

Role of Flaxseed Oil as an Adjuvant in Decreasing Tobacco Craving: A Review

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Abstract

India is the world's third largest tobacco producer and second largest tobacco consumer. It is well known that smoking is injurious to health but still the increase in the rate of smoking and tobacco consumption is day by day increasing due to craving effect. Studies in past state that smoking induces oxidative stress which lowers omega-3 fatty acid level in the plasma and brain tissues that affect neurotransmitter which leads to hypo-functioning of mesocortical system, which in turn increases craving. Previous studies suggest: administration of omega-3 has reduced tobacco craving by direct administration of EPA (Eicosapentaenoic acid) and DHA (Docosahexaenoic acid) as well as fish oil rich in omega-3 fatty acids. Flaxseeds are highly rich source of omega-3 fatty acids: ALA (alpha-linolenic acid), PUFA (polyunsaturated fatty acid- short chain fatty acids), fibres (soluble and insoluble), phytoestrogenic lignans (SDG-secoisolariciresinol diglycoside), proteins and a number of antioxidants. Flaxseed has never been used in this field as a source of omega 3 fatty acids which is economical, more easily accessible to the people of India due to its higher production and does not cause a matter of concern to the vegetarians especially. This concludes that increasing omega-3 fatty acid intake of smokers and tobacco consumers shall decrease craving effect, decrease their consumption of tobacco too and might be helpful for those individuals who desire to quit the use of tobacco. This review aims at identifying effects of flaxseed oil on tobacco craving.

Keywords: Omega-3 Fatty Acids; Tobacco Craving; Flaxseed Oil; Quit Tobacco

Introduction

History of tobacco

Humans have been making use of tobacco ever since 600 A.D [1]. Tobacco was introduced by Columbus in Europe, during his historical travels when he came to learn about tobacco from the Caribbeans. It was introduced by the Portuguese in India [2]. Tobacco came to India in the early 1600s, through Portuguese traders. Tobacco was introduced initially among nobility, and slowly became popular among common people. The Smokeless Tobacco use was justified for its supposed medicinal properties, even though no medicinal system has ever supported its medicinal use in India. Since the early 1600's, tobacco has been an important cash crop and a significant domestic and foreign trade item [3].

Forms of tobacco

Earlier, tobacco was usually smoked using various types of cigars or as pipes or orally consumed (smokeless tobacco). Paper cigarettes and cigars were introduced in the mid-19th century. Isolation of nicotine was done from the leaves of tobacco by 1828 A.D [4]. In India, tobacco use has many ways of consumption including smoking and non-smokeless usage [5].

Smoking of tobacco is done in the form of cigarettes and beedis, or by use of devices such as chhutta, dhumti, hooka, hookli or chillum [6-8]. The smoking of pipes and cigars is not much popular in India as is common in certain western countries. Cigarette smoking is widespread in urban areas. Locally produced and imported cigarette brands, both are available. However, smoking cigarette is more popular amongst the middle and upper socio-economic group than amongst the poor population, due to the comparatively higher cost of cigarettes as compared to the other tobacco forms. Tobacco is also used as a pan masala ingredient in different varieties of smokeless types in India, including gutka, betel quid chewing, khaini, mishri, snuff, etc.

The use of tobacco by adolescents and children is influenced by several factors. Some of these be family history of elder member's tobacco use, experimentation, influence of peer, ease of access of these products, factors of personality, underlying psychological and emotional problems, accompanied with risk-taking habits and, most significantly, the tobacco industry's aggressive marketing strategies [5].

Current scenario

The Global Adult Tobacco Survey 2 (GATS 2) study reported that 28.6 percent (266.8 million) of adults of age 15 and above - in India currently does tobacco use in some or the other form. Amongst the adults 24.9 percent (232.4 million) are frequent tobacco users and 3.7 percent (34.4 million) be infrequent users. Khaini, a combination of lime and tobacco used by every 9th adult (11.2 per cent), is the most common used product of tobacco in India. Beedi is the 2nd most widely used tobacco product, smoked by 7.7 per cent of Indian adults. Gutkha, a mixture of tobacco, lime, areca nut, ranks third (6.8 percent), and betel quid along with tobacco, it ranks fourth (5.8 percent). According to the survey study, the prevalence of use of tobacco amongst men is 42.4 percent, whereas amongst women it is 14.2 percent [3].

