Study Effect of Supplementation of Two Types Omega 3 Fatty Acids on Lipid Profile of Asthmatics.

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Abstract

Asthma is a chronic worldwide disorder. Recent studies refer to association between asthma and major CVD incidence, which the abnormality of lipid profile is a direct indicator to this type of disease. The aim of this study is measuring the lipids levels in asthmatics and evaluates the omega 3 fatty acid effects on lowering its levels in asthmatics sera. Twenty five asthmatic patients (10 females and 15 males) were involved compared with 25 healthy controls. Serum samples analyzed for total cholesterol, triglycerides, high density lipoprotein, low density lipoprotein, and very low density lipoprotein. Before and after 3 weeks of supplementation of two types omega-3 polyunsaturated fatty acids (300mg/day) (4 weeks of follow up.) After 3 weeks of supplementation the change in levels of lipid profile.

Introduction

Asthma is a worldwide disease. It is defined as achronicinflammatory disorder of the airways. The inflammation also causes an associated increase in airway responsiveness to a variety of stimuli [1].Lungs are organs with large epithelial surface area that is at risk for oxidant-mediated attack. The tracheobronchial tree and the alveolar spaces are exposed to reactive oxidizing species in the form of inhaled airborne pollutants, tobacco smoke and product of inflammation.

Disequilibrium, either through increased oxidant stress or decrease antioxidant resources, can result in a series of pathophysiological events in the lungs that culminate in cellular death and pulmonary dysfunction [2]. It has been shown that inflammation driven by increased oxidative stress (defined as imbalance between the production of reactive oxygen species (ROS) and a biological system's ability to readily detoxify the reactive intermediates) occurs in the airways of patients with asthma[3,4]. The heart is the most susceptible of all the organs to premature aging and free radical oxidative stress. Clinical research has clearly documented the role of free radical damage and the progression of numerous degenerative diseases, particularly cardiovascular disease [5]. It has been suggested that oxidation of low density lipoproteins (LDL) by cells in the artery wall leads to a proatherogenic particle that may help initiate early lesion formation [6]. Depending on that information andother factors it was concluded that Asthma was prospectively associated with increased risk of major CVD[7].

Fatty acids (FAs) are energy-rich molecules, which play important metabolic roles. They are also an integral part of cells as membrane components, which can influence fluidity and receptor or channel function.

Dietary fat is well recognized as an important macronutrient that has major effects on growth, development and health of all animals including humans. The amount and type of fat in the diet impacts on many aspects of metabolism including lipoprotein Pathways, lipid synthesis and oxidation, adipocyte differentiation and cholesterol metabolism [8].

Omega 3 fatty acids are important in human nutrition. They are significant structural components of the phospholipid membranes of tissues throughout the body and are especially rich in the retina, brain, and spermatozoa, in which docosahexaenoic acid (DHA; 22:6 n23) constitutes 36.4% of total fatty acids (1, 2). Membrane fluidity is essential for proper functioning of these tissues. Another important feature of omega 3 fatty acids is their role in the prevention and modulation of certain diseases [9].

Dietary fish oils, which are rich in omega-3 fatty acids, have been reported to reduce plasma lipid levels in normolipidemicsubjects[10]. In in another word dietary omega 3 fatty acids have hypolipidemic properties [9].

Subjects, Materials, and Methods

Twenty five asthmatic patients (10 females and 15 males) were evaluated in this study. Diagnosis of asthma was made by a respiratory physician. The study was carried out in Baghdad Teaching Hospital.

A matching group of 25 healthy volunteer subjects (15 male and 10 female) were considered as a control group.

ω-3 polyunsaturated fatty acids supplements (particularly ecosapentanoic acid EPA and ecosahexanoic acid DHA) ordered to be consumed by patients as 1 capsule per day (300mg/day:120mgDHA and 180 mg EPA).

Samples of blood collected from patients weekly for 3 weeks, in addition to base line. Total period of observation and collecting blood samples is 4 weeks for every patient.

Each plasma sample was analyzed for total cholesterol (TC) and triglyceride (TG) which measured by enzymatic methods using kits from RANDOX (France) AND BIOMAGRAB (T unesia). Serum high-density lipoprotein (HDL) was determined by precipitation with phosphotungstate-$MgCl_2$solution followed by an enzymatic method, for determination of cholesterol in the supernatant using kits supplied by Biomaghrab Company - Tunesia. Serum Very Low Density Lipoproteins (VLDL) and Low Density Lipoproteins (LDL) were calculated by the Friedwald formula

LDL = TC - [HDL + VLDL]

LDL = TC - [HDL + TG/5]

Results & Discussion

Number and percentage (according to gender) of subjects who's involved in this study are given in Table (1).

Table (1)
Distribution of study participants according to their health status and gender.

