

Effect of Omega's different sources supplementation on some biological assessments and mental efficiency at adolescence

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ABSTRACT

Food plays an important role in influencing the students' learning behavior and achievement through a few basics. This study aimed to improve nutritional status (especially hemoglobin and lipid profile) and developing the mental efficiency (especially perception, remembering and attention) in adolescence using various rich sources of omegas (3, 6 and 9). Also, to compare the effectiveness of natural food sources with the medical supplements of them. Forty eight adolescents (12-15 yrs) with institutionalized nutrition were subjected and divided to 3 groups (each of 16; 8 M & 8 F). The first group was served as control, while the second and the third ones were enriched and supplemented equally with natural and medical sources of omegas for three consecutive months. Nutritional assessment was also surveyed for the subjects (24 hrs. recall for three continuous days). Biological analysis for Hb, AST, ALT, TG, TC, HDL-C, LDL-C and VLDL-C had been taken place pre and post supplying intervention. Psychological test was applied also pre and post supplying intervention to assess the perception, attention and remember for them.

Results showed that both kinds of intervention increased significantly ($p \leq 0.01$) Hb and HDL-C, while decreased significantly ($p \leq 0.01$) ALT, AST, TG, TC, LDL-C, VLDL-C in serum of the studied adolescents. On the other hand, psychological test revealed significant development statistically ($p \leq 0.01$) after three months of interventions comparing with the control group or even with the pre test assessment.

In conclusion: supplementation with natural or medical omegas for adolescence could improve the mental efficiency (especially perception, attention, remember) after three months without discrimination for the source used.

key words : Omega, nutrition, supplementation, mental efficiency, perception, attention, remember, adolescence.

INTRODUCTION

Long-chain polyunsaturated fatty acids (PUFAs) fall into two main families: omega-3 and omega-6. Omega-3 PUFAs are derived from fish and some plants, whereas omega-6 PUFAs are derived mainly from vegetable oil. Omega 3 fatty acids is a group of unsaturated fatty acids and is important for many functions in the human body. These acids are found in foods, fatty fish and oysters, and some are found in vegetable oils and are also available in the form of dietary supplements (Covington, 2004).

The principal precursors of omega-3 and omega-6 PUFAs can not be endogenously synthesized from carbohydrates (Mazza *et al.*, 2007). Thus, the source of α -Linolenic acid (ALA) with 18 carbons, 3 double bonds, the first located at the third carbon from the last (ω) (18:3: ω 3), and Linoleic acid (LA-18:2 ω 6), are entirely nutritional. ALA is converted in the body to Eicosapentaenoic acid (EPA-20:5: ω 3), and Docosahexaenoic acid (DHA-22:6: ω 3) comprising the omega-3 group. Similarly, LA is converted to Arachidonic acid (AA-20:4: ω 6), representing the omega-6 group.

The conversion of the precursors to omega 3/6 acids is performed by an enzymatic system of elongation and desaturation which is responsible for the steady state ratio of $\omega 3/\omega 6$, vital for normal membrane fluidity. The specific concentrations of omega-3 and omega-6 PUFAs in blood or cell membranes reflect dietary intakes (Gadoth, 2008).

Fat is 15-30% of the dry weight of the brain and is essential for the growth of brain function. It was noted that the low level of fatty acids, especially omega-3 in the blood is linked to a range of behavioral disorders, including attention deficit and hyperactivity. The physical and behavioral symptoms of the lack of essential fatty acids are similar to those of attention deficit disorder and hyperactivity. Therefore, it is conceivable that omega-3 deficiency or dysfunctions of fatty acids may contribute to symptoms in patients with attention deficit disorder and hyperactivity (Antalis *et al.*, 2006; Mcnamara and Carlson, 2006; Germano *et al.*, 2007; Sorgiet *al.*, 2007).