Harmful effects of tobacco

The scenario around use of tobacco in India is even more of a challenge. India is the world's 3rd largest tobacco producer and 2nd largest tobacco consumer. Tobacco-related deaths in India are estimated at more than 1.3 million [9,10]. The link connecting tobacco use and mortality in India is well established and resonates with global experience regarding tobacco use. A striking feature in India though is the higher occurrence of oral cancer, as opposed to lung cancer, among tobacco users. In fact, India alone accounts for nearly half the world's overall oral cancer cases [11]. Smoking raises TB risk by more than two-and-a-half times [12]. All this makes it imperative to accelerate efforts for the control of tobacco at the global as well as national levels.

Solutions to help quit tobacco use

Tobacco cessation clinics

Several TCCs (Tobacco Cessation Clinics) were started in 2002 to help people stop using tobacco, and these cessation clinics became component of the NTCP (National Tobacco Control Program) in 2007 - 2008. In the TCCs, between 2002 to 2007, users of SLT (smokeless tobacco) represented 65.5 per cent of enrolled cases. Behavioural counseling is the initial strategy for cessation intervention at these clinics, while pharmacotherapy has also been provided in about 30 percent of cases. The quit rate was 31.1 per cent among all men attending tobacco cessation clinics [3].

Omega-3 fatty acid

Past studies state that smoking induces oxidative stress which lowers omega-3 fatty acid level in plasma and brain tissues that affect neurotransmitter which leads to hypo-functioning of mesocortical system which in turn increases craving. This concludes that increasing omega 3 fatty acid's intake in smokers and tobacco consumers shall decrease craving effect and decrease their tobacco intake.

Previous studies suggests: Supplementation of omega-3 PUFA reduces craving of tobacco in regular smokers and brought about a drop in nicotine dependence. However, these studies were being done by direct administration of EPA (Eicosapentaenoic acid) and DHA (Docosahexaenoic acid) as well as omega-3 fatty acid rich fish oil.

Potential health benefits including nutritional aspects of flax seeds

Flaxseeds have nutritional properties and are highly rich source of omega-3 fatty acids: ALA (alpha-linolenic acid), polyunsaturated PUFA (short chain fatty acids), fibres (soluble and insoluble), phytoestrogenic lignans (SDG-secoisolariciresinol diglycoside), proteins and a number of antioxidants [13- 16]. For several conditions such as cardiovascular disease, hypertension, diabetes, atherosclerosis, arthritis, cancer, osteoporosis, neurological disorders and autoimmune, the health benefits of all omega-3 fatty acids (ALA, EPA and DHA) have widely been reported [17,18].

Flaxseed is a multi-component system containing organic plant substances including oil, soluble polysaccharides, protein, lignans, dietary fiber, phenolic compounds, vitamins (A, C, E and F), and minerals (Na, K, Mg, P, Mn, Zn, Cu and Fe) according to flaxseed's physico-chemical composition [19,20].

According to Ayurveda, flaxseed has properties such as Madhura (skin balance pH), Picchaila (lubric) Balya (improves skin tensile strength or elasticity), Grahi (improves skin moisture retention capacity), Tvagdoshahrit (removes blemishes of skin) Vranahrit (healing of wound), and of use in Vata (disorders of skin such as skin dryness, undernourishment, lack of glow or luster) [21].

Purpose of flax seed depiction

As per the report of Food and Agriculture Organization-2012, India ranks 4th with 0.15 million tonnes of total production of flaxseed. Thus, there is a higher rate of production in India which makes it economical and easily available. The other reason behind using flaxseed is that, no other study or research has been conducted using flaxseed in this field although it has been used for various other purposes and also its potential health benefits other than nutrition. Also, it does not create a matter of concern for vegetarians like fish oil does.

Materials and Methods

Study design

Narrative or Traditional literature review.

Methods

PubMed, MEDLINE, Web of Science and Google scholar data bases were searched using keywords omega-3 fatty acids, tobacco craving, flaxseed oil, quit tobacco for reviews concerning effect of omega-3 fatty acid on tobacco craving.

