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Original Article

Effects of sea fish oil capsule on hemoglobin and serum iron in medical college employee with type-2 Diabetes mellitus

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ABSTRACT: Background: Anaemia is a common condition in type-2 diabetes mellitus and its complications. Consumption of sea fish oil capsule may improve hemoglobin concentration and serum iron level in diabetic patient. **Objective:** To monitor the effect of consumption of omega-3 fatty acid on heamoglobin and serum iron levels in type- 2 DM. **Methods:** A prospective interventional study with 52 diagnosed diabetic patients of both sexes were scrutinized of 40 to 50 years. Among them, 27 type 2 diabetic patients with supplementation of omega 3 fatty acid (2g/day) for 12 weeks were named study group. Another 25 type 2 diabetic patients with placebo were named as control group for comparison. The study subjects were selected from employee of Dhaka Medical College, Dhaka on the basis of inclusion and exclusion criteria. The research work was conducted with obtaining ethical clearance from concerned departments.. The study parameters were estimated in Dhaka Medical College Hospital, Dhaka. The parameters were studied 2 times in study and control groups i.e. at the base line and after 12 weeks of study period. Data were gathered in pre-designed questionnaire form. For statistical analysis, Paired and Unpaired Student's 't' test were performed as applicable using SPSS **Results**: In this study hemoglobin and serum iron were increased in diabetic patients after supplementation with omega-3 fatty acid in comparison to that of their baseline value. Again, after 12 weeks, Hb and serum iron levels are lower in diabetic patients after supplementation with omega-3 fatty acid in comparison to control group. **Conclusion:** After analyzing the results of the study, it can be concluded that fish oil capsule can uphold Hb and serum iron levels in diabetic patients may be helpful to correct anaemia and prevent the complications of type-2 diabetes mellitus.

Keywords: Diabetes mellitus, Anaemia, Haemoglobin, Serum iron and Omega-3 fatty acid.

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INTRODUCTION

Diabetes mellitus as well as hyperglycemia is an inflammatory diseases by its nature. Hyperglycemia has a direct relationship with development of inflammatory condition showed by increased expression of pro-inflammatory cytokines. Studies suggest that longer duration of disease, the higher the inflammatory process[1].When pro-inflammatory cytokine rises, it leads insulin resistance and induces appearance of micro and macro-vascular complication, kidney disease and anaemia[2] In diabetes mellitus, the

nephropathy may arise, that further decreases the renal production of erythropoietin which leads anaemia[3].

Omega-3 Fatty acids are a group of polyunsaturated fatty acids consists of alpha- linolenic acid (ALA), eicosapentaenoic acid (EPA) and docosahexanoic acid (DHA). They are found in seafood including fatty fish (e.g. salmon, tuna and trout) and shellfish (e.g. crab, mussels and oysters).The omega 3 fatty acid; increases insulin sensitivity, helps in blood clotting, promote fat digestion, improve fertility, acts as a mood elevator and helps in brain development [4].

Consumption of fish oil can decreases free fatty acid level, improve insulin sensitivity as well as reduce the incidence of type 2 DM [5].

Omega- 3 fatty acid has some anti-inflammatory effects. In diabetes inflammation occurs that helps to increases serum hepcidine level. Hepcidine rises in inflammatory condition that produces from liver. When hepcidine level rises it causes degradation of ferroprotein as a result pathway of transferring iron from enterocyte to plasma blocked. So when fish oil reduce inflammation than reduce hepcidine level and Hb and serum Iron level rises[6].

MATERIALS AND METHODS

This prospective, interventional study was conducted in Department of Physiology, Dhaka Medical College, Dhaka from January 2017 to December 2017.The research work was accomplished with ethical clearance from concerned departments, Research Review Committee and Ethical Review Committee of Dhaka medical college, Dhaka. The patients were nominated from employe of Dhaka medical college. Sample size was calculated by a formula it was

$$n=\frac{(Z\alpha+Z\beta)^2\times(\bar{\delta}_1+\bar{\delta}_2)^2.}{(\mu_1-\mu_2)^2}$$ Sample was 28.

On the basis of inclusion criteria patient were selected by systematic random sampling.There was a sampling frame for calculation.

At the Beginning of study 60 diagnosed type-2 diabetic patients were randomly selected on the basis of exclusion and inclusion criteria. There were 30 patients of control group and 30 patients of study groups recruited for completion of study, After 6 weeks of study period, 3 patients were dropped out from study group and 5 patients were dropped out from control group. Finally, total 52 type diabetic patient of both sexes with the age ranging from 40-50 years with FBG 7.0 mmol/l or 126 mg/dl, HbA1c 6.5%, serum total cholesterol >200 mg/dl, serum triglyceride >150 mg/dl, LDL>130 mg/dl, BMI≤30 Kg/m^2, Hb 8-12 g/dl and patients with oral hypoglycemic drug were included in this study. Subjects having history of heart, liver, endocrine disorder, insulin therapy,iron supplementation pregnant and lactating women were excluded from this study. For this study 27 diagnosed type-2 diabetic patients with omega-3 fatty acid supplementation were selected as study group and 25 type-2 diabetic patients without oral omega-3 fatty supplementation were selected as control group. The study group again sub-divided into pre-supplementation group and after 12 weeks of supplementation as post supplementation group. The control group was sub-divided as pre and post follow-up group. After selection, the nature, purpose and benefits of the study were explained to each subject and informed written consent was taken from participants. Before taking blood detailed family and medical history were taken. Study and control subjects both are taken same oral anti-diabetic drug.Anthropometric measurement of the subjects was recorded and blood pressure was measured. All the information were recorded in a prefixed questionnaire. With aseptic precaution, 5 ml of venous blood was collected from ante-cubital vein by a disposable plastic syringe from each subject after overnight fasting for biochemical tests. Serum iron was estimed by sphectrophotometric method and hb was estimated by sahil's acid hematin method department of Laboratory Medicine and department of physiology Dhaka Medical College Hospital, Dhaka. Omega-3 fatty acid (2gm) was supplied to study group and placebo were supplied to control group then they were asked to intake twice daily for 12 weeks with proper instructions. Subjects were instructed not to change their diet and physical activities during the course of the study. A regular telephonic contact and periodic visit were made to participants because most of them are employee of Dhaka medical college. For statistical analysis, Paired Student's't' test and Unpaired Student's 't' test were performed as applicable using SPSS for windows version 16.0**.**Data were expressed as mean ± SE. The *p* value of < 0.05 was accepted as level of significance.

