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## Daily Consumption of Marjoram Oil Improve the Health Status of Patients with Asthma

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**Abstract:** Folk medicine claims that some foods can improve the health status of patients with asthma, examples being marjoram and lettuce seeds oils. The present study aimed to investigate the effect of these oils on asthma outcome. A sample of thirty patients with asthma (15 females and 15 males) aged  $42.6 \pm 1.84$  years was chosen from outpatient clinics of Tanta University Hospital, Egypt. All patients were diagnosed according to lung functions, blood variables, and clinical signs as being asthmatic. The patients were randomly divided into three equal groups; control group (CG); marjoram group (MG), who received two drops of marjoram oil daily; lettuce group (LG), who received 5 ml of lettuce seeds oil daily. The supplementation continued for three consecutive months. Lung functions (forced vital capacity (FVC), maximum voluntary ventilation (MVV), and peak expiratory flow rate (PEFR) were measured at baseline and after the supplementation. Blood eosinophilic cell counts and IgE concentration were also determined at baseline and after 3 months of supplementation. The results revealed that the majority of subjects were of intermediate socio-economic status (53.3%), and had suffered from asthma for  $14.6 \pm 6.3$  years. FVC increased significantly ( $P < 0.001$ ) after the supplementation for all groups particularly for MG. On the other hand, MVV increased significantly ( $P < 0.001$ ) for MG (by 7.34%) and LG (by 2.63%), while it decreased by 4.3% for CG. Moreover, PEFR increased significantly for all groups, the highest increment being for CG (9.4%). Eosinophilic cell counts decreased significantly for all subjects, particularly for MG (-42.7%) as compared with CG and LG (-19.7% and -21.9% respectively). Finally, the IgE concentration decreased significantly ( $P < 0.001$ ) to normal levels for MG and LG. In conclusion, data suggests that administration of marjoram oil at a safe dose (two drops daily) was effective in improving the health and lung functions of adult patients with asthma.

**Key words:** Marjoram, lettuce, oil, asthma, IgE

### Introduction

The word asthma is derived from the Greek *aazein*, meaning "sharp breath, Hippocrates was the first to use it in reference to the medical condition in 450 BC (Wikipedia, the free encyclopedia [Asthma] <http://www.wikipedia.com>)

Asthma is a condition in which the air passages become sensitive and narrow, making it hard to breath. It can cause wheezing, coughing, tightness in the chest, and shortness of breath, (Akbari *et al.*, 2003).

Asthma prevalence has increased dramatically in many countries over recent decades, demonstrating that environmental exposures play a dominant role in the etiology of this disease (Tricia and John, 2004).

The fundamental problem in asthma appears to be immunological. In 1968 Andor Szentivanyi first described The Beta Adrenergic Theory of Asthma; in which blockage of the Beta-2 receptors of pulmonary smooth muscle cells causes asthma. In 1995 Szentivanyi and colleagues demonstrated that IgE blocks beta-2 receptors. Since overproduction of IgE is central to all atopic diseases (Szentivanyi *et al.*, 1993)

Moreover, the inflammatory response in asthma is

responsible for the clinical manifestations of an asthma attack. The treatment based on reducing IgE concentration and inflammation response; hence prevent the swell, narrowing, and mucous production of the airway ducts (AAFA, 2004).

Some foods or nutrients like omega 3 fatty acids can prevent the mechanism of asthma attack. Also, the folk medicine uses oils of marjoram (*Origanum majorana* L.) and lettuce (*Lactuca sativa* L.) in treatment of asthma. According to Yazdanparast and Shahriyary (2008) marjoram are used as blood anti-coagulator in Iranian folk medicine, the observations of the same researchers provide the basis for the traditional use of these herbs in treatments of cardiovascular diseases and thrombosis. Moreover, El-Ashmawy *et al.* (2007) found that marjoram oil has antioxidative properties and may be useful herbal remedies, especially for controlling oxidative damages. The results of a study carried out by Rau *et al.* (2006) provide a possible rationale for the traditional use of many herbs as antidiabetics.

