Diabetes & Metabolic Syndrome: Clinical Research & Reviews 13 (2019) 143–147

Contents lists available at ScienceDirect

Diabetes & Metabolic Syndrome: Clinical Research & Reviews

journal homepage: www.elsevier.com/locate/dsx

Original Article

Prevalence of metabolic syndrome in Iranian patients with schizophrenia: A systematic review and meta-analysis

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ARTICLE INFO

Article history:
Received 17 July 2018
Accepted 9 August 2018

Keywords:
Metabolic syndrome
Schizophrenia
Meta-analysis
Iran
Prevalence

ABSTRACT

Metabolic syndrome as a set of cardiovascular risk factors is highly prevalent among patients with schizophrenia. It can also lead to cardiovascular diseases and shorten lifespan. This systematic review and meta-analysis aimed to estimate the prevalence of metabolic syndrome among Iranian patients with schizophrenia. Five national studies were retrived without any time limitation and reported in the present systematic review and meta-analysis. Data bases including Web of Science, Google Scholar, PubMed and Scopus were used to search and retrieve related articles. Keywords including "schizophrenia", "metabolic syndrome", "MetSyn" and "X syndrome", and their combinations were used. Data were analyzed using the meta-analysis method and the random effects model. The heterogeneity of the studies was evaluated using the I^2 index and data was analyzed using the STATA software version 12. The analysis of five selected articles with a sample size of 1589 people showed that the prevalence of metabolic syndrome in patients with schizophrenia was reported as 23.9% (95% CI: 14.8–33). The prevalence of metabolic syndrome in women and men was reported as 34% (95% C: 19–49) and 10.8% (95% CI: 2.9–18.7), respectively. According to the meta-regression analysis, no correlation was reported between the prevalence of metabolic syndrome and the mean age of patients ($p = 0.607$), year of publication of articles ($p = 0.350$), sample size ($p = 0.392$) and duration of disease ($p = 0.607$). Also, about one fourth of the patients with schizophrenia were suffering from metabolic syndrome. The identification of at-risk patients is necessary to control and treat metabolic syndrome.

1. Introduction

Schizophrenia as a chronic and debilitating disease consisted of a wide range of emotional, social, and cognitive disorders and is associated with an impairment of individual performance [1]. The prevalence of schizophrenia is 1% of the population [2]. The mortality rate of schizophrenia in patients with mental disorders is 2–3 times more than others, and patients' life expectancy is 10–20 years shorter than others [3,4]. Cardiovascular disease is one of the most common causes of mortality in the patients [5]. Physical underlying diseases, smoking, obesity, and unhealthy lifestyle are risk factors that increase mortality in these patients. The use of antipsychotic medications also increase the risk of cardiovascular diseases [4,6].

Metabolic syndrome refers to cardiovascular risk factors including hypertension, dyslipidemia, hyperglycemia, and abdominal obesity that can increase the risk of cardiovascular diseases and diabetes [7]. The risk of coronary artery disease and stroke in patients with metabolic syndrome is three times more than healthy individuals [8]. ATP III, IDF and WHO have provided common definitions of metabolic syndrome, that have some similar components [9]. Metabolic syndrome in patients with schizophrenia has become a major concern in psychiatry, and it is the main cause of cardiovascular disease and mortality across the globe [10]. While the pathophysiology of metabolic syndrome has not been

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https://doi.org/10.1016/j.dsx.2018.08.014
1871-4021/

completely understood, insulin resistance and central obesity are considered the most important causes of metabolic syndrome [11]. Patients that take antipsychotic medications are mainly prone to metabolic syndrome due to weight gain, and changes in cholesterol, blood pressure, and blood glucose levels [12]. The prevalence of metabolic syndrome among Iranian population has been reported to be 29%, 38% and 30%, respectively, based on criteria suggested by ATP III, IDF and WHO [13]. Several studies have been conducted to investigate the prevalence of metabolic syndrome in patients with schizophrenia in Iran, that have reported various results. The prevalence of metabolic syndrome in these patients is 9.5%–37.6% [14,15]. A review of literature showed that no general estimation of the prevalence of metabolic syndrome has been reported in Iranian patients. Therefore, this study was conducted to evaluate the prevalence of metabolic syndrome in Iranian patients with schizophrenia using a systematic review and meta-analysis design.

2. Methodology

2.1. Search strategy

In this study, the prevalence of metabolic syndrome in patients with schizophrenia was evaluated using articles published in national and international journals without any time limitation. Electronic databases inclusing Web of Science, PubMed, Scopus, and Google scholar were used to retrieve articles. Keywords such as “schizophrenia”, “metabolic syndrome”, “MetSyn”, “X syndrome” and their combinations were used for search. References of the retrieved articles were also reviewed to find possible related articles.

