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Original Article

The effect of OMEGA-3 and OMEGA-6 fatty acids on allergic and asthmatic patients – A cross-sectional analysis

Ayesha Aslam [1], Nida Javaid [1]*, Musammat Manzoor [1], Iqra Waheed [1], Mariam Fatima [1], Eman Rashid [1], Wajeeha Arooj [1], Quratulain Shahid [1], Ahood Khalid [1], Tanzeel Shahid [1], Zoya Abid [1]

[1] The University Institute of Diet and Nutritional Sciences, Faculty of Allied Health Sciences, University of Lahore, Lahore, Pakistan

* Correspondence to: Nida Javaid, University Institute of Diet and Nutritional Sciences, Faculty of Allied Health Sciences, University of Lahore, Lahore 54590, Punjab, Pakistan. Phone: +923245977457; E-mail: nida.javaid@dnsc.uol.edu.pk

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Abstract

Allergy is an abnormally extended and evolved sensitivity to specific substances, whereas asthma is constriction of the airways of the lungs due to swelling of internal walls of the airways. Dietary consumption of omega-3 and omega-6 supplementation may help in the prevention of allergies and asthma. The objective of this investigation was to assess the effectiveness of omega 3 and 6 supplementation on patients who were suffering from asthma or any allergy. A cross-sectional study on 100 patients with asthma and different types of allergies was conducted at different hospitals in Lahore. They were given a questionnaire to accumulate input about their dietary practices, understanding, and awareness. Data was analyzed by using SPSS 22.0. Results showed that 40% of patients had mild improvement in symptoms, 28% exhibited good responses, and 32% had no progress in their symptoms at all. About 27% of patients took omega 3 and 6 supplementations weekly, while 36% used to take them daily, and 37% never took the supplementation. It was concluded that most of those patients who took the omega-3 and omega-6 fatty acids supplementations showed mild improvement as compared to those who were not taking supplements. People taking omega 3 and 6 food sources such as fish, nuts, legumes, and meat faced fewer symptoms.

Keywords: OMEGA-3 fatty acids, OMEGA-6 fatty acids, asthma, allergies, supplementation.

Introduction

Up to 334 million people worldwide suffer from asthma, and 250,000 people die from it each year [1, 2]. Asthma prevalence has been rising for the past 30 years. The prevalence of asthma has roughly doubled over the past thirty years, and despite improvements in treatment options, up to 50% of asthma patients do not benefit from available medication therapies. Therefore, there is an increasing demand for non-pharmacologic therapy approaches that might be able to stop this trend. A potentially modifiable factor to halt the asthma epidemic is dietary modification, one of several environmental factors linked to the increased incidence of the disease.

Asthma is a chronic ailment that may affect people of any age. Physical, emotional and social well-being may be affected by asthma. Healthcare Quality of Life (HRQoL) indicators are designed to enhance typical health metrics such as the frequency and severity of disease, mortality, and hospitalization [1]. Asthma and other allergy disorders are the most common and serious health concerns globally because of many environmental and dietary factors. Around 334 million people are facing asthma globally.

In the past two decades, increasing interest has been shown in the role of dietary polyunsaturated fatty acids (PUFAs) [3–5]. This assumption is supported by the hypothesis that patterns of PUFA consumption have dramatically changed in the typical Western diet, with consumption of omega-6 (n-6) PUFA, which is primarily found in vegetable oils, increasing and omega-3 (n-3) PUFA, which is primarily found in marine oils declining [6–8]. The main cause of the rising asthma and

allergy disease morbidity is a reduced dietary intake of n-3PUFAs [9]. Red blood cell (RBC) eicosatetraenoic acid (EPA) + docosapentaenoic acid (DPA) expressed as a percentage weight of total RBC membrane fatty acids are biomarkers that more accurately indicate this insufficiency or the "omega index" have been proposed in view of the relative imprecision and lack of specificity of the ratio between n-3 and n-6 fatty acids [10].