Lettuce belongs to the Compositae (sunflower or daisy family). *Lactuca sativa*. It is an annual plant native to the Mediterranean area. Cultivation may have started as

early as 4500 BC, perhaps initially for the edible oil extracted from its seeds. Salad lettuce was popular with the Ancient Greeks and Romans (Wikipedia, the free encyclopedia [Asthma] <http://www.wikipedia.com>).

Although several studies proved that lettuce as a vegetable has a positive effect on human health and work as antioxidant (Paolino *et al.*, 2005), there is no data about the effects of its oils on human health.

So this study aimed to find out the effect of marjoram and lettuce oils on outcome of asthma and IgE concentrations among a sample of adults males and females who suffer from asthma.

### Materials and Methods

This study was carried out on 30 asthmatic patients (15 man and 15 women), their age ranged from 40 to 48 years old, they were chosen from out-patients clinic of Tanta University Hospital, Al Gharabia Governorate, Egypt.

#### Inclusion criteria

- 1 Age from 40 to 50 years old.
- 2 Had bronchial asthma (mild, moderate or severe).

#### Exclusion criteria

- 1 Chronic illness like nephritic syndrome or cardiac lesion.
- 2 Acute illness like pneumonia or bronchitis.
- 3 Disabilities or handicaps.
- 4 Infectious diseases (like tuberculosis).

**Oils:** Seeds of lettuce and marjoram herb were purchased fresh from Ministry of Agriculture, Cairo, Egypt. Then the oils were extracted in the Labs of National Nutrition Institute, Ministry of Health, Cairo, Egypt according to the method given by Scheffer *et al.* (1977).

**Study design:** All patients with inclusion criteria were enrolled in this study and received the suggested supplementation; they were divided into 3 equals groups (10 for each group) as follows:

- a Control group (CG): in whom patients received their medical treatment only without any dietary supplementation along the trial.
- b Marjoram oil group (MOG): in whom patients received their medical treatment plus 2 drops/marjoram oil daily;
- c Lettuce oil group (LOG): in whom patients received their medical treatment plus 5 ml/lettuce oil daily.

Each patient received suggestive supplementation for consecutive 12-weeks.

**Ethical consideration:** All patients were informed about the study, objectives, and procedures.

**Pulmonary functions:** This was carried out by chest specialists at out-patients' clinic under supervision of Prof. Dr. Ali Hassan the head of chest dept., Faculty of Medicine, Tanta University. It involves several testes that measure lung volumes and capacities, gas flow rates, gas diffusion, and distribution. The following tests were carried out at baseline and after supplementation.

- a Forced vital capacity (FVC), measured according to Watters *et al.* (1986).
- b Forced expiratory volume in 1 second (FEV1) measured according to Strumpf *et al.* (1981).
- c Maximum voluntary ventilation (MVV) measured according to Crofton (1981).
- d Peak expiratory flow rate (PEFR) measured according to Crofton and Douglas (1981).

**Laboratory investigations:** Complete blood count (CBC) including; RBCs count, Hb, PCV, WBCs, lymphocyte, and IgE were determined at baseline and after supplementation

**Follow-up:** All patients were kept under observation by regular meetings every week to assure and giving them the suggested amounts of oils.

**Socioeconomic data:** Include, age, sex, residency, family size, education, job, number of rooms, and the socioeconomic level that calculated according to Al Shakhs (1995).

**Statistical analysis:** Paired sample t-test used for verifying differences between mean $\pm$ SD values before and after supplementation.

### Results

The general characteristics of studied patients presented in Table 1 showed that the mean age for subjects was 42.5 $\pm$ 2.0 years, while their monthly income was 389.3 $\pm$ 101.3 pound, and per capita was 88.5 $\pm$ 48.6 pound/month. Most of them (66.7%) were from rural areas, while the majority (93.3%) was married. Moreover, Most of patients were got either high education (36.7%) or university (26.7%) certificates; on the other hand about one fourth were illiterate. Like Egyptian families, the family size of the majority (70.0%) was composed of 4 to 6 persons, and the crowded rate was 2.1 $\pm$ 0.7 person/room. The majority (53.3%) of studied patients were from intermediate socioeconomic class, while 33.3% was from low class. Finally, still 13.3% of subjects were smoke cigarettes and 13.3% was smoke cigarettes and narghile.