Omega-3 and Omega-6 fatty acids are important components of cell membranes and act on cell wall permeability. Omega-3 fatty acids also act on the prevention of heart disease and have anti-inflammatory effects that may be important in other diseases. There is increasing interest in the role of omega fatty acids 3 in the prevention of diabetes and certain types of cancer (Lunn *et al.*, 2006)

There are many cognitive processes in human, first of them is attention, it is one of the most important cognitive processes in cognitive psychology. The attention process is the main input to all cognitive processes that take place within the system, such as reading comprehension, linguistic comprehension, auditory and visual perception, memory and learning. The second one is perception, it is the process by which we organize, interpret and make sense of the patterns of stimuli. The term

cognition in psychology is used to refer to the direct knowledge of the world and to our bodies because of neurological signals from the sensory organs of the eye, ear, nose, tongue and skin. The last one is remembering, the process of remembering is a series of efforts aimed at the whole range of treatments carried out by the person remembered from the moment to the end of the task of perception. This means preparing a subject for gradual introduction into long-term memory, and retaining it for its next retrieval (محمد ناجي سعد 2007)

Adolescence is the second important stage after the infant phase due to the similar rapid growth in each. Therefore, special nutrition recommendations are required in all nutrients to meet the needs and requirements for growth. Early adolescence begins with rapid growth in both sexes and begins in females early than age 9. - 11 years and up to 14 years, either in males from 11 to 13 years and up to 16 years (ايڤيلين سعيد 2005)

Adolescence is characterized by the growth of all mental functions, where the adolescent reaches about 95% of his intelligence and mental abilities are directed towards accuracy as the speed of achievement and grow memory. Mental growth requirements at this stage include: Considering individual differences in capacity. Attention to mental abilities and innovation in adolescents. Exploiting the level of ambition among adolescents. The diversity of courses and methods to agree with the differences of the adolescents in the capacity (حامد عبد السلام زهران 2005).

The aim of this research is to study the effect of supplementation with different sources of omega on the nutritional status and mental efficiency in adolescence. Through the following sub-goals:

1. Improve nutritional status, especially hemoglobin and lipid profile in adolescence using various sources rich in omega.

Effect of Omega's different sources supplementation on some biological assessments and mental efficiency at adolescence

2. Developing the mental efficiency, especially perception, remembering and attention in adolescence, using various sources rich in omega.
- 3 – Comparing the effectiveness of natural or medical sources of omegas on the nutritional status or mental efficiency.

MATERIALS AND METHODES

The study included 48 adolescence (24male) from " Dar elamel", " Hadayek Al-Kobba " and (24 female) from " el shraiaa " , " EL Matria " , Cairo , Egypt their age ranged from 12 – 15 years .Demographic data, Dietary assessment had been complied. The subjects were divided into three groups randomly.

Group 1 controls(n=16): Consists of 8 males and 8 females.

Group 2 (n=16): Consists of 8 males and 8 females who were given natural food sources for omegas 3,6,9 equally with the capsules content.

Group3 (n=16): Consists of 8 males and 8 females who were given pharmacological supplements for omega three capsules per day.

All groups were subjected to the following pre- and post- nutrition intervention:

1-Demographic data: name, sex, height, weight.

2- Nutritionalassessment:

2.A- Anthropometric measurements:

The Quetelet index relates weight (kg) to the square of the height (m²), which enables calculation of body mass index (BMI) (Dwyer, 2006) It predicts disease risk in those termed underweight and in those who are obese. The World Health Organization categorizes underweight as BMI, 18.5, normal 18.5 to 24.9, overweight 25 to 29.9 and obese 30 to 39.9, and extreme obesity40 (WHO, 1995).

3-Blood sampling :

The blood samples were immediately collected from fore arm

(cubital fossa) before and after dietary intervention from adolescent,each blood sample was divided into two portions , the first portion was taken on EDTA for blood haemoglobin estimation , while the second portion was left to clot in clean dry test tubes and then centrifuged at 3000 r.p.m for 15 min to separate the serum which was kept at -20 °c for biochemical analysis.