Numerous studies have been done on the function of PUFA as immune modulators in connection to lung health [11–13]. Linoleic acid, the most prevalent n-6 PUFA in the Western diet, is converted to arachidonic acid, which is a precursor to leukotriene B4 and prostaglandin E2, which are both made by mast cells and eosinophils. Leukotriene and prostaglandin are both powerful bronchoconstrictors and show pro-inflammatory characteristics in allergic illnesses. Alpha-linolenic acid (ALA), an n-3 PUFA, on the other hand, is changed into EPA and inhibits arachidonic acid, which in turn prevents the synthesis of eicosanoid inflammatory mediators that are produced from n-6 PUFA. EPA serves as a precursor for bioactive compounds, including resolvins, protectins, and maresins. These mediators that promote resolution significantly reduce inflammation [11]. Recent research has demonstrated that the imbalance between these pro- and anti-inflammatory chemicals causes the inflammation seen in asthmatics' airways to worsen.

Respiratory tract inflammation is the cause of this disease. As disease severity and airway eosinophilia increased, researchers found that IL-5 was involved with eosinophil growth, maturation, and survival. The symptoms include breathlessness, wheezing, chest tightness, and constant cough [2].

Airways soreness in asthma is triggered by exposure to allergens and viruses and induces airway hyper-responsiveness (AHR), airway smooth muscle contraction, and excess mucous production [3, 4]. Systemic inflammation is also a part of this condition, with C-reactive protein (CRP) levels being raised in people with asthma, which is associated with unsatisfactory lung operation and more intense airway inflammation [5, 6]. Recent treatments for this condition mainly concern inhaled corticosteroid (ICS) medication, which assists in managing signs and exacerbations and improving lung functioning and quality of life by decreasing the inflammation of the airways [7, 8]. Common "triggers" can make asthma symptoms worse. Triggers vary from person to person but can include viral infections (colds), dust, smoke, fumes, changes in the weather, grass and tree pollen, animal fur and feathers, strong soaps, and perfume [7–9].

There has been a shift in the intake of -3 and -6 PUFAs over the last several decades, with an overall preference for -6 PUFAs. As a result of the high levels of PUFA (Polyunsaturated fatty acids) in the average Western diet, it is possible that allergic sensitization and allergy symptoms would intensify. Soybean oil, maize oil, sunflower oil, and cottonseed oil are all sources of polyunsaturated fats. Food allergies may be reduced by increasing the ratio of omega-3 to omega-6 PUFAs in the diet, despite the fact that the typical Western diet includes much more omega-6 PUFAs than omega-3 PUFAs (FA) [11]. A double bond at the third carbon atom in the chain of important dietary lipids like omega-3 fatty acids makes them polyunsaturated fatty acids. Leafy greens, almonds, fish oil, and vegetable oils are all good sources of omega-3 fatty acids. Less DHA and EPA may be found in white fish than in oily fish such as bluefish (salmon), mackerel, and sole. Whitefish and tuna are two popular choices. Fried fish may increase your risk of heart failure due to the trans-fats and omega fatty acid degradation that occurs during the cooking process. Cardiovascular disease (CVD) and inflammatory diseases benefit from linoleic acid, the most basic omega-3 fatty acid. These long-chain polyunsaturated fatty acids, such as EPA and DHA, make up a large portion of our daily intake of omega-3 fatty acids in the food.

The consumption of foods high in omega-3 fatty acids lowers the risk of heart disease, osteoarthritis, and rheumatoid arthritis (RA). A balanced diet may be used to increase omega-3 fatty acid levels [11]. Adding omega-3 fatty acids to nonsteroidal anti-inflammatory drugs (NSAIDs) was shown to lower the daily dose of NSAIDs and the risk of side effects associated with NSAIDs in recent research. It is true that arachidonic acid produces molecules that decrease inflammation by converting linoleic acid into arachidonic acid; however, this is only half-true for Omega-6s' pro-inflammatory compounds.

Material and methods

A cross-sectional study was designed to analyze the consumption of omega 3 and omega 6 among asthmatic and allergic patients. For this purpose, patients were targeted in different hospitals; our settings were Sir Ganga Ram Hospital, the University of Lahore Teaching Hospital, and Mayo Hospital Lahore to retrieve the data against our questionnaire.