Gender	*Study Group*					
	Asthmatic		*Control*		*Total*	
	N	*%*	*N*	*%*	*N*	*%*
Male	15	60%	15	50 %	30	60 %
Female	10	40 %	10	40 %	20	40 %
Total	25	100.0%	37	100.0%	50	100.0%

Plasma cholesterol (Ch) levels (mg/dl)

The mean (±SEM) values of plasma cholesterol levels in control and asthmatics group before and after the course of eicosapentaenoicacids and docosahexaenoic acids (EPA & DHA) supplementation are listed in Table (2).

a- Before EPA and DHA supplementation

Data in Table (2) showed that cholesterol concentration in the plasma of asthmatic group (181.02 ± 9.29 mg/dl) was significantly higher ($p< 0.01$) than that of control group (138.81 ± 7.26 mg/dl).

Similar findings were reported by Wadehra NR. etal who found that plasma cholesterol was higher in plasma of asthmatic patients compared to controls[11].

The abnormalities in lipids of blood are recorded especially cholesterolin asthmaticsfavored to raise it concentration compared to control group [11,12] what this study confirm it.

b- After EPA and DHA supplementation

The plasma cholesterol levels decrease after 3 weeks of EPA and DHA supplementation to asthmatic patients, reaching near normal level. No significant difference ($p> 0.05$) between asthmatics (mean 165.97±12.11 mg/dl) and control groups noticed after the supplementation as shown in Table (2).

The finding thatdecrease in cholesterol levels after EPA and DHA supplementationmay be indicate to success of lower plasma cholesterol which agree with the finding of Connor[13].and Sanders TAB et al[14].

Table (2)
Plasma cholesterol concentration (mg/dl) in asthmatic patients before (week 0) and after ecosapentanoic acid and docosahexanoic acid supplementation (week 3) compared to control subjects.

Study group	N	Mean	SEM	P
control	25	138.81	7.26	
Asthmatics 0	25	181.02	9.29	0.001
Asthmatics 3	25	165.97	12.11	N.S.

Plasma Triglyceride (Tg) levels (mg/dl)

The mean (±SEM) values of plasma triglyceride levels in control and asthmatics group before and after the course of eicosapentaenoic and docosahexaenoic acids (EPA & DHA) supplementation are listed in Table (3).

a- Before EPA and DHA supplementation

Data in Table (3) showed that triglyceride concentration in the plasma of asthmatic group (106.34 ± 10.13 mg/dl) was non significantly differ than that of control group (110.62 ± 9.83 mg/dl).

This finding are agree with that of Al Senaidy [15] and disagree with finding of leslely et al that report increasing in triglyceride levels [16], which may be due to heavy use steroid medication, That excluded in this study.

b- After EPA and DHA supplementation

Data in Table (3) showed that Plasmatriglyceride significantly decreased ($p<0.05$) after four weeks EPA and DHA supplementation to asthmatic patients (mean 95.33 ±10.89mg/dl).

This finding are agreed with that of Hassan K.S. etal[17], Ann C Skulas-Ray etal [18] and confirmed by systemic review done by Balk EMetal[19]. Omega-3 fatty acids elicit hypotriglyceridemic effects by coordinately suppressing hepatic lipogenesis through reducing levels of sterol receptor element binding protein-1c (SREBP-c), upregulating fatty oxidation in the liver and skeletal muscle through peroxisome proliferator-activated receptors (PPAR) activation, and enhancing flux of glucose to glycogen through downregulation of hepatocyte nuclear factor-4alpha (HNF-4alpha) [20].

Table (3)
Plasmatriglyceride concentration (mg/dl) in asthmatic patients before (week 0) and after ecosapentanoic acid and docosahexanoicacid supplementation(week 3) compared to control subjects.

Study group	N	Mean	SEM	P
Control	25	110.62	9.83	---
Asthmatics 0	25	106.34	10.13	N.S.
Asthmatics 3	25	95.33	10.89	0.05

Plasma High Density Lipoprotein (HDL) levels (mg/dl)

The mean (±SEM) values of plasma high density lipoprotein (HDL) levels in control and asthmatics group before and after the course of eicosapentaenoicacids and docosahexaenoic acids (EPA & DHA) supplementation are listed in Table (4).

a- Before EPA and DHA supplementation

Data in Table (4) showed that high density lipoprotein (HDL) concentration in the plasma of asthmatic group (35.41 ± 3.49 mg/dl) was significantly differing than that of control group (27.35 ± 0.90 mg/dl).

Similar findings were reported by Wadehra NR. etal who found that plasma HDL was higher in plasma of asthmatic patients compared to controls[11].

b- After EPA and DHA supplementation

Data in Table (4) showed that HDL concentration in the plasma of asthmatic group after three weeks EPA and DHA supplementation (28.22 ± 5.29 mg/dl) was significantly not differ than that of control group (27.35 ± 0.90 mg/dl).

Table (4)
Plasma high density lipoprotein (HDL) concentration (mg/dl) in asthmatic patients before (week 0) and after ecosapentanoic acid and docosahexanoicacid supplementation (week 3) compared to control subjects.

Study group	N	Mean	SE	P
Control	25	27.35	0.90	---
Asthmatics 0	25	35.41	3.49	0.045
Asthmatics 3	25	28.22	5.29	N.S.