The dietary supplementation resulted in slight improvement in lung functions, as shown from Table 2 the forced vital capacity (FVC) improved significantly ( $P < 0.001$ ) after dietary supplementation, but the highest

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Table 1: General Characteristics of Studied Subjects

Sex	Female	15 (50.0%)
	Male	15 (50.0%)
Age (yr) (mean±SD)		42.5±2.0
Family income (pound/month) (mean±SD)		389.3±101.3
Per capita (pound/month) (mean±SD)		88.5±48.6
Residency	Rural	20 (66.7%)
	Urban	10 (33.3%)
Marital status	Divorced	1 (3.3%)
	Widowed	1 (3.3%)
	Married	28 (93.3%)
Education level	Illiterate	7 (23.3%)
	Primary	3 (10.0%)
	Secondary	1 (3.3%)
	High education	11 (36.7%)
	University	8 (26.7%)
Family Size	Less than 4 person	5 (16.7%)
	4 to 6	21 (70.0%)
	More than 6	4 (13.3%)
Crowded ratio (mean±SD)		2.1±0.7
Socioeconomic class	Low class	10 (33.3%)
	Moderate	16 (53.3%)
	High	4 (13.3%)
Smoke type	None	22 (73.3%)
	Cigarettes	4 (13.3%)
	Cigarettes & Narghile	4 (13.3%)

Table 2: Lung Functions of Asthmatic Subjects at Baseline and after 3 months of Dietary Supplementation

		CG (n=10)	MOG (n=10)	LOG (n=10)
		Mean±SD	Mean±SD	Mean±SD
FVC (milliliter)	Baseline	3.5±0.5	3.6±0.4	3.4±0.4
N: 4.600 milliliter	After 3 mo	3.6±0.5	3.9±0.4	3.5±0.5
	Mean Diff.	0.1***	0.3***	0.1***
FEV1 %	Baseline	73.7±6.8	73.7±6.8	71.1±7.2
N: More than 75%	After 3 mo	76.4±7.7	77.8±5.4	74.1±5.5
	Mean Diff.	2.7**	4.1***	3.0***
MVV (%)	Baseline	73.6±6.6	73.1±6.4	72.0±9.0
	After 3 mo	75.5±7.4	77.6±5.7	75.1±7.2
	Mean Diff.	1.9*	4.5***	3.1***
PEFR %	Baseline	77.2±9.1	75.5±8.1	75.0±9.0
N: More than 80%	After 3 mo	80.3±9.9	84.9±5.6	78.2±8.5
	Mean Diff.	3.2***	9.4***	3.2***

CG: control group, MOG: Marjoram oil group, and LOG: Lettuce oil group. FVC: Forced vital capacity, FEV1: Forced expiratory volume in 1 second, MVV: Maximum voluntary ventilation, and PEFR: Peak expiratory flow rate. N: Normal values Obtained from Pinnock and Shah (2007). Significance difference between values at baseline and after 3 months calculated by paired sample t-test.

\*\* P<0.01, and \*\*\* P<0.001. Mean Diff. : Mean difference between values at baseline and after supplementation.

increment (+8.3%) was among MOG (changed from 3.6±0.4 to 3.9±0.4 milliliter), however it didn't reach to the normal values (4.6 milliliter). Simultaneously, the percentage of forced expiratory volume in 1 second (FEV1%) improved significantly and reached to the normal value (> 75.0%) among all studied groups, but the highest increments were among MOG (+4.1% at P<0.001) and LOG (+3.0% at P<0.001), moreover it increased significantly (P<0.01) among CG by 2.7%.