RESULTS AND DISCUSSION

In this study some significant difference were observed in age, sex, BMI, systolic and diastolic blood pressure between study and control group (Table 1).

Table 1. General characteristics of the patients in both groups (N=52)

Parameters				
	Study group (n=27)		**Control group** (n=25)	
Age (years)[a]	45.90 ± 3.80		44.92 ± 3.75	
Sex (%)[b]				
Male	18 (66.7%)		11 (44 %)	
Female	9 (33.3%)		14 (56%)	
BMI (kg/m^2)	At base line 25.03 ± 2.27	After 3 month with fatty acid supplementation 21.03 ±1.04	At base line 25.87 ± 1.75	After 3 months with fatty acid supplementation 24.67± 1.09
Systolic BP (mmHg)	119.07 ± 7.08		121.79 ± 4.47	
Diastolic BP [a] (mmHg)	79.63 ± 6.26		80.00 ± 0.00	
Duration of disease [a] (years)	5.43 ± 1.50		5.35 ± 1.57	

Table 2. Hb and serum Iron levels in different groups (N=52)

Parameters	**Study group** (n=27)		**Control group** (n=25)	
	Pre-supplemenation group	Post supplementation group	Pre-follow-up group	Post follow-up group
Hb(g/dl)	9.95 ± 1.34	11.48 ± 3.67**	9.20 ± 4.20	9.96 ± 4.43##
Serum iron(µgm/dl)	50.00± 7.40	128.75± 18.02*	77.68 ± 14.68	84.88 ± 1.20##

Results are expressed as mean ± SD. a= Paired student's t test was performed for comparison within groups and b=unpaired t test was performed to compare between groups. *p* value < 0.05 was accepted as level of significance. N= total number of subjects, n = number of subjects in each group, Hb=Hemoglobin , (*= study group baseline vs study group after 12 weeks of supplementation; # = study group after 12 weeks vs control group after 12 weeks); (* $p<.01$, ** $p<.001$;# $p<.01$,## $p<.001$).

In this study, the mean serum hheamoglobin and serum iron were almost similar and there is no statistical difference were observed at the beginning of the study. In study group, the mean hemoglobin ($p<.0.001$) was found higher and mean serum iron ($p<.0001$) level were found significantly higher in post supplementation group, than pre-supplementation group. Again the mean serum hemoglobin ($p<.0001$) levels were found significantly higher and mean serum iron ($p<.0001$) levels were found significantly higher and in study group compared to control group. In control group, there was no statistical difference were accomplished in mean serum hb and serum iron between pre-follow-up and post follow-up group.

In the current study, the mean serum iron and hb levels were higher in patients of T2DM after supplementation with omega-3 fatty acid in comparison to that of their baseline value. After 12 weeks, hb (.001) and serum iron (.001) level was significantly higher in type-2 diabetic Hepcidine is a peptide hormone, it is an iron regulatory hormone.During inflammation hepcidine synthesis rises. When serum hepcidine concentration rises hepcidine binds to ferroprotein, ferroprotein is internalized and iron export blocked resulting a low serum iron, low serum iron leads lower hb[7].Ecosapentanoic acid and Docosahexanoic acid are essential polyunsaturated fatty acid that have anti-inflammatory effect. They reduce serum hepcidine level that leads to help iron transport so that serum iron level rises and Hb also rises[8]. Diabetes is a chronic inflammatory condition, In diabetic complication such as diabetic nephropathy may contribute to decreases erythropoiesis. Erythropoetin is essential for Hb synthesis[9].Omega -3 fatty acid reduce inflammation, that increases Hb and serum iron level [10].The causes of Hb level decreases in diabetes and diabetic complications are damage of renal

interistitium and systemic inflammation[11].Omega-3 fish oil capsule are effective in reducing inflammation. Because this fish oil reduces inflammatory mediators When inflammation reduces than Hb level rises.[12] When serum triglyceride level rises, it decreases the binding of insulin with its receptor through releasing some inflammatory mediators from liver, that decreases insulin receptor signaling activity. Fish oil has a role on reducing serum triglyceride level. Peroxisome proliferating receptor –α present in liver increases hepatic uptake of free fatty acid. It also increases free fatty acid oxidation on skeletal muscle. When free fatty acid decreases in blood that decreases serum triglyceride which decreases BMI level[13].

In the present study Hb and serum ferritin levels rises in patients with T2DM after supplementation of omega-3 fatty acid in comparison to their baseline value and control group.

CONCLUSIONS

The result of study can be concluded that consumption of omega-3 fatty acid can improve serum Hb and serum iron levels in patients of type-2 diabetes mellitus. Therefore, omega-3 fatty acid containing food may be helpful to minimize the complications in type-2 diabetes mellitus.

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