Plasma Low Density Lipoprotein (LDL) levels (mg/dl)

The mean (±SEM) values of plasma low density lipoprotein (LDL) levels in control and asthmatics group before and after the course of eicosapentaenoic and docosahexaenoic acids (EPA & DHA) supplementation are listed in Table (5).

a- Before EPA and DHA supplementation

Data in Table (5) showed that low density lipoprotein (LDL) concentration in the plasma of asthmatic group (140.16 ± 12.09mg/dl) was significantly differing than that of control group (89.45 ± 6.83mg/dl).

b- After EPA and DHA supplementation

Data in Table (5) showed that LDL concentration in the plasma of asthmatic group after three weeks EPA and DHA supplementation (119.46 ± 14.95 mg/dl) was significantly differing than that of control group (89.45 ± 6.83mg/dl), although its lower than that of asthmatic before supplementation.

The lowering levels of LDL are agreed with finding of Harris et al [21].

Reductions in the plasma concentrations of LDL in human subjects consuming diets rich in long-chain omega-3 fatty acids from fish oils or omega-6 fatty acids from vegetable oils may be due to a reduction the hypocholesterolemic effects of long-chain omega-3 fatty acids present in fish oils results from a reduction in the rate of LDL apoprotein B synthesis [22].

Table (5)
Plasma Low density lipoprotein (LDL) concentration (mg/dl) in asthmatic patients before(week 0) and after ecosapentanoic acid and docosahexanoic acid supplementation (week 3) compared to control subjects.

Study group	N	Mean	SEM	P
Control	25	89.45	6.83	---
Asthmatics 0	25	140.16	12.09	0.001
Asthmatics 3	25	119.46	14.95	0.046

Plasma Very Low Density Lipoprotein (VLDL) levels (mg/dl)

The mean (±SEM) values of plasma Very low density lipoprotein (VLDL) levels in control and asthmatics group before and after the course of eicosapentaenoic acid and docosahexaenoic acids (EPA & DHA) supplementation are listed in Table (6).

a- Before EPA and DHA supplementation

Data in Table (6) showed that very low density lipoprotein (VLDL) concentration in the plasma of asthmatic group (20.83 ± 2.07mg/dl) was significantly not differing than that of control group (22.01 ± 1.99 mg/dl).

b- After EPA and DHA supplementation

Data in Table (6) showed that VLDL concentration in the plasma of asthmatic group after three weeks EPA and DHA supplementation (19.07 ± 2.18 mg/dl) was significantly not differing than that of control group (22.01 ± 1.99 mg/dl).

Table (6)
Plasma Very Low density lipoprotein (VLDL) concentration (mg/dl) in asthmatic patients before(week 0) and after ecosapentanoic acid and docosahexanoicacid supplementation (week 3) compared to control subjects.

Study group	N	Mean	SEM	P
Control	25	22.01	1.99	---
Asthmatics 0	25	20.83	2.07	N.S.
Asthmatics 3	25	19.07	2.18	N.S.

Asthma was prospectively associated with increased risk of major CVD. [23].which this study refers to it by recording some

abnormality in lipid profile of asthmatics involved here. The omega 3 using was success to lowering the serum lipid levels which lead to conclude the benefit of these fatty acids in reduces the CVD risks.

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تخفيض مستوى الدهون في مصل مرضى الربو مما يؤدي الى تقليل مخاطر التعرض لامراض القلب الناتجة عنها.

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الخلاصة

يعتبر مرض الربو من الامراض الالتهابية واسعة الانتشار. تشير البحوث الاخيرة الى ترافق هذا المرض مع خطر الاصابة بامراض القلب والتي يكون فيها عدم الانتظام في صورة الدهون هو مؤشر اساسي لحدوث هذا النوع من الامراض. تشير الدراسات الى ان الاحماض الشحمية نوع اوميغا ٣ ربما تكون لها تاثيرات مخفضة للدهون. هدف الدراسة: قياس مستوى الدهون في مرضى الربو واستخدام الدهون الشحمية غير المشبعة نوع اوميغا-٣ لتبيان مدى تاثيرها في تخفيض مستويات الدهون في مصل مرضى الربو. شارك في هذه الدراسة خمسة وعشرون (١٠ إناث و ذكور ١٥) من مرضى الربو مقارنة مع ٢٥ الاصحاء كمجموعة سيطرة. تم قياس الكولسترول والشحوم الثلاثية والبروتين الدهني عالي الكثافة والبروتين الدهني واطيء الكثافة والبروتين الدهني جدا واطيء الكثافة في مصلا لمشاركين قبل وبعد ٣ أسابيع من استعمال نوعين أحماض أوميغا ٣ الدهنية المتعددة غير المشبعة (300mg/day) (اربعة اسابيع متتالية). بعد ٣ أسابيع من استعمال هذه المركبات كان التغير في صورة الدهون في مصل مرضى الربو واضحا ومقاربا للمستويات التي في مجموعة السيطرة. هذه النتائج تشير إلى مدى قدرة هذه الاحماض الشحمية على