Regarding, the maximum voluntary ventilation (MVV) the results of the same Table 2 showed that it increased significantly among MOG (by 4.5% at P<0.001), followed by LOG (by 3.1% at P<0.001), and CG by (by 1.9% at P<0.05), however, these values satisfied only three fourth of normal values. Finally, the percentage of peak

expiratory flow rate (PEFR) the results indicated that dietary supplementation resulted in improvement of it especially among MOG in whom the PEFR increased by 9.4% and changed from 75.5±8.1 to 84.9±5.6% at P<0.001 and reached to the normal value (> 80.0%), although the PEFR among CG and LOG increased after dietary supplementation (by 3.2% and 3.2% respectively) but it still somehow on the borderline of normal values. Table 3 revealed that hemoglobin concentration among all patients with asthma in this study were lower than 10 g/dL, which in turn showed that these patients suffer from iron deficiency anemia, however, the dietary supplementation resulted in significant increase of hemoglobin among all groups, where it increased by 1.1 g/dl at P<0.01 among CG; 1.6 g/dl at P<0.001 among

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Table 3: Hematological indices of Asthmatic Subjects at Baseline and after 3 months of Dietary Supplementation

		CG (n=10)	MOG (n=10)	LOG (n=10)
		Mean±SD	Mean±SD	Mean±SD
Hb (g/dL) N: 14:17.5	Baseline	9.1±1.2	9.2±1.3	8.8±1.5
	After 3 mo	10.3±1.0	10.8±1.0	10.3±0.6
	Mean Diff.	1.1**	1.6***	1.6**
PCV % N: 41.5:50.4	Baseline	26.4±0.4	26.1±0.4	26.3±0.6
	After 3 mo	27.1±0.3	28.8±1.2	27.9±0.5
	Mean Diff.	0.7**	2.7***	1.6***
RBCs (10 <sup>12</sup> /L) N: 4.5:5.9	Baseline	3.7±0.3	3.7±0.3	3.6±0.4
	After 3 mo	4.0±0.3	4.1±0.3	3.8±0.4
	Mean Diff.	0.2**	0.4***	0.2**

CG: control group, MOG: Marjoram oil group, and LOG: Lettuce oil group. N: Normal values obtained from Henry (2004)

Significance difference between values at baseline and after 3 months calculated by paired sample t-test. \*\* P<0.01, and \*\*\* P<0.001  
Mean Diff.: Mean difference between values at baseline and after supplementation.

MOG; and 1.6 g/dl at P<0.01 among LOG, but still lower than normal values. Moreover, the values of both RBCs and PCV were lower than normal values and the dietary supplementation - although it increased it significantly among all groups - didn't elevate it to normal values.

From Table 4 it was clear the dietary supplementation MOG resulted in the highest decrement of leucocytes (from 12.6±0.5 to 11.3±0.6 10<sup>3</sup>/μl at P<0.001), followed by LOG (from 12.4±0.8 to 11.4±0.8 10<sup>3</sup>/μl at P<0.001), and finally CG (from 12.5±0.5 to 11.8±0.5 10<sup>3</sup>/μl at P<0.01), however, all values didn't reach to the maximum range of normal values. Although, the mean values of lymphocyte were in the normal range, but it was close to the upper limit of normal, however, still the marjoram oil has the best effect, where the lymphocyte decreased significantly among all groups after dietary supplementation, but the highest decrement was among MOG (from 4.6±0.05 to 4.2±0.13 10<sup>9</sup>/L at P<0.001), then LOG (from 4.5±0.08 to 4.3±0.11 10<sup>9</sup>/L at P<0.001) and CG (from 4.5±0.08 to 4.3±0.17 10<sup>9</sup>/L P<0.01).

In this study the eosinophil level was higher than normal values at baseline, but after three months of dietary supplementation it moved into the worm zone of normal range. As shown from Table 4, and again the supplementation with marjoram oil had the best effect, where eosinophil count decreased (- 42%) among MOG significantly from 0.57±0.12 to 0.33±0.09 10<sup>9</sup>/L at P<0.001, also, it decreased significantly among LOG and CG (from 0.56±0.21 to 0.43±0.16 10<sup>9</sup>/L at P<0.01 and from 0.61±0.13 to 0.47±0.13 10<sup>9</sup>/L at P<0.001 respectively) but still close to the maximum range of the normal values.

Simultaneously, marjoram oil still had the best effect, where, the immunoglobulin E (IgE) decreased significantly among MOG and LOG after dietary supplementation by about 31.0% (P<0.001), also, it decreased among CG significantly by about 12,5% (P<0.001).