4-Biochemical investigation :

Investigations were performed to study the changes in lipid patterns including , triglyceroles (TG) , total cholesterol (TC) , HDL-c , LDL-c , VLDL-c , serum enzymes including amino trans ferases (AST , ALT) .Blood hemoglobin concentrationwas determined using commercial kit according to the method described by (Drabkin & Austin 1932). Also, serum AST & ALT activity were determined using a commercial Kit according to the method described by Reitman and Frankel (1957). For lipid profile assessment serum triglyceride was determined according to the method of Koditscheck & Umdreit, 1969). Also, serum total cholesterol was determined according to the method of Richmond (1973). Serum LDL-cholesterol was determined according to the method of Levy (1981), while serum HDL-cholesterol was determined according to the method of Burstein (1970) and serum VLDL-cholesterol was determined according to the modification of the method of Wieland and Seidel (1983). The total fatty acids were transmethylated according to the method of Stahl (1967).

5- Psychological tests:

Battery diagnostic scale assess nine variables perception , attention, memory, reading, mathematics and writing. Each variable consists of twenty questions and information is taken by the supervisors.

Supplements:

Flax seed oil gelatin capsules (three times per day). Each capsule contains flax seed oil 1000 mg.

Alpha Linolenic Acid (omega 3) 1713 mg.

Linoleic Acid (omega 6) 477 mg.

Oleic Acid (omega 9) 531 mg.

Dietary intervention:

Mahlbia with walnuts (30 gm day after day) . It contains omega 3 (1710 mg), Omega 6 (460 mg), Omega 9 (500 mg).

Sesame cooked as sweet (one piece 50 gm day after day). It contains Omega 3 (1715 mg), Omega 6 (475 mg), Omega 9 (532 mg).

Adolescent were subjected to the institutionalized nutrition before and with the intervention as follow :

Group 1 : institutionalized nutrition only.

Group 2 : institutionalized nutrition with swsame and mahlbia with nuts .

Group 3 : institutionalized nutrition with three capsules of flax seed oil / day.

All groups were submitted to this intervention for three months continuously.

Statistical Analysis:

Statistical analysis was carried out using T-test , Anova and Duncan's multiple. Continuous data were reported as mean \pm SD. Repeated-measures analysis of variance was used for intergroup comparisons of continuous data. Pairwise comparisons were performed with Bonferroni adjustment if analysis of variance was significant. In all tests, results were considered statistically significant if the *P*-value was equal or less than 0.05. The analysis was carried out using the PROC ANOVA procedure of Statistical Analysis System (SAS, 2006).

RESULTS AND DISCUSSION**1. Demographic Characteristics:**

As shown in Table (1) the present study included 48 adolescents; 24 males from " Dar Elamal ", "Hadayek Al-Kobba ", Cairo, Egypt, with mean age 13.25 ± 1.11 yrs, mean height 138 ± 6.40 cm and mean weight 36.83 ± 6.04 kg. and 24 females from " ElShraiaa ", " EL-Matriaa ", Cairo, Egypt, with mean age 13.5 ± 1.10 yrs, mean height 140 ± 8.56 cm and mean weight 38.92 ± 7.69 kg.

Table (1): Demographic and Characteristics of the subjected adolescents:

Demographic data		Male (n=24)	Female (n=24)
Age(yrs)	Range	12:15	12:15
	Mean \pm SD	13.25\pm1.11	13.5\pm1.10
Height(Cm)	Range	130:150	120:155
	Mean \pm SD	138\pm6.40	140\pm8.56
Weight(Kg)	Range	30:45	31:52
	Mean \pm SD	36.83\pm6.04	38.92\pm7.69

*SD: Standard Division.

2- Nutritional assessment:

The nutritional status of the sample was assessed by measuring the height, weight, and body mass index, as well as the food intake of nutrients by 24 hours recall for three days and calculating the average on this basis. Laboratory analysis of the blood sample was performed to

confirm the nutritional status assessment; Hemoglobin (Hb.), HDL-c, LDL-c, VLDL-c, TG, TC, ALT, AST.

