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REVIEW ARTICLE

Association of Fish Consumption with Prevalence of Depression among Men and Women - A Literature Review

Manzur Kader*

Unit for Preventive Nutrition, Department of Bioscience and Nutrition, Karolinska Institute, Sweden

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*Corresponding Author
Email:manzur_physio@yahoo.com
Tel: +46768539867
Unit for Preventive Nutrition, Department of Bioscience and Nutrition, Karolinska Institute, SE-171 77 Stockholm, Sweden

ABSTRACT

Background: Depression is a frequent mental disorder characterized by a high level of morbidity in both men and women and has become a leading cause of disability as measured by Years Lived with Disability (YLDs). Fish is major source of long-chain omega-3 polyunsaturated fatty acids (ω-3 PUFAs) that are important in the development of the central nervous system. Lower ω-3 PUFA levels have been found in red blood cell membranes among depressed people in some studies, but trial evidence that has examined the effect of ω-3 PUFAs on depression is very limited.

Objectives: This review aims to find out if there is any association of fish consumption or dietary intake of omega-3 PUFAs with prevalence of depression among adult men and women.

Methods: Research articles were searched through database PubMed by using search string "fish consumption AND depression". The inclusion criteria were being the articles based on studies dealing with omega-3 PUFAs in fish in relation to depression or mood disorders among men and women.

Results: Fish consumptions or intake of ω-3 PUFAs were inversely associated with the prevalence of depressive symptoms among men and women. There were gender differences in the results where one study demonstrated the association in men; two studies demonstrated the association in women and one study found association in both men and women.

Conclusion: High dietary intakes of fish and omega-3 fatty acids appear to be related to a lower risk of depression in all the studies included in this review, although there is inconsistency with gender.

BACKGROUND

World Health Organization (WHO) has defined depression as "Depression is a common mental disorder, characterized by sadness, loss of interest or pleasure, feelings of guilt or low self-worth, disturbed sleep or appetite, low energy and poor concentration"[1]. It is a growing problem worldwide and has become a leading cause of disability as measured by Years Lived with Disability (YLDs) and the 4th leading contributor to the global burden of disease DALY in 2000[1]. Several factors like genetic, biological, and environmental risk factors, unhealthy diet - in particular low fish consumption low or omega-3 polyunsaturated fatty acid (ω-3 PUFA) intake are suggested to risk factors for psychiatric disorder and depression[2,3].

Fish is major source of long-chain ω-3 PUFAs and the most important bioactive components of ω-3 PUFAs are eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA). EPA and DHA are important in the development of the central nervous system and have a role in neurotransmitter synthesis, degradation, release, reuptake and binding[4,5]. Some studies have shown lower ω-3 fatty acid levels in red blood cell membranes among depressed people[6,7]. Several randomized controlled trials have been done to investigate the relationship between the ω-3 PUFAs and depression as well as the effectiveness of omega-3 supplements in the treatment of depression, but trial evidence that has examined the effect of ω-3 PUFAs on depression is very limited[8].

The aim of this literature review was to find out if there is any association of fish consumption or dietary intake of ω-3 PUFAs with prevalence of depression among adult men and women.

METHODS

A systematic search of published research articles was carried out on electronic database PubMed by using search string "fish consumption AND depression". The search result gave 113 articles, where 30articles had full free text. After reading the titles and abstracts of the articles, 4 studies were reviewed in detail from the articles. Some additional articles were selected that were cited at chosen articles and these articles contributed to write the background and supported to build the discussion part of this review. More background information about depression was also taken from WHO website.

Inclusion criteria: Studies dealing with ω-3 PUFAs in fish in relation to depression or mood disorders among men and women.

Exclusion criteria: Studies dealing with some other nutrients like protein, minerals rather thanω-3 PUFAs in fish or in relation to some other diseases like cardiovascular diseases (CVDs), stroke etc. Studies dealing with any specific group e.g. pregnant women and experimental studies/ trials with ω-3 PUFA supplements rather than natural source from fish were also excluded.

RESULT

Of all the 4 studies included in this literature review found that omega-3 polyunsaturated fatty acids (ω-3 PUFAs) or fish intakes are inversely associated with depressive symptoms. There were gender differences in the results where two sets of cross-sectional studies by Suominen-Taipale AL et al.[9] found the association in men but no consistent association in women. A cohort study by Colangelo LA et al.[10] and a cross-sectional study by Tanskanen A et al.[11] showed significant result in women, but not in men. Study by Chrysohoou CA et al.[12] found significant association in both men and women. A summary of the major findings presented in table 1 below:

DISCUSSION

This literature review was aimed to find association between the dietary intake of omega-3 polyunsaturated fatty acids (ω-3 PUFAs)in fish and depressionamong men and women.

All the studies reviewed agree that the higher intake of ω-3 PUFAs or fish reduce the prevalence of depression among general population, although the association was pronounced by gender. Inconsistent findings may be due to difference in study design and methodology, measure of depression or dietary intake of fish or ω-3 PUFAs, targets group and adjustment of confounding factors. Food frequency questionnaire (FFQ) was used for dietary measurement in the studies by Suominen-Taipale AL et al[9], TanskanenA et al[11] and Chrysohoou C[12] and quantitative FFQ with additional information about portion size was used in the study by Colangelo LA et al.[10]. None of the studies had exact information about the quantification of type of fish consumption. Four different scales for measurement of depression were used in the studies such as M-CIDI[9], CES-D[10] and BDI[11] GDS[12], while the CES-D has shown high sensitivity for detecting clinically diagnosed depression for a cut point of 16, reported sensitivities ranged from 73% to 99% in various patient groups[13].