### Discussion

In comparison with lettuce oil, the dietary supplementation with marjoram oil resulted in the highest and significant improvement in lung functions,

where the forced vital capacity (FVC), forced expiratory volume in 1 second (FEV<sub>1</sub>), maximum voluntary ventilation (MVV), peak expiratory flow rate (PEFR) improved after regular consumption of marjoram oil for three months.

Moreover, the dietary supplementation with marjoram oil resulted in the highest decrement of leucocytes, lymphocytes, eosinophils, and immunoglobulin E (IgE). The favorable and positive effects of marjoram oil on health status of asthmatic patients can be explained by one or more of the following mechanisms.

The marjoram oil contains some compounds known to have medicinal and curative properties (terpineol, geraniol, ugeineol, and leinaleol) as mentioned by Yazdanparast and Shahriyari (2008). Also, some studies found that marjoram oil have antioxidative activity and can protect human body from free radicals (El-Ashmawy *et al.*, 2007)

The asthma diseases characterized by different abnormalities and one of them is elevated white blood cells counts and differential, so the treatment objectives is to reduce its concentrations (Maddox and Schwartz, 2002). Marjoram oil with its antimicrobial properties may reduce the production of white blood cells and its differential (Leeja and Thoppil, 2007).

The elevated level of eosinophils is an important indicator for occurrence of asthma (Zhao *et al.*, 2002), marjoram oil may decrease it and therefore improve health status of asthmatic patients.

Asthma may occurred through infections, and marjoram oil known to act as antimicrobial as mentioned by Leeja and Thoppil (2007)

Some allergen may inhaled and cause asthma, then the humoral immune system produces antibodies (especially IgE) against that inhaled allergen. Later, when an asthmatic inhales the same allergen, the antibodies "recognize" it and activate a humoral response. Inflammation results: chemicals are produced that cause the airways to constrict and release more mucus, and the cell-mediated arm of the immune system is activated. The inflammatory response is responsible for the clinical manifestations of an asthma attack (Szentivanyi *et al.*, 1993). Marjoram oil may prevent

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Table 4: Concentrations of White Blood Cells and its Differential (Eosinophil and Lymphocytes) and Immunglobulin E (IgE) at Baseline and after 3 Months of Dietary Supplementations

		CG (n=10)	MOG (n=10)	LOG (n=10)
		Mean±SD	Mean±SD	Mean±SD
Leucocyte (103/ $\mu$ l) N: 4.4:11.0	Baseline	12.5±0.5	12.6±0.5	12.4±0.8
	After 3 mo	11.8±0.5	11.3±0.6	11.4±0.8
	Mean Diff.	-0.7**	-1.3***	-1.0***
Lymphocyte (109/L) N: 1.0:4.8	Baseline	4.5±0.08	4.6±0.05	4.5±0.08
	After 3 mo	4.3±0.17	4.2±0.13	4.3±0.11
	Mean Diff.	-0.20**	-0.37***	-0.22***
Eosinophil (109/L) N: 0:0.45	Baseline	0.61±0.13	0.57±0.12	0.56±0.21
	After 3 mo	0.47±0.13	0.33±0.09	0.43±0.16
	Mean Diff.	-0.13***	-0.24***	-0.13**
IgE (mg/dL) N: 0.1: 0.4	Baseline	0.32±0.06	0.29±0.06	0.31±0.07
	After 3 mo	0.28±0.07	0.20±0.04	0.22±0.07
	Mean Diff.	-0.04***	-0.09***	-0.09***

CG: control group, MOG: Marjoram oil group, and LOG: Lettuce oil group. N: Normal values obtained from Henry (2004)

Significance difference between values at baseline and after 3 months calculated by paired sample t-test. \*\* P<0.01, and \*\*\* P<0.001  
Mean Diff.: Mean difference between values at baseline and after supplementation.

the severity of inflammation through reducing the concentration of white blood cells responsible for inflammation as observed in Table 4.

**Conclusion:** The administration of marjoram oils in a save dose (2 drops daily) was effective in improving health and lung functions among adult patients with asthma. Also, the results of this study indicate the necessity of prolonged studies with emphasize on isolation of active ingredients from this oil and study its health benefits.

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