The study's duration was conducted from January 2022 to June 2022. A probability sampling technique

Table 1: Betterment in symptoms after usage of supplementation.

Effect of supplements on asthma	Frequency (n)	Percentage %
Mild improvement	40	40%
No improvement	32	32%
Good improvement	28	28%

was utilized to target the population. Males and females of age 19–50 were targeted. Patients with tuberculosis, patients who were oxygen dependent, patients who were admitted to the Intensive Care Unit and patients who were reluctant to answer the questions were excluded from the study. A standardized questionnaire was used, and data was analyzed on SPSS.

Results

According to the data, the mean age of the participants was 29.42±10.18 and almost 67% of the patients were females, while 33% were male. According to the results, 40% of patients experienced mild betterment in symptoms after the usage of omega 3 and omega 6 supplementation, while 28% showed good response and 32% of patients had no improvement in symptoms at all (Tables 1 and 2).

According to the results from Table 3, around 25% of patients consumed fish weekly, 15% never consumed it, while 55% used to consume fish monthly. The consumption of nuts among patients was based on 25% of patients consuming them weekly, 35% eating them monthly, and 40% never consuming nuts. Meat consumption among patients showed that 39% of them consumed meat weekly, 33% consumed it monthly, and 28% of patients never did. The legume consumption was based on 40% of persons consuming it weekly, 25% of persons consuming it monthly, and 35% of patients never consumed legumes. The consumption of yogurt was based on 33% of patients consuming it daily, 29% of persons used to consume it monthly, while 38% of patients did not use to consume them.

Approximately 23% of patients used an inhaler to reduce the signs twice a day; 33% of patients never used inhalers; meanwhile, 44% of persons used them twice a week (Figure 1).

Discussion

Food allergy is a negative immunological response that transpires on divulgence to a portion of food that re-occurs on repetition of the exposure [12]. In another study, it was discovered that despite dietary restrictions on allergens (i.e., fish, milk, eggs, chickpeas, and buckwheat), asthmatic patients with food allergies or

Table 2: Response to experiencing symptoms.

Experienced symptoms	Frequency (n)	Percentage %
Daytime	25	25%
Night time	49	49%
During or after physical activity	26	26%

Table 3: Consumption of food sources containing omega-3 and omega-6 fatty acids.

Food source	Weekly consumption (%)	Monthly consumption (%)	Never consumed (%)
Fish	25%	55%	15%
Nuts	25%	35%	40%
Meat	39%	33%	28%
Legumes (like soybeans etc.)	40%	25%	35%
Yogurt and cheese	33%	29%	38%

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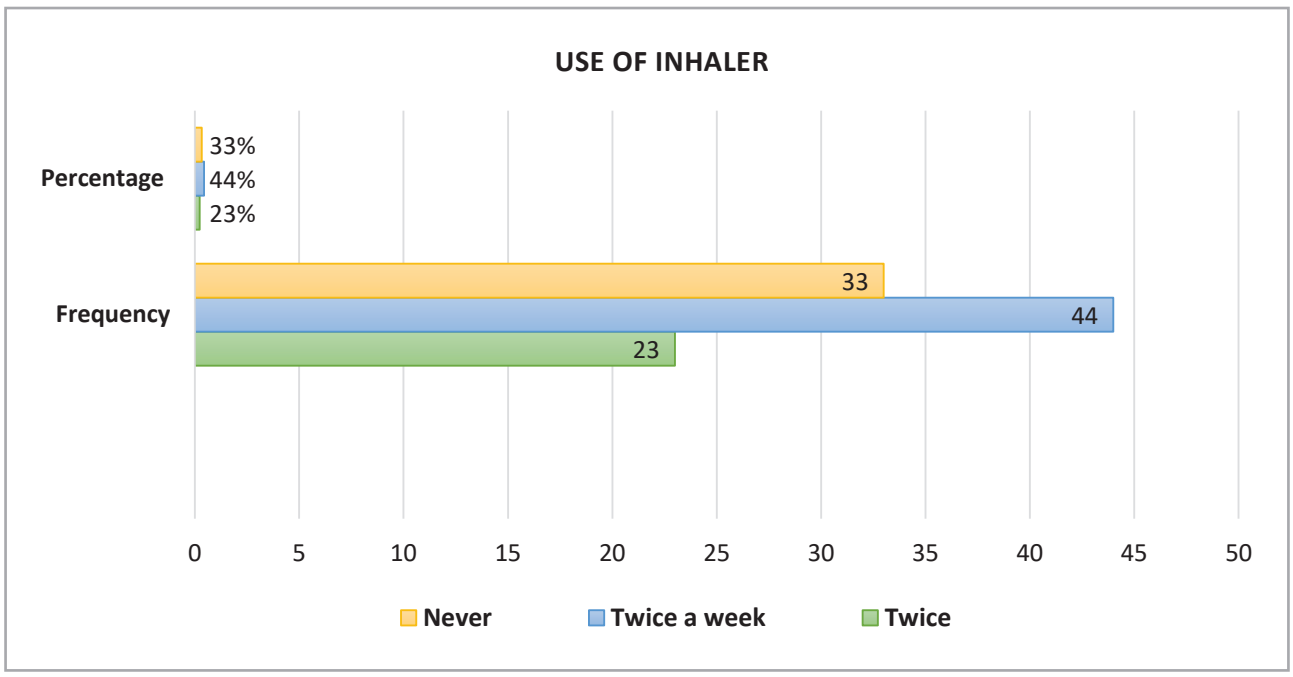