In The nationwide Health 2000 Survey[9], the result was significant in men who consumed the most alcohol, were occasional or former smokers, or had intermediate physical activity, so the result was modified by lifestyle, but for women, the association was not adjusted for alcohol consumption, smoking, or physical activity.

Another possible explanation for the gender difference in the studies by Suominen-Taipale AL et al.[9] and Chrysohoou CA et al.[12] may be due to the selection of more elderly women compared with other studies. One study shows that the elder women are more prone to depression than men with similar age and generally prevalence of depression is about twofold among women compared with men[14]; so the protective effect of fish might not be strong enoughto be significant in women.

One limitation may be the selection of professional fishermen and their families who have generally higher fish consumption[9], so beneficial effects in them may not be representative for general population.

Omega-3 PUFAs intakes are inversely associated with depressive symptoms in women, but not in men in both studies by Colangelo LA[10] and by Tanskanen A et al[11]. One possible explanation for the gender difference is that the endogenous ω-3 PUFAs are higher in women than man. Giltay EJ et al.[15] in their study demonstrated that the plasma DHA con-

centrations in women are higher than in men when they are given identical diets and this might have a protective effect in women.

The effect of ω-3 PUFAs on depression is still unknown. They contain EPA and DHA which are not effectively synthesized our body; must be obtained mainly from the diet with the consumption of fatty fish rich with ω-3 PUFAs[4-6]. DHA is the main ω-3 PUFAs in human brain and associated with membrane stability of the nervous cell[17]. They are found to be related with the functions of serotonin and dopamine transmission, which might explain some of the mechanisms of ω-3 PUFAs effect on depression[4-5,11,17].

Table1: Associations of fish consumption or dietary intake of omega-3 PUFAs with prevalence depression among general population

Reference	Settings and designs	Measurements	Results
Suominen-Taipale AL et al, 2010[9]	Two cross-sectional data sets, Finland;	FFQ (g/day) and IFQ (times/month).	1. Depressive episodes decreased from 9% to 5% in men (p = 0.01)
	1. The nationwide Health 2000 Survey, n=5492, age 40-79 years, during 200-2001	Serum concentrations (% from fatty acids) of PUFAs.	Significant in men with alcohol consumer, smokers, or intermediate physically active.
	2. The Fishermen Study cohort: with maritime fishermen and their all family members, n=14039, age 40-79 years, during 2004-2005	Depressive episodes were assessed with the M-CIDI and a self-report of two CIDI probe questions, respectively.	2. Depressive episodes decreased from17% to 3% in men (p = 0.05).
Colangelo LA et al, 2009[10]	Cohort study, USA; n=3317, age 24-42 years.	Quantitative FFQ.	Inverse association with risk of chronic depressive symptoms in women, but not in men. OR at 95% CI, 0.75 (0.55-1.01) for fish intake, 0.66 (0.50-0.89) for EPA, 0.66 (0.49-0.89) for DHA, and 0.71 (0.52- 0.95) for EPA +DHA.
	Diet assessment in year 7 (1992-1993). Depressive symptoms measurement in years 10 (1995-1996), 15 (2000 -2001), and 20 (2005-2006)	Serum concentrations (% from fatty acids) of PUFAs.	
		Depressive symptoms were assessed by the 20-item CES-D.	
Tanskanen A et al, 2001[11]	Cross-sectional data from a large survey in two coastal and two lakeside areas, Finland;	FFQ (gram/day).	Infrequent fish consumers had 31% higher odds of having depression than among frequent consumers, OR at 95 % CI, 1.31 (1.10-1.56, p<.01). Significant in women, 1.40 (1.11-1.78, p<.01) but not in men.
	n=3,204, age 25-64 years, during 1992	Depressive symptoms were assessed with the 21-item BDI.	
Chrysohoou CA et al, 2010 [12]	Cross-sectional, inhabitants of Ikaria Island; n=673 age above 65 years, during 2009-2009,	FFQ (gram/week).	Fish consumption was associated with lower prevalence of depression in both men and women. OR at 95% CI, 0.34 (0.19-0.61, p<.05)
		Depressive symptoms were assessed with GDS	

Note: OR-Odds ratio, CI- confidence interval, FFQ- food frequency questionnaire,PUFAs- polyunsaturated fatty acids, IFQ- independent frequency questions M-CIDI- the Munich version of the Composite International Diagnostic Interview, CIDI-Composite International Diagnostic Interview, CES-D- Center for Epidemiological Studies Depression Scale,BDI-Beck Depression Inventory, GDS- Geriatric Depression Scale

CONCLUSION

High dietary intakes of fish or ω-3 PUFAs appear to be related to a lower risk of depression in all the studies included in this review, although there is inconsistency with gender and the associations between depressive symptoms and the intake of fish or of ω-3 PUFAs were not clear in some studies. The results were also modified by several lifestyle variables which need to be taken into account properly in future studies. Similar study design and methodology, measure of depression and dietary intake of fish or ω-3 PUFAs are also important to get consistent results.

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