

Omega-3, Metabolic Syndrome, and Schizophrenia: A review

Seyedeh Narjes Roudbaraki^{1*} (MD); Fatemeh Behdani¹ (MD); Paria Hebrani¹ (MD); Majid Ghayour-Mobarhan² (MD); Sadegh Vahabi Amlashi³ (MD)

¹ Psychiatry and Behavioral Sciences Research Center, Ibn-e-Sina Hospital, Faculty of Medicine, Mashhad University of Medical Sciences, Mashhad, Iran.

² Biochemistry and Nutrition Research Center, School of Medicine, Mashhad University of Medical Sciences, Mashhad, Iran.

³ Dermatology Department, School of Medicine, Mashhad University of Medical Sciences, Mashhad, Iran.

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ABSTRACT

According to the literature, schizophrenia is associated with the components of metabolic syndrome. This mental disorder has such manifestations as visceral obesity, impaired lipid metabolism, hyperglycemia, and hypertension. The prevalence rate of schizophrenia varies in different countries. There is a body of evidence about the higher incidence of cardiovascular events in the schizophrenic patients with metabolic syndrome. Therefore, the prevention or treatment of this condition in these patients is a matter of fundamental importance. Fish oils, commonly used by people, contain omega-3 fatty acid. Omega-3 has been demonstrated to be effective in the patients with metabolic syndrome.

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Introduction

The association between schizophrenia and the components of the metabolic syndrome has been demonstrated in various studies.

This disorder is identified by such symptoms as visceral obesity, impaired lipid metabolism, hyperglycemia, and hypertension (1).

Many studies have demonstrated high cardiovascular-related mortality rate and short life span in the patients suffering from metabolic syndrome.

However, the mechanism underlying the high incidence of metabolic disorders among the schizophrenic patients is not well illuminated yet.

Nevertheless, some reasons have been proposed in this regard including poor lifestyle, dietary habits, and direct effect of antipsychotic medications on metabolism (2-4).

The prevalence of metabolic syndrome in the schizophrenic patients varies from 10-30% based on the antipsychotic drug administration.

There are some shortcomings in many of the available studies investigating this issue including the employment of small sample size, the use of cross-sectional studies rather than control trials, and no use of matched-group design with regard to different medications (5).

Although schizophrenia itself is an important risk factor for metabolic syndrome, some disease-specific risk factors contribute to the increasing mortality rate of this disorder. These risk factors include genetic factors, antipsychotic drugs, and inappropriate lifestyle due to negative symptoms, smoking, and substance or alcohol abuse (6). The patients with psychotic disorders have a reduced life expectancy with higher rate of physical comorbidities due to a poor or unhealthy life style and the complications of antipsychotic treatment (7). The mortality rate in the patients affected by schizophrenia is 2-3 times higher than that in the general population.

This is due to the fact that the suicide, cardiovascular events, and metabolic diseases are more common in these patients (7).

The antipsychotic agents have a great impact on the modifiable risk factors leading to weight gain and other metabolic changes (e.g., insulin resistance, dyslipidemia, and hypertension) (8).

Regarding this, it is crucial to prevent or treat this condition in the schizophrenic patients. Fish oils, commonly used by people, contain omega-3 fatty acid.

Omega-3 has been demonstrated to be effective in the patients with metabolic syndrome (9-11). In some countries, omega-3 is an over-the-counter drug.

With this background in mind, in the current study, we aimed to perform a review over the recently

published articles on the association between metabolic syndrome and schizophrenia.

Materials and Methods

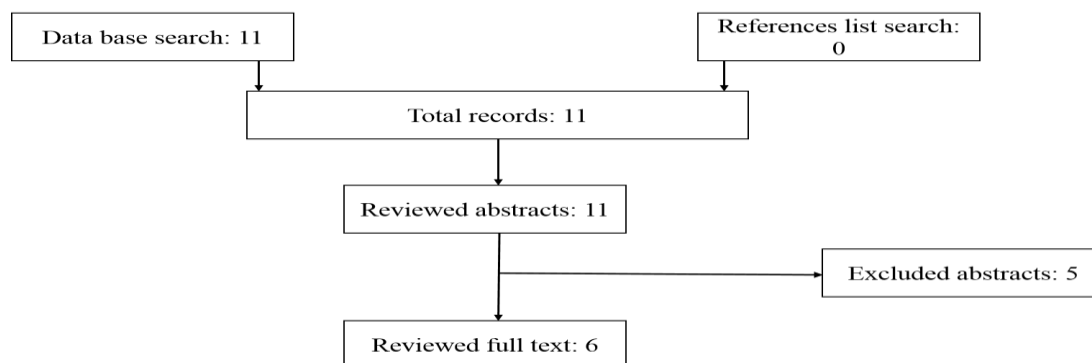
The articles, which were published up to November, 2016, were selected through searching the PubMed database. Our keywords and medical subject headings were broad terms such as "schizophrenia" AND "metabolic syndrome" AND "Omega-3". Subsequently, the reference lists of the retrieved articles were examined to identify the additional related articles. Finally, those articles with available abstract and full text in English language were included in the study.