Results and Discussion

Results and discussion must illustrate and interpret the reliable results of the study.

The topic has been picked from the facts gathered from the following studies: A significant drop in the levels of cigarette craving, dependence on nicotine and smoking cigarettes/day in the group administered with omega-3 fatty acid in comparison with the placebo group and the gap between the 2 groups began to increase from baseline to follow-up for 3 months. The model considered that these variations were statistically important [22].

Consumption of more than 340 grams of fish a week has been reliably related to positive smoking habits. After monitoring all socio-demographic factors and markers of healthy lifestyle practices, these results continued. The smoking prevalence dropped significantly as weeks of gestation increased from roughly 32 percent pre-pregnancy as to a low of 19 percent at some stage in the second trimester. Despite such a decrease in smoking rates during the trimester, however, there was consistent severity of protective effects for fish consumption. Protective associations, comparable in intensity and direction, have been observed across trimesters for fish intake and cessation of smoking. However, while these relationships were robust for socio-demographic factors to compensate for uncertainty, they were not robust for further modification by factors clearly indicative of a healthy lifestyle. Fish intake may also have been an indication of higher overall health-conscious attitudes, including reduced smoking. High omega 3 intake should be assessed as an intervention to prevent or reduce smoking in randomized clinical studies/trials [23].

Fourteen days supplementation of fish oil increased significantly, in dose-dependent manner, plasma PC EPA, DHA, and DPA at all doses excluding 1 and 3 mL per day. There was a 16 per cent drop in concentrations of plasma triacylglycerol after 14 days of supplementation for the combined group of women who consumed some fish oil. Supplementation of flaxseed oil for 14 days resulted in considerable rise in ALA, DPA and EPA, while DHA stayed unchanged [24].

In women's cohort at elevated risk of recurring spontaneous preterm delivery, supplementation of omega-3 was linked to reduced recurring spontaneous preterm delivery in smokers but not in non-smokers. Likewise, supplementation with omega-3 lowered low birth weight risk in smokers but not in non-smokers, most likely relevant to the reduced spontaneous preterm delivery risk. Smokers and non-smokers taking supplementation of omega-3 were at equal risk of getting an experience of any preterm delivery, pregnancy-associated hypertension, admittance in the intermediate care nursery or Neonatal Intensive Care Unit (N.I.C.U.) and adverse composite neonatal outcome. The research suggests that omega-3 supplementation in smokers but not in non-smokers can be protective against reoccurring spontaneous preterm delivery and low birth weight [25].

Smokers consumed a lesser amount of fish rich in omega-3-rich fatty acids as compared to non-smokers, showing an inverse and important relationship between smoking and intake of omega-3. Smokers had lower DHA and EPA levels, a finding which was not previously reported. Having regard to the fact that PUFAs are likely to interfere with the habit of smoking, the increase in consumption of omega-3 may turn to be a perspective in smoking prevention or treatment [26].

The lipid profile of omega-3 fatty acids found that smokers had lower concentrations of DHA, i.e. smokers had peripheral levels lower of omega-3 and treatment using the most significant omega-3 fatty acids resulted in decreased nicotine dependency [27].

In frequent cigarette smokers (n = 48), administration of 2710 mg EPA/day and 2040 mg DHA/day for 1 month was followed by a substantial reduction in recorded daily smoking and craving of tobacco following exposure to cigarette cue. Treatment was discontinued if the craving hasn't returned to the baseline values in a month. This is the 1st research demonstrating that the treatment of omega-3 PUFA decreases tobacco cravings in frequent smokers relative to placebo. Hence, omega-3 PUFAs might be beneficial in managing tobacco use [28].

Although studies have revealed that omega-3 administration has reduced tobacco craving and smoking but no study has been done using administration of flaxseed or flaxseed oil which is rich in omega-3 fatty acids.