2-a. Anthropometric measurements:

As illustrated in Table (2), the mean heights for male and female weres 138 ± 6.40 cm and 140 ± 8.56 cm comparing

Effect of Omega's different sources supplementation on some biological assessments and mental efficiency at adolescence

with calculated normal heights 140 ± 7.5 cm and 135 ± 15.3 cm, respectively. The mean weights for adolescent male and female were 36.83 ± 6.04 kg and 38.92 ± 7.69 kg comparing with calculated

normal weights 35.8 ± 6 kg and 37.25 ± 5.20 kg respectively. Also, the mean values of BMI for male and female were 23.45 ± 1.02 , 23.75 ± 1.43 , respectively.

Table (2). Anthropometric measurements of the subjected adolescents.

Anthropometric measurements		Male (n=24)	Female (n=24)
Height(Cm)	Mean \pm SD	138 \pm 6.40	140 \pm 8.56
	Normal	140 \pm 7.5	135 \pm 15.3
Weight(Kg)	Mean \pm SD	36.83 \pm 6.04	38.92 \pm 7.69
	Normal	35.8 \pm 6	37.25 \pm 5.20
BMI	Mean \pm SD	23.45 \pm 1.02	23.75 \pm 1.43

SD: Standard Division.

The index of body mass:

Under weight : (<18.5), Over weight:(25 – 29.9), Extreme obesity (< 40)

Normal :(18.5 – 24.9), Obese:(30 – 39.9).

There was a statistically significant difference between pre- and post-intervention for Hb., ALT, AST at $p < 0.01$ in nutritional and medical groups. These improvements were attributed to the dietary intervention with omega's different sources. As showed in Table (3) the mean

values of Hb were 12.04, 12.03 g/dl for control group pre-post intervention, respectively, while in nutritional group were 12.7, 14.5 g/dl pre-post, respectively, and in medical group were 12.3, 14.2 g/dl pre- post, respectively.

Table (3). Effect of omega's different sources supplementation on Hb, AST, ALT for subjected adolescents (Mean \pm SD).

		Pre-intervention	Post-intervention	sig.
Hb (g/dl)	Control	12.04 \pm 0.82	12.03 ^b \pm 0.8	-
	Nutritional	12.7 \pm 0.8	14.5 ^a \pm 0.8	.01
	Medical	12.3 \pm 0.8	14.2 ^a \pm 1.1	.01
ALT (u/l)	Control	12.81 \pm 1.64	12.9 ^b \pm 1.7	-
	Nutritional	9.1 \pm 2.7	7.7 ^c \pm 1.5	.01
	Medical	12.3 \pm 0.8	14.2 ^a \pm 1.1	.01
AST (u/l)	Control	16 \pm 4.17	15 ^b \pm 3.9	-
	Nutritional	22.6 \pm 5.2	16 ^b \pm 4.1	.01
	Medical	24.5 \pm 5.7	18.1 ^a \pm 3.3	.01

Control group, which didn't receive any thing.

Nutritional group, which given natural food sources of omegas 3,6,9.

Medical group, which given pharmacological supplements of omegas (three capsules/ day).

a , b , c: Means with different letters among intervention in the same column are Significantly different .

This result disagreed with Afshin *et al.* (2008) who reported that 45 subjects (25 in the omega-3 and 20 in the placebo group completed the study). No significant changes were observed in blood hemoglobin, serum iron, and required dose of intravenous iron in either within or between group comparisons. Additionally, erythropoietin resistance index as well as required dose of intravenous erythropoietin showed no significant change in the omega-3 group compared to the placebo group. Although a relative alleviation in inflammatory state appeared in the omega-3 group, the mean differences of inflammatory and anti-inflammatory markers between the two groups did not reach statistically significant level except for ratio and serum ferritin level which showed significant changes in favor of omega-3 treatment ($P < 0.001$ and $P = 0.003$, respectively).