Critical appraisal

First, the abstracts were reviewed by two independent researchers. As a result, 11 abstracts were screened for relevancy two times, and none of them was excluded. The 11 abstracts were fully assessed by our reviewers. Based on the study type, five articles were excluded from the study. To assess the quality of the retrieved studies, the consolidated standards of reporting trials checklist was employed. The meta-analysis was not performed due to the heterogeneity of the findings of these studies.

Results

The flow diagram of literature search process is presented in Figure 1.



References

- 1- Ventriglio A, Gentile A, Stella E, Bellomo A. Metabolic issues in patients affected by schizophrenia: clinical characteristics and medical management. *Front Neurosci*. 2015 Sep 3;9:297.
- 2- Ringen PA, Engh JA, Birkenaes AB, Dieset I, Andreassen OA. Increased mortality in schizophrenia due to cardiovascular disease - a non-systematic review of epidemiology, possible causes, and interventions. *Front Psychiatry*. 2014 Sep 26;5:137.
- 3- Pawelczyk T, Grancow M, Kotlicka-Antczak M, Trafalska E, Gębski P, Szemraj J et al. Omega-3 fatty

Discussion & Conclusion

The mechanism of metabolic syndrome in the schizophrenic patients is not fully understood yet. There is a bulk of evidence regarding the higher incidence of cardiovascular events in the schizophrenic patients with metabolic syndrome. Consequently, the prevention or treatment of this condition in the patients afflicted with schizophrenia is crucial. The alterations of the hypothalamic-pituitary-adrenal axis or hippocampal volume are proposed for the impaired lipid and carbohydrate metabolism in hypercortisolism (12-14). Recent studies have revealed that the long-chain Omega-3 Fatty Acids (OM3FAs) can effectively reduce the Triglyceride (TG) levels (12). In the 2016 Standards of Medical Care in Diabetes, which was published by the American Diabetes Association, the use of OM3FAs is recommended in all diabetic patients with hypertriglyceridemia. Omega-3 can directly decrease the low-density lipoprotein and TG levels. The safety and tolerability of the OM3FAs have been demonstrated in the literature (13), and no serious drug interaction was reported after its usage (14).

Brain autopsy revealed reduced levels of polyunsaturated fatty acids, particularly docosahexaenoic and arachidonic acids, in the frontal lobes of the schizophrenic patients. Furthermore, the deficiency of polyunsaturated fatty acids in neuronal membrane is correlated with abnormality in these patients (15). According to a recent study, carried out in Australia, low omega-3 index in people with mental illness, especially schizophrenia, can contribute to higher cardiovascular disease mortality (16).

- 6- Yogaratnam J, Biswas N, Vadivel R, Jacob R. Metabolic complications of schizophrenia and antipsychotic medications--an updated review. *East Asian Arch Psychiatry*. 2013 Mar;23(1):21-8
- 7- Mitchell AJ, Vancampfort D, De Herdt A, Yu W, De Hert M. Is the prevalence of metabolic syndrome and metabolic abnormalities increased in early schizophrenia? A comparative meta-analysis of first episode, untreated and treated patients. *Schizophr Bull*. 2013 Mar;39(2):295-305.
- 8- Peet M. The metabolic syndrome, omega-3 fatty acids and inflammatory processes in relation to schizophrenia. *Prostaglandins Leukot Essent Fatty Acids*. 2006 Oct-Nov;75(4-5):323-7. Epub 2006 Aug 28.
- 9- Pouwer F, Lieveise R, Diamant M, Assies J. Schizophrenia Am J Psychiatry. 2004 Oct;161(10):1926., syndrome X, and omega-3 fatty acids.
- 10- Peet M. Nutrition and schizophrenia: beyond omega-3 fatty acids. *Prostaglandins Leukot Essent Fatty Acids*. 2004 Apr;70(4):417-22.
- 11- Kim SW, Jhon M, Kim JM, Smesny S, Rice S, Berk M et al. Relationship between Erythrocyte Fatty Acid Composition and Psychopathology in the Vienna Omega-3 Study. *PLoS One*. 2016 Mar 10;11(3):e0151417.
- 12- Bos DJ, van Montfort SJ, Oranje B, Durston S, Smeets PA. Effects of omega-3 polyunsaturated fatty acids on human brain morphology and function: What is the evidence? *Eur Neuropsychopharmacol*. 2016 Mar;26(3):546-61.
- 13- Knöchel C, Voss M, Grüter F, Alves GS, Matura S, Sepanski B et al. Omega 3 Fatty Acids: Novel Neurotherapeutic Targets for Cognitive Dysfunction in Mood Disorders and Schizophrenia? *Curr Neuropharmacol*. 2015;13(5):663-80.
- 14- Zugno AI, Canever L, Mastella G, Heylmann AS, Oliveira MB, Steckert AV et al. Effects of omega-3 supplementation on interleukin and neurotrophin levels in an animal model of schizophrenia. *An Acad Bras Cienc*. 2015 Aug;87(2 Suppl):1475-86.
- 15- Amminger GP, Schäfer MR, Schlögelhofer M, Klier CM, McGorry PD. Longer-term outcome in the prevention of psychotic disorders by the Vienna omega-3 study. *Nat Commun*. 2015 Aug 11;6:7934.
- 16- Parletta N, Zarnowiecki D, Cho J, Wilson A, Procter N, Gordon A et al. People with schizophrenia and depression have a low omega-3 index. *Prostaglandins Leukot Essent Fatty Acids*. 2016 Jul;110:42-7.