Figure 1: Usage of inhaler.

certain food triggers need frequent examinations, detailed monitoring, and dietary controls and crisis management techniques, examination of therapy [13]. According to a study in which the relationship between food allergies and asthma was studied. Food allergy is a negative immunological response that transpires on divulgence to a food that re-occurs on repetition of the exposure [13]. In the following study, despite dietary restrictions of allergens (i.*e.*, fish, milk, eggs, chickpeas, and buckwheat), the children had more impaired chronic asthma signs when there was environmental vulnerability to the foods (i.*e.*, families cooked with the allergenic foods at home) it was uncovered that when the families controlled cooking the allergenic foods at home, the child's symptoms were eased and they required less inhaled corticosteroid therapy [14].

It was concluded that asthmatic patients with food allergies or certain food triggers need frequent examinations, detailed monitoring and dietary controls and crisis management techniques, and examination of therapy [13]. In our study, we investigated whether supplementation of omega 3 and omega 6 influences the signs and symptoms of asthma and allergies or not. We found that 27% of patients were taking omega 3 and 6 supplementations weekly, while 36% used to take them daily, and 37% of patients never took the supplementation. The severity of symptoms was lower in higher consumers. According to our results, 40% of patients experienced mild betterment in symptoms after the usage of omega 3 and omega 6 supplementation, while 28% showed good response and 32% of patients had no improvement in symptoms at all.

Numerous investigations have emphasized the probable protecting role of omega-3 polyunsaturated fatty acids (n-3 PUFA) in asthma and different types of allergies. A study stated the Relationship between Serum Omega-3 Fatty Acid and Asthma that n-3 fatty acids (EPA and DPA) are associated with decreased Nonspecific Bronchial Hyperresponsiveness (NSBH) risk, while certain n-6 fatty acids (LA, DGLA, and AA) are associated with an increased risk of NSBH. It was found that fish and fish oil consumption only accounted for about 25% of the variation in plasma n-3 levels and total n-3 PUFA formatting was associated with reduced NSBH (Nonspecific Bronchial Hyperresponsiveness) risk [14].

A recent study was reported on omega 3 and omega 6 Lung function and short-term ambient air pollution exposure: differential impacts of omega-3 and omega-6 fatty acid. Sixty-two healthy adults were enrolled into either high or low n-3 FA (Poly unsaturated omega 3 fatty acids) groups on the basis of n-3 FA intake and erythrocyte n-3 FA concentrations. They observed lag-dependent associations between short-term ambient air pollutants and lung function that were differentially modulated by n-3 and n-6 FAs, suggesting that n-3 and n-6 FAs counteract the respiratory response to low levels of ambient air pollution in healthy adults. This study reported that 27% of patients were taking omega 3 and 6 supplementations weekly, while 36% used to take them daily, and 37% of patients never took the

supplementation. Influencing asthma outcomes, with a specific focus on important co-factors such as NSBH [15]. A study on asthma and dietary intake of fish, seaweeds, and fatty acids in Korean adults found significantly inverse associations between the consumption of fish, seaweeds, and the ratio of n3/n6 PUFA and asthma in Korean adults.