2.2. Study selection and data extraction

Inclusion criteria were observational studies published in Farsi and English languages. Exclusion criteria were duplicate studies and lack of access toarticles' full text. The titles and abstracts of the articles were reviewed by two researchers independently, related ones were separated and their full texts were extracted. In case of disagreements, the articles were reviewed by a (RGG). A form was devised to record data extracted from selected articles, which was consisted of items such as “the first author”, “year of publication”, “location of the study”, “total sample size” (sample size of men and women), “total number of patients with schizophrenia with metabolic syndrome” (total, based on gender) and “score of methodological quality”. The quality of the articles was assessed using the STROBE checklist [16].

2.3. Statistical analysis

Variance of each study was calculated using the binomial distribution, and the weighted average was used to combine the prevalence in different studies. Given the heterogeneity of the selected studies based on the I^2 index and Cochran's Q test ($p < 0.1$), the fixed effects model or the random effects model was used to combine the studiesfor estimating the prevalence. According to the I^2 index, heterogeneity was classified into lower than 25% (low heterogeneity), 25%–75% (moderate heterogeneity), and 75% (high heterogeneity) [17]. According to the heterogeneity tests, the random effects model was used for the pooled estimated prevalence. Subgroup analysis was used to determine the prevalence of metabolic syndrome based on gender and screening criteria used for metabolic syndrome. The funnel plot based on the Egger's regression test was used to investigate the effect of publication bias. Univariate meta-regression was used to examine the association between the prevalence of metabolic syndrome and year of the study, sample size, and mean age of subjects. Data analysis was also performed using the Stata version 12 software.

3. Results

3.1. Research results and selection of participants

All Iranian articles that examined the prevalence of metabolic syndrome in patients with schizophrenia were analyzed using the PRISMA guideline [18]. A total of 377 articles were retrieved during the initial search. After deleting duplicates and irrelevant ones, five studies in 7 groups were used for the data analysis Fig. 1.

The total sample size was 1589 people with an average of 227 people in each study (range: 60-372 people). All articles were published in English. For the methodological quality, Shakeri et al. had high quality, but other selected studies had moderate quality. (Table 1).

3.2. Prevalence of metabolic syndrome and subgroup analysis

The prevalence of metabolic syndrome in the Iranian patients with schizophrenia was reported as 23.9% (95% CI: 14.8–33%). The prevalence of metabolic syndrome in the patients with schizophrenia based on criteria suggested by the ATP III and IDF was 24% (95% CI:14.8–33.2%) and 23.5% (95% CI: (−4)-51), respectively. For gender analysis, it was shown that the prevalence of metabolic syndrome was 10.8% (95% CI: 2.9–18.7) and 34% (95% CI: 19-49) in men and women, respectively.

Meta-regression results showed no statistically significant difference between the prevalence of metabolic syndrome in the Iranian patients with schizophrenia ($p = 0.350$), sample size ($p = 0.392$), duration of disease ($p = 0.607$) and mean age of patients ($p = 0.607$) (see Figs. 2 and 3).

4. Discussion

This was the first study to investigate the prevalence of metabolic syndrome in Iranian patients with schizophrenia. The prevalence of metabolic syndrome in the Iranian patients with schizophrenia was reported as 23.9%. In other words, about one fourth of Iranian patients with schizophrenia suffered from metabolic syndrome.

The prevalence of metabolic syndrome in patients with schizophrenia in Turkey was 34.2% [21], in Spain was 38.6% [22] and in Japan was 27.5% [3]. The results of a study in Singapore showed that the prevalence of metabolic syndromein patients with schizophrenia was reported as 46% and the risk of developing metabolic syndrome in patients with schizophrenia was reported as 2.79 times more than healthy individuals [23]. Differences in studies' results can be attributed to differences in the sociodemographic profile, definitions of metabolic syndrome and samples' lifestyle. For example, the small physique of the Asian population compared to the Europeans led to modifications of criteria used for the diagnosis of metabolic syndrome in some Asian studies. In these studies, waist circumferences above 90 cm and 80 cm respectively in men and women have been considered one of the characteristics of individuals with metabolic syndrome [24]. The selected studies did not use the modified criteria of metabolic syndrome, which led to a low prevalence of metabolic syndrome among Iranian patients.