While agreed with Varnalidis *et al.* (2011) who observed that animals fed an omega 3 rich diet exhibited a statistically significant increase in hematocrit and hemoglobin levels, compared to animals drinking tap water, and a trend towards histopathological and clinical improvement, with the administration of omega 3 fatty acids ameliorating epithelial erosion by day 8 post-DSS, but no statistically significant difference was observed between group A and group B

animals at 4 or 8 days post-DSS. Also, a statistically significant increase in neutrophil infiltration was observed, as depicted by myeloperoxidase activity.

Regarding ALT, AST, the mean values of ALT were 12.81, 12.9 u/l for control group pre - post, respectively, 9.1, 7.7 u/l in pre and post intervention nutritional group, 12.3, 14.2 u/l in pre and post intervention medical group. The mean values of AST were 16, 15 u/l for control group pre and post intervention, respectively, while in nutritional group these were 22.6, 16 u/l for pre - post intervention, respectively, and in medical group these were 24.5, 18.1 u/l for pre and post intervention, respectively. It could be noticed from the tabled means that nutritional and medical groups were improved by the intervention, specially nutritional, which was more effective in AST and ALT improving.

This result disagreed with Wenxia *et al.* (2016) who reported that it was not significant on ALT, AST, when used omega supplementation in treatment.

There were a statistically significant difference between pre and post intervention for TG, TC at $p < 0.01$ in nutritional and medical groups (Table 4). These improvements were attributed for the dietary intervention with omega's different sources.

Table (4). Effect of omega's different sources supplementation on serum lipids for subjected adolescents (Mean±SD).

		Pre-intervention	Post-intervention	Sig.
TG(mg/dl)	Control	79±16	77 ^a ±15.3	
	Nutritional	88.8±13.7	68.1 ^a ±9.1	.01
	Medical	78±10.7	60 ^b ±9.1	.01
TC(mg/dl)	Control	147±87	148±88.1	
	Nutritional	159.2±18.2	138.4 ^b ±19.2	.01
	Medical	170.5±18.2	153.9 ^a ±19.2	.01

Control group, which didn't receive any thing.

Nutritional group, which given natural food sources for omega 3,6,9.

Medical group, which given pharmacological supplements for omega three capsule/day.

a, b, c: Means with different letters among intervention in the same column are significantly different.

Effect of Omega's different sources supplementation on some biological assessments and mental efficiency at adolescence

Table (4) exhibited the mean values of TG were 79 , 77 m g/dl for control group pre – post respectively , while in nutritional group were 88.8, 68.1 mg/dl pre - post respectively , and in medical group were 78, 60 mg/dl pre – post, respectively . And the mean values of TC were 147 , 148 mg/dl for control group pre – post, respectively , while in nutritional group were 159.2 , 138.4 mg/dl pre - post respectively , and in medical group were 170.5 , 153.9mg/dl pre – post .From this result it was found an improved in TG in intervention groups control group specially medical group , while it noticed an improved in TC in intervention groups than control group especially nutritional group .

This result agreed with Vasil'ev *et al.* (2009) who reported that therapy with omega-3 PUFAs resulted in a significant decrease of serum triglycerides from 3.04 +/- 0.39 to 1.91 +/- 0.15 mmol/l (-37.2%). Its combination with hypotensive therapy reduced mean AP from 114.5 +/- 2.4 to 106.3 +/- 1.8 mm Hg (p < 0.01). Also, omega-3 PUFAs increased amplitude fluctuations in LDF-grams in endothelial and neurogenic ranges by 33.3 and 30.8% respectively, tissue hemoperfusion rate

There was a statistically significant difference between pre and post intervention for LDL-c, HDL-c , VLDL-c at p < 0.01 in nutritional and medical groups. These improvements were attributed for the dietary intervention with omega's different sources. Table (5) illustrated that the mean values of HDL-c were 37.2 , 38 mg/dl for control group pre – post respectively , while in nutritional group were 42.3 , 53.4 mg/dl pre – post, respectively , and in medical group were 39.3 , 50.3 mg/dl pre - post