These results suggested that high consumption of fish, seaweeds, and foods rich in n3 PUFA may provide benefits to asthma. This study showed that about 19% of patients never consumed fish and, 24% of persons consumed it once a week, 57% of the patients consumed fish once a month as higher consumption lowers the symptoms severity [16]. A study reported that exercise training provides a 17% improvement in asthma-related quality of life, a 3% improvement in lung function and an additional nine symptom-free days per month. Evidence is inconsistent for the efficacy of physical activity on airway hyperresponsiveness. However, another systematic review found that physical activity can reduce airway and systemic inflammation, including reducing C-reactive protein and sputum cell counts. As asthma is an inflammatory disease, this may be a key mechanism behind which other improvements from exercise can be seen. This study showed that 24% of patients never faced difficulties in physical activity because of asthma or any allergy, while 28% of persons often faced them, and 48% of the patients did face difficulties [17].

Bronchodilators are central in the symptomatic management of asthma. It is likely that the once-daily dosing of a bronchodilator would be a significant convenience and probably a compliance-enhancing advantage, leading to improved overall clinical outcomes in patients with asthma. If lifestyle changes do not successfully prevent and control asthma symptoms, pharmacologic therapy can reduce the frequency and severity of asthma exacerbations and reverse airflow obstruction during acute attacks [18].

Most asthma medications are delivered as orally inhaled products in order to achieve local effects in the lung and to minimize systemic adverse effects. Inhaled asthma medications are categorized into two general classes: long-term control medications (also known as preventive or maintenance medications), which are taken regularly to achieve and maintain control of persistent asthma, and rapid-acting drugs (also known as rescue medications) taken as needed to provide prompt reversal of acute airflow limitation and relieve bronchospasm. The onset of action of inhaled drugs for rescue from acute bronchospasm is approximately 5–10 minutes. Rescue medications are typically short-acting β2-adrenergic agonists (SABAs), such as albuterol, but may be a long-acting beta-agonist with rapid onset of action, such as formoterol [19].

Bronchodilators provide relief of bronchoconstriction by relaxing bronchial smooth muscle and functionally enlarging the luminal diameter of the airways. This decreases airflow obstruction so that breathing becomes less labored. SABAs are delivered via wet nebulization or metered dose inhaler (MDI) [19]. MDIs may provide better clinical outcomes and fewer adverse effects than nebulizers; however, nebulizers are useful for young children, older adults, and patients who cannot use an MDI [20]. According to Sander *et al.* and his reported study, more than half (53%) of the asthma patients they surveyed. Who used an inhaled bronchodilator (N ¼ 342) and refilled their bronchodilator prescriptions more frequently than recommended in national guidelines? A bronchodilator prescription typically requires refill only a few times a year, yet almost 20% of patients reported refilling their inhaler at least once a month. The authors speculated that the excessive number of bronchodilator refills might be due, in part, to throwing away partially used inhalers to forestall the prospect of finding an inhaler empty during an acute asthma event [21].

Conclusion

The study concluded that most of the asthmatic patients who were facing symptoms at night were not using bronchodilators, while they often used inhalers twice a day due to more attacks. It was also concluded that the allergic and asthmatic patients who took the omega 3 and omega 6 supplementation showed mild improvement in their symptoms as compared to those who were not taking supplements at all.

Moreover, the patients who were consuming omega 3 and 6 from their natural food sources such as nuts, legumes, meat and dairy were seemingly facing reduced severity in their symptoms as compared to those who were not regularly consuming these sources. Most of the participants were facing severity in the symptoms during or after performing any physical activity due to asthma.

Conflict of interest

The authors declare no conflict of interest.

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