The results of a meta-analysis study by Vancampfort et al. showed that the prevalence of metabolic syndrome in patients with depression was reported as 30.5% [25]. The results of a systematic review and meta-analysis in India showed that the prevalence of

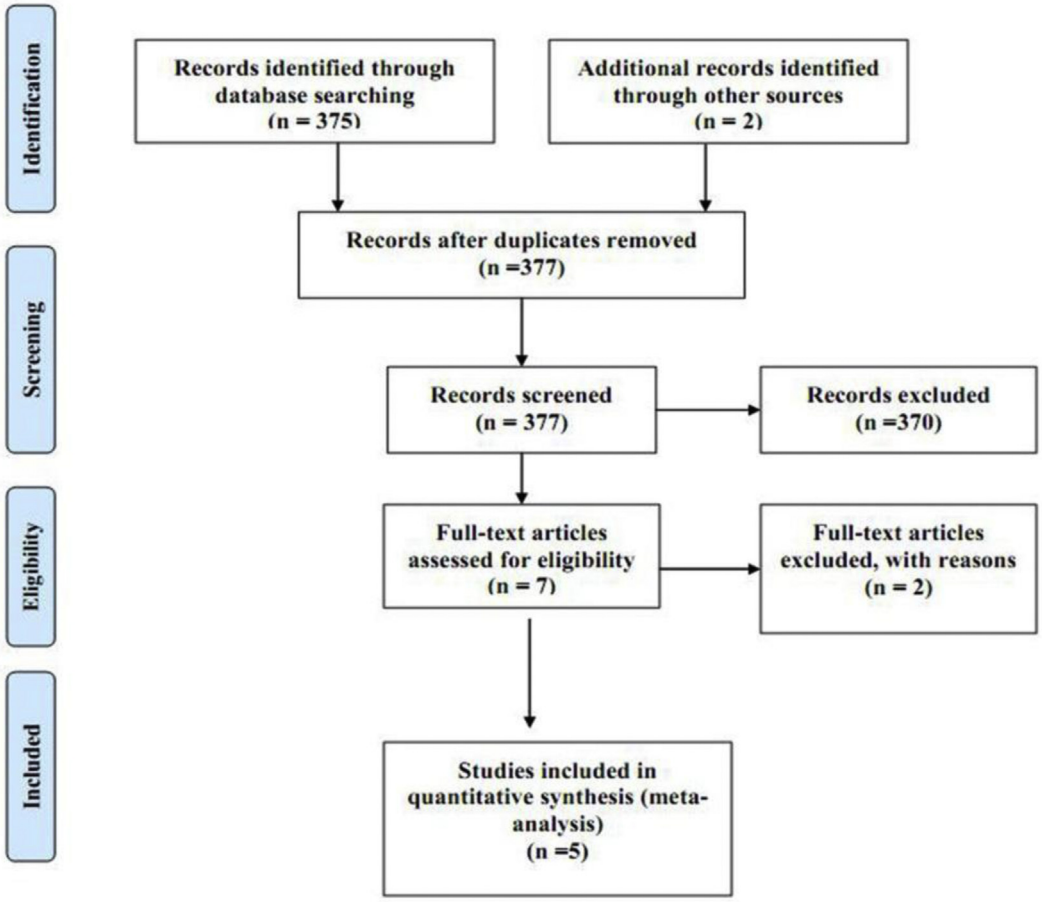

Fig. 1. Flowchart of screening and selection of qualified articles according to the PRISMA guideline.

Table 1
Characteristics of the articles.

Quality	Prevalence	Criteria	Place of study	Sample size	Year of publication	First author
Moderate	28	ATP III	Tehran	60	2017	Nayerifard [19]
Moderate	25.7	ATP III	Zanjan	105	2016	Ghoreishi [20]
High	30.4	ATP III	Kermanshah	280	2016	Shakeri [1]
Moderate	10	ATP III	Bandar Abbas	200	2015	Khalili [14]
Moderate	9.5	IDF	Bandar Abbas	200	2015	
Moderate	27.4	ATP III	Tehran	372	2009	Rezaei [15]
Moderate	37.6	IDF	Tehran	372	2009	

metabolic syndrome among patients with schizophrenia was 29.83% [26], which was more than the prevalence of metabolic syndrome in Iranian patients. Factors that predispose patients with schizophrenia to metabolic syndrome are complicated. Second-generation antipsychotics can increase patients' weight and impair glucose and lipid metabolism. In addition, many patients do not pay enough attention to the side effects of atypical antipsychotics and weight gain and do not adhere to drug regimen.

The gender analysis showed that the prevalence of metabolic syndrome in men and women with schizophrenia was 34% and 10.8%, respectively. Various results regarding the relationship between metabolic syndrome and gender have been reported. For instance, the prevalence of metabolic syndrome in women has been reported to be higher than in men [27,28]. In other studies, the prevalence of metabolic syndrome in men has been reported to be higher than that of women [29,30]. In some studies, no statistically significant difference between the two groups of men and women was reportes [31,32]. Meta-regression showed no association between the prevalence of metabolic syndrome, and the mean age of patients, year of study, duration of disease and sample size. One limitation of this study could be the insufficiency of information in some articles.