from 4.9 +/- 0.13 to 5.3 +/- 0.15 U (p < 0.05), capillary blood flow reserve by 13.7% (p < 0.05), maximum tissue hemoperfusion by 18.8% (p < 0.01), and coefficient of variation of tissue blood flow by 26.9%. Blood C-reactive protein level dropped by 40.7%. These changes were absent in control patients. It is concluded that correction of omega-3 PUFAs deficiency in patients with HA and MS reduces hyperlipidemia, has moderate antihypertensive effect, improves endothelial function and microcirculation. Multifunctional action of omega-3 PUFAs gives reason to recommend them for the treatment of MS. At the same direction, Caniato. *et al.* (2006) confirmed that Participants taking omega-3 fatty acids demonstrated a statistically significant reduction in mean serum triglyceride levels of 22%. There was an associated increase in total cholesterol (6.6%) and low-density lipoprotein cholesterol (22%).

Also, agreed with Ateya *et al.* (2017) who reported that children in omega-3 group showed a highly significant reduction in total cholesterol and a highly significant increase in glutathione peroxidase and superoxide dismutase levels.

respectively , it could be noticed more improvement in nutritional group than medical and control groups. And the mean values of LDL-c were 95.4, 90 mg/dl for control group pre - post respectively , while in nutritional group were 99.1, 71.3 mg/dl pre - post respectively , and in medical group were 115.6, 91.6 mg/dl pre – post , from this result it was found an improvement in nutritional group than medical and control groups. The mean values of VLDL-c were 15.8, 15.4 mg/dl for control group

pre - post respectively, while in nutritional group were 17.7, 13.6 mg/dl pre – post respectively, and in medical group were 15.5, 12 mg/dl pre – post respectively, it could be noticed an improved in intervention groups than control group especially medical group. This result agreed with Tianhua *et al.* (2016) who indicated that omega-3 fatty acids (O3FA) supplementation reduced TG by 0.61, LDL by 0.35. However, O3FA had no significant effect on TC, HDL, albumin,

hemoglobin, homocysteine, glucose, lipoprotein (a), and ferritin. O3FA supplementation is associated with lower several serum lipids and vascular inflammation markers in patients with end-stage renal disease (ESRD). Also agreed with Wenxia Luet *al* (2016) who demonstrated that omega-3 PUFAs improved liver fat, GGT, TG, and HDL in patients with nonalcoholic fatty liver disease (NAFLD). Therefore, n-3 PUFAs may be a new treatment option for NAFLD.

Table (5). Effect of omega's different sources supplementation on cholesterol fractions for subjected adolescents (Mean±SD).

		Pre-intervention	Post-intervention	Sig.
HDL-c (mg/dl)	Control	37.2±4.1	38 ^b ±4.2	.01
	Nutritional	42.3±5.2	53.4 ^a ±7.1	
	Medical	39.3±5.2	50.3 ^a ±7.1	
LDL-C (mg/dl)	Control	95.4±12.3	90 ^a ±11.2	.01
	Nutritional	99.1±13.7	71.3 ^b ±10.3	
	Medical	115.6±12.7	91.6 ^a ±12.3	
VLDL-C(mg/dl)	Control	15.8±2.1	15.4±1.9	.01
	Nutritional	17.7±2.7	13.6±3.1	
	Medical	15.5±3.7	12±3.1	

Control group, which didn't receive any thing.

Nutritional group, which given natural food sources for omega 3,6,9.

Medical group, which given pharmacological supplements for omega three capsules per day.

a , b , c: Means with different letters among intervention in the same column are significantly different.

As seen in Table (6)the mean values of perception were 47.7, 40.4 for control group pre - post respectively, while in nutritional group were 47.8, 20.9 pre – post respectively, and in medical group were 51.1, 21.1 pre - post respectively, it was noticed that there was an improvement in intervention groups than control group especially nutritional group.

This result were agreed with Richardson and Montgomery (2005) who

reported on 117 children ages 5 to 12 years old with developmental coordination disorders and associated behavior and/or learning difficulties, who were treated for 3 months with an omega-3 fatty acid, omega-6 supplement, or an olive oil placebo in a randomized, controlled double-blind trial. Results of this study indicated significant benefits for active treatment over the placebo for both reading and spelling progress.