Title of Study	Target group	Administration of	Result/Conclusion	References/ Authors
Effects of omega-3 fatty acid supplementation on cigarette craving and oxidative stress index in heavy-smoker males: A double-blind, randomized, placebo-controlled clinical trial.	Heavy smokers of either sex	Fish oil derived omega-3 fatty acid (n-3 FA) supplements	High-dose n-3 FA supplementation in heavy-smoker males is safe and useful in reducing cigarette craving, nicotine dependence and oxidative stress.	Sadeghi-Ardekani, <i>et al.</i> (2018) [22]
Maternal fish consumption during pregnancy and smoking behavioural patterns.	Pregnant women (perinatal smokers)	Self-administered semi-quantitative FFQ (Food Frequency Questionnaire)	Greater fish or n-3 highly unsaturated fatty acid consumption should be evaluated as an intervention to reduce or prevent smoking in randomised clinical trials.	Gow, <i>et al.</i> (2018) [23]
Effect of supplementation with flaxseed oil and different doses of fish oil for 2 weeks on plasma phosphatidylcholine fatty acids in young women.	18 years or older and were not allergic to fish or nuts.	Fish oil or flaxseed oil in capsule form	Flaxseed oil supplementation for 14 day resulted in significant increases in ALA, EPA and DPA, whilst DHA remained unchanged.	Hodson, <i>et al.</i> (2018) [24]
The effect of omega-3 supplementation on pregnancy outcomes by smoking status	Women with a singleton pregnancy and a history of a prior singleton spontaneous preterm delivery.	Omega-3 supplementation or identical appearing placebo capsules	Omega-3 supplementation in smokers may have a protective effect against recurrent spontaneous preterm delivery and low birth weight.	Kuper, <i>et al.</i> (2017) [25]
The relationship between omega-3 and smoking habit: A cross-sectional study.	Current smokers, trying to quit (group I) Non-smokers (group II)	Food Frequency Questionnaire and Fagerström Test for Nicotine Dependence (FTND)	Smoker ate less fish rich in omega-3 fatty acids than non-smokers.	Scaglia, <i>et al.</i> (2016) [26]
Omega-3 Levels and Nicotine Dependence: A Cross-Sectional Study and Clinical Trial.	Sample of smokers with a sample of non-smokers.	Capsules of mineral oil (placebo) or fish oil (source of omega-3).	After treatment, the omega-3 group showed a significant reduction in their levels of dependence.	Zaparo, <i>et al.</i> (2015) [27]
Effects of omega-3 fatty acids on tobacco craving in cigarette smokers: A double-blind, randomized, placebo-controlled pilot study.	Regular smokers	PUFA capsule and placebo capsules (containing mineral and soybean oil)	Omega-3 PUFA supplementation reduces tobacco craving in regular smokers, compared to placebo treatment.	Rabinovitz (2014) [28]

Thus, the study could be done by administration of food grade pure flaxseed oil/flaxseeds because of its higher rate of production in India which makes it economical and easily available. The other reason behind using flaxseed is that, it does not cause a matter of concern to the vegetarians especially and it has been used for various other purposes and also its potential health benefits other than nutrition.

Conclusion

The role of omega-3 rich flaxseed remains largely unknown in reducing tobacco craving. While, some research studies have shown that omega-3 administration has reduced tobacco craving by direct administration of EPA (Eicosapentaenoic acid) and DHA (Docosahexaenoic acid) and omega-3 fatty acids rich fish oil as well as have yielded positive results. More studies are required to state definitively that flax seed is impactful for this use and to specify the exact dose required. To date, no studies have reported flaxseed's affect in reducing craving of tobacco in tobacco dependent patients. Therefore, further clinical trials are required to determine if flaxseed is an impactful means of reducing tobacco craving in tobacco dependent patients.

The work has advanced existing as the use of flax seed has never been used in this field as a source of omega 3 fatty acids which is economical, more easily accessible to the Indian people due to its higher production and does not particularly of concern to the vegetarians especially.

Thus, it could be concluded that if food grade pure flaxseed oil/flaxseeds administration containing omega-3 fatty acids turns to be useful in decreasing craving of tobacco and then it would slowly and gradually decrease the consumption of tobacco too.

And it would be of greater well-being for tobacco consumers if results turn to be positive i.e. it goes in the direction that it is thought of to be helpful for those individuals who wish to quit the use of tobacco.

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Availability of Data and Material (Data Transparency)

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Authors' Contributions

For conceptualization, N.V. for resources, K.B. and for writing-review and editing, A.S.

Conflict of Interest

The authors declare no conflict of interest.

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