5. Conclusion

Metabolic syndrome is common in Iranian patients with schizophrenia, as one fourth of patients are suffering from metabolic syndrome. Given that the mortality rate in patients with

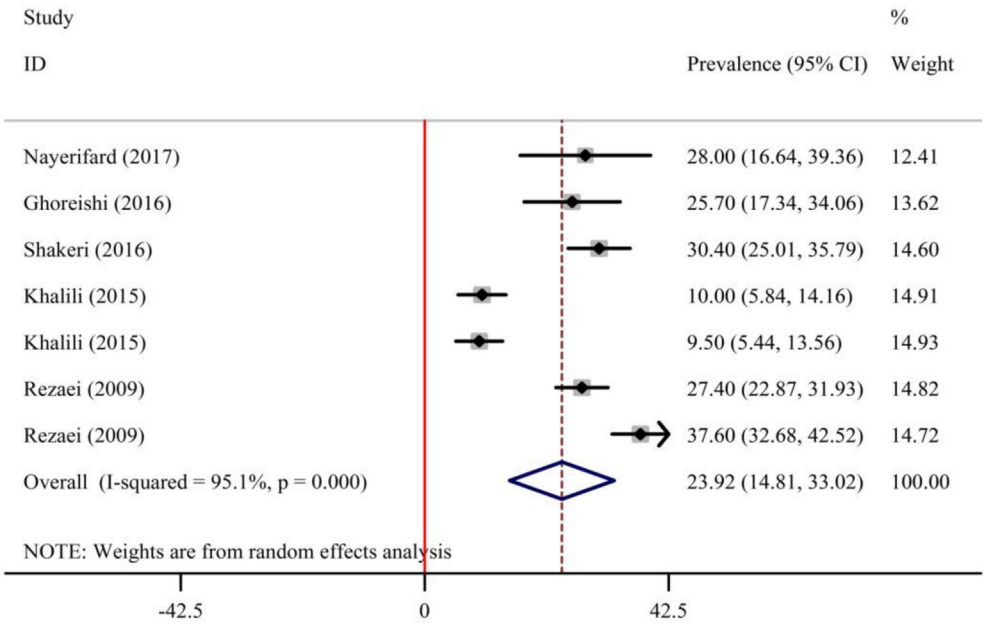

Fig. 2. The forest plot of the prevalence of metabolic syndrome in the patients with schizophernia. The 95% confidence interval for each study was shown in the form of horizontal lines around the central mean and midpoint of the dotted line represented the mean of the overall score. The lozenge shape showed the confidence interval of the prevalence of this disorder.

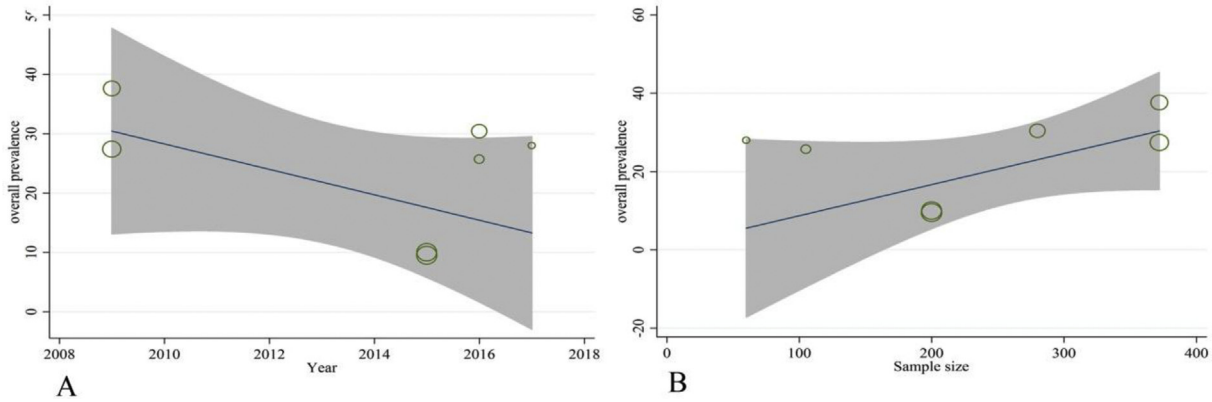

Fig. 3. The meta-regression of the prevalence of metabolic syndrome in the patients with schizophrenia. The prevalence of metabolic syndrome based on year (A) and sample size (B). Circles indicated the weight of the studies.

metabolic syndrome is higher than those without metabolic syndrome, the identification of at-risk patients, and controlling and treating metabolic syndrome necessary.

Funding

The authors report that there was no funding source for the work that resulted in the article or the preparation of the article.

Disclosure (authors)

The authors declare no conflicts of interest.

Acknowledgements

The authors appreciate all the researchers whose articles were used in the present research.

Appendix A. Supplementary data

Supplementary data related to this article can be found at https://doi.org/10.1016/j.dsx.2018.08.014.

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