Effect of Omega's different sources supplementation on some biological assessments and mental efficiency at adolescence

Table (6). The effect of omega's different sources supplementation on perception for subjected adolescents (Mean±SD).

		Pre-intervention	Post-intervention	Sig.
Perception (0 → 61)	Control	47.7±6.3	40.4 ^a ±5.4	
	Nutritional	47.8±4.2	20.9 ^b ±3.9	.01
	Medical	51.1±5.9	21.1 ^b ±5.3	.01

Control group, which didn't receive any thing.

Nutritional group, which given natural food sources for omega 3,6,9.

Medical group, which given pharmacological supplements for omega three capsules per day.

Normal dispersion: (0 - 20)*Light dispersion: (21 - 40).

Medium dispersion: (41 - 60).*High dispersion: (> 61).

a , b , c: Means with different letter among intervention in the same column are significantly different.

Table (7) showed the mean values of remember were 51.3, 45 for control group pre - post respectively, while in nutritional group were 49.7, 20.2 pre - post respectively, and in medical group were 49.4, 21.5 pre – post , respectively. , it was noticed that there was an improvement in intervention groups than control group especially nutritional group.

This were agreed with Isabelle *et al.* (2011) who found that 30 days EPA-rich supplementation decrease functional activation relative to cognitive performance (Colour / Word Stroop, Spatial Working Memory), whereas the DHA-rich supplementation had a lesser effect compared with EPA-rich

supplementation. Also, this agreed with Yurko-Mauro *et al.* (2010) who reported that intention-to-treat analysis demonstrated significantly fewer PAL six pattern errors with DHA versus placebo at 24 weeks (difference score, -1.63 ± 0.76 [-3.1, -0.14, 95% CI], $P = 0.03$).

DHA supplementation was also associated with improved immediate and delayed Verbal Recognition Memory scores ($P < .02$), but not working memory or executive function tests. Plasma DHA levels doubled and correlated with improved PAL scores ($P < 0.02$) in the DHA group. DHA was well tolerated with no reported treatment-related serious adverse events.

Table (7). Effect of omega's different sources supplementation on remember for subjected adolescents (Mean±SD).

		Pre-intervention	Post-intervention	Sig.
Remember (0 - >61)	Control	51.3±5.4	45 ^a ±5.1	
	Nutritional	49.7±4.8	20.2 ^b ±5.4	.01
	Medical	49.4±4.5	21.5 ^b ±3.4	.01

Control group, which didn't receive any thing.

Nutritional group, which given natural food sources for omega 3,6,9.

Medical group, which given pharmacological supplements for omega three capsules per day.

Normal dispersion: (0 - 20)*Light dispersion: (21 - 40).

Medium dispersion: (41 - 60).*High dispersion: (> 61).

a , b , c: Means with different letter among intervention in the same column are significantly different.

As seen in Table (8) the mean values of attention were 52.1, 50.1 for

control group pre – post, respectively, while in nutritional group these were 49.3,

19.6 pre – post, respectively , and in medical group these were 51.5, 15.8 pre - post respectively. It was noticed that there was an improvement in intervention groups than control group especially medical group. This result were agreed with Mcnamara *et al.*(2010) who revealed that 8 weeks DHA supplementation led to an increase in functional activation in the dorsolateral prefrontal brain regions during a sustained visual attention task (a simple continuous performance task) compared with pre-supplementation in healthy children aged 8 to 10 years. Also, results agreed with Bauer *et al.* (2011) who showed that 30 days EPA-rich supplementation improved performance on a choice reaction time task

in young adults and enhanced neural recovery for high-contrast multifocal visual evoked potentials (mfVEPs). In addition, Milte *et al.* (2011) reported that omega-3 polyunsaturated fatty acid levels may contribute to improve attention deficit (AD) and related developmental problems with and without learning difficulties.

