

REFERENCES

1. Adabag, A. S., Luepker, R. V., Roger, V. L., & Gersh, B. J. (2010). Sudden cardiac death: epidemiology and risk factors. *Nature Reviews Cardiology*, *7*(4), 216-225.
2. Writing Group Members, Lloyd-Jones, D., Adams, R. J., Brown, T. M., Carnethon, M., Dai, S., ... & Wylie-Rosett, J. (2010). Heart disease and stroke statistics—2010 update: a report from the American Heart Association. *Circulation*, *121*(7), e46-e215.
3. Ponikowski, P., Voors, A. A., … & Anker, S. D. (2016). 2016 ESC Guidelines for the diagnosis and treatment of acute and chronic heart failure: The Task Force for the diagnosis and treatment of acute and chronic heart failure of the European Society of Cardiology (ESC) Developed with the special contribution of the Heart Failure Association (HFA) of the ESC. *Eur Heart J*, *37*, 2129-200.
4. Yancy, C. W., Jessup, M., … & Bozkurt, B. (2016). 2016 ACC/AHA/HFSA focused update on new pharmacological therapy for heart failure: An update of the 2013 ACCF/AHA guideline for the management of heart failure: A report of the American college of Cardiology/American heart association task force on clinical practice guidelines and the heart failure society of America. *Circulation*, *134*, e282-93.
5. Albert, C. M., Chae, C. U., Grodstein, F., Rose, L. M., Rexrode, K. M., Ruskin, J. N., ... & Manson, J. E. (2003). Prospective study of sudden cardiac death among women in the United States. *Circulation*, *107*(16), 2096-2101.
6. de Vreede-Swagemakers, J. J., Gorgels, A. P., Dubois-Arbouw, W. I., Van Ree, J. W., Daemen, M. J., Houben, L. G., & Wellens, H. J. (1997). Out-of-hospital cardiac arrest in the 1990s: a population-based study in the Maastricht area on incidence, characteristics and survival. *Journal of the American College of Cardiology*, *30*(6), 1500-1505.
7. World Health Organization. (2017). Obesity and overweight. Retrieved from https://www.who.int/news-room/fact-sheets/detail/obesity-and-overweight (Accessed 20 Aug 2017).
8. Lavie, C. J., Arena, R., Alpert, M. A., Milani, R. V., & Ventura, H. O. (2018). Management of cardiovascular diseases in patients with obesity. *Nature Reviews Cardiology*, *15*(1), 45-56.
9. Kramer, C. K., Zinman, B., & Retnakaran, R. (2013). Are metabolically healthy overweight and obesity benign conditions? A systematic review and meta-analysis. *Annals of internal medicine*, *159*(11), 758-769.
10. Moher, D., Shamseer, L., Clarke, M., Ghersi, D., Liberati, A., Petticrew, M., ... & Prisma-P Group. (2015). Preferred reporting items for systematic review and meta-analysis protocols (PRISMA-P) 2015 statement. *Systematic reviews*, *4*, 1-9.
11. Ouzzani, M., Hammady, H., Fedorowicz, Z., & Elmagarmid, A. (2016). Rayyan—a web and mobile app for systematic reviews. *Systematic reviews*, *5*, 1-10.
12. Hou, Y., Tian, J., Zhang, J., Yun, R., Zhang, Z., Chen, K. H., ... & Wang, B. (2017). Quality of meta-analysis in nursing fields: An exploration based on the JBI guidelines. *PloS one*, *12*(5), e0177648.
13. Chiuve, S. E., Sun, Q., Sandhu, R. K., Tedrow, U., Cook, N. R., Manson, J. E., ... & Albert, C. M. (2015). Adiposity throughout adulthood and risk of sudden cardiac death in women. *JACC: Clinical Electrophysiology*, *1*(6), 520-528.
14. Eranti, A., Aro, A. L., Kerola, T., Tikkanen, J. T., Rissanen, H. A., Anttonen, O., ... & Huikuri, H. V. (2016). Body mass index as a predictor of sudden cardiac death and usefulness of the electrocardiogram for risk stratification. *The American journal of cardiology*, *117*(3), 388-393.

15. Twig, G., Yaniv, G., Levine, H., Leiba, A., Goldberger, N., Derazne, E., ... & Kark, J. D. (2016). Body-mass index in 2.3 million adolescents and cardiovascular death in adulthood. *New England journal of medicine*, *374*(25), 2430-2440.
16. Kurl, S., Laaksonen, D. E., Jae, S. Y., Mäkikallio, T. H., Zaccardi, F., Kauhanen, J., ... & Laukkanen, J. A. (2016). Metabolic syndrome and the risk of sudden cardiac death in middle-aged men. *International journal of cardiology*, *203*, 792-797.
17. Gastelurrutia, P., Pascual-Figal, D., Vazquez, R., Cygankiewicz, I., Shamagian, L. G., Puig, T., ... & Bayes-Genis, A. (2011). Obesity paradox and risk of sudden death in heart failure: results from the MUerte Subita en Insuficiencia Cardiaca (MUSIC) Study. *American heart journal*, *161*(1), 158-164.
18. Adabag, S., Huxley, R. R., Lopez, F. L., Chen, L. Y., Sotoodehnia, N., Siscovick, D., ... & Folsom, A. R. (2015). Obesity related risk of sudden cardiac death in the atherosclerosis risk in communities study. *Heart*, *101*(3), 215-221.
19. Agbaedeng, T. A., Mahajan, R., Munawar, D. A., Elliott, A., Twomey, D. J., Khokhar, K. B., ... & Sanders, P. (2017). P5316 Risk of sudden cardiac death in obesity: A systematic review and meta-analysis of emerging evidence. *European Heart Journal*, *38*(suppl_1), ehx493-P5316.
20. Bibbins-Domingo, K., Coxson, P., Pletcher, M. J., Lightwood, J., & Goldman, L. (2007). Adolescent overweight and future adult coronary heart disease. *New England Journal of Medicine*, *357*(23), 2371-2379.
21. Skinner, A. C., Perrin, E. M., Moss, L. A., & Skelton, J. A. (2015). Cardiometabolic risks and severity of obesity in children and young adults. *New England Journal of Medicine*, *373*(14), 1307-1317.
22. Mangner, N., Scheuermann, K., Winzer, E., Wagner, I., Hoellriegel, R., Sandri, M., ... & Erbs, S. (2014). Childhood obesity: impact on cardiac geometry and function. *JACC: Cardiovascular Imaging*, *7*(12), 1198-1205.
23. Güven, A., Özgen, T., Güngör, O., Aydın, M., & Baysal, K. (2010). Association between the corrected QT interval and carotid artery intima-media thickness in obese children. *Journal of Clinical Research in Pediatric Endocrinology*, *2*(1), 21-7.
24. McGill Jr, H. C., McMahan, C. A., Herderick, E. E., Malcom, G. T., Tracy, R. E., Strong, J. P., & Pathobiological Determinants of Atherosclerosis in Youth (PDAY) Research Group. (2000). Origin of atherosclerosis in childhood and adolescence. *The American journal of clinical nutrition*, *72*(5), 1307s-1315s.