Portwood (2006) demonstrated improvement inattention and hyperactivity through supplementation of omega-3 fatty acids. He found that 3 months of supplementation with omega-3 fatty acids improved inattentiveness scores for teenagers, from an average of 94 at the beginning of the study to 17 at the end of 3 months.

Table (8). Effect of omega's different sources supplementation on attention for subjected adolescents (Mean \pm SD).

		Pre-intervention	Post-intervention	Sig.
Attention (0 \rightarrow 61)	Control	52.1 \pm 5.4	50.1 ^a \pm 5.2	
	Nutritional	49.3 \pm 4.6	19.6 ^b \pm 1.9	.01
	Medical	51.5 \pm 5.4	15.8 ^b \pm 1.7	.01

Control group, which didn't receive any thing.

Nutritional group, which given natural food sources for omega 3,6,9.

Medical group, which given pharmacological supplements for omega three capsules per day.

Normal dispersion: (0 - 20)*Light dispersion: (21 – 40).

Medium dispersion: (41 – 60).*High dispersion: (> 61).

a , b , c: Means with different letter among intervention in the same colum are significantly different .

Conclusion

Omega polyunsaturated fatty acids are important through out life.The support of different omega sources led to improving nutritional status. This was reflected in an increase in hemoglobin, beneficial fats (HDL-C) and a decrease in LDL-C , VLDL-C, TG, TC, AST, ALT. Also, improve mental efficiency, which was reflected in improved perception, remembering and attention. Therefore, the results of this research tend to use omega as fat to improve memory, perception, attention and mental efficiency in general.

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Effect of Omega's different sources supplementation on some biological assessments and mental efficiency at adolescence

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Effect of Omega's different sources supplementation on some biological assessments and mental efficiency at adolescence

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تأثير الدعم بمصادر مختلفة للاوميغا على بعض القياسات الحيوية والكفاءة الذهنية بمرحلة المراهقة

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المستخلص

يلعب الغذاء دوراً هاماً في التأثير على سلوك التعلم والتحصيل لدى الطلاب من خلال بعض الأساسيات وتهدف هذه الدراسة إلى تحسين الحالة الغذائية (خاصة الهيموجلوبين والدهون النافعة) وتحسين الكفاءة الذهنية (خاصة الإدراك والتذكر والانتباه) في مرحلة المراهقة باستخدام مصادر مختلفة غنية بالاوميغا ، أيضا مقارنة فعالية مصادر الغذاء الطبيعية مع المكملات الغذائية الطبية من الاوميغا. تتكون عينة البحث من 48 مراهق (12-15 سنة) يتم تغذيتهم تغذية مؤسسية وتم تقسيمهم إلى 3 مجموعات (16 / كل 8 ذكر- 8 انثى) المجموعة الأولى مجموعة ضابطة، في حين تم إثراء المجموعة الثانية والثالثة بالمصادر الطبيعية والطبية بالمساواة من الاوميغا لمدة ثلاثة اشهر . تم تطبيق التقييم الغذائي على المجموعات وتم عمل استمارة استرجاع 24 ساعة لمدة ثلاثة ايام ، و عمل تحليل بيولوجي لمعرفة نسبة (الهيموجلوبين وانزيمات الكبد والدهون) قبل وبعد التدخل الغذائي ، كما تم تطبيق الاختبار النفسي لتقييم الادراك والتذكر والانتباه . أظهرت النتائج وجود دلالة احصائية لزيادة نسبة الهيموجلوبين والدهون النافعة في التدخل الطبيعي والصناعي وايضا وجود دلالة احصائية في انخفاض نسبة انزيمات الكبد والدهون الضارة مقارنة بالمجموعة الضابطة ، وايضا وجد تطور ذات دلالة احصائية في الاختبار النفسي مقارنة بالمجموعة الضابطة والاختبار القبلي . ومن ثم وجد انه يمكن استخدام المكملات الغذائية الطبيعية او الصناعية للمراهقين لتحسين الكفاءة الذهنية خاصة الادراك والتذكر والانتباه دون التمييز للمصدر .