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COMPARATIVE STUDY OF CONSUMPTION OF OMEGA-3 AND ITS RELATION TO CHRONIC DISEASES IN VEGETARIANS AND NON-VEGETARIANS

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ABSTRACT:

Background: *Omega-3 PUFAs are plant-derived [α-linolenic acid] or marine-derived [eicosapentaenoic acid and docosahexaenoic acid]. Omega-3 fatty acids prevent or reduce the severity of multitude of diseases.*

AIM: *To perform a comparative study of consumption of omega-3 and its relation to chronic diseases in vegetarians and non-vegetarians.*

METHODOLOGY: *Sample size taken for study was 100(50 males and 50 females) from age group 30-50 years. Predesigned questionnaire was used. Anthropometric measurements were taken. Three-day dietary recall was collected. IBM SPSS software 20.0 version was used for analysis. Data was analyzed using t-test and chi-square association test. P <0.05 was considered statistically significant.*

RESULTS: *Mean waist circumference in cm, weight in kg, hip circumference in cm, BMI, waist-to-hip ratio was more in non-vegetarian study participants (p<0.05). Mean energy intake,* *protein intake, consumption of EPA, DHA, and total omega-3 consumption was more in non-vegetarian study participants ($p<0.05$). Analysis of chronic diseases in study population showed 36.0% vegetarian study population and 22.0% non-vegetarian study population having chronic diseases. Vegetarians who had less consumption of omega-3 had higher incidence of chronic diseases as compared to non-vegetarians who had higher consumption of omega-3 ($p<0.05$).*

CONCLUSION: *The study findings showed consumption of energy, protein, EPA, DHA, and total omega-3 was higher in non-vegetarian study participants. Vegetarians who had less consumption of omega-3 had higher incidence of chronic diseases as compared to non-vegetarians who had higher consumption of omega-3 ($p<0.05$).*

Keywords: Alpha-linolenic acid, polyunsaturated fatty acids, Eicosapentaenoic acid, Docosahexaenoic acid, Omega-3 fatty acids.

I. INTRODUCTION

Nutrients must be obtained through a judicious choice and combination of a variety of foodstuffs from different food groups (Saunders AV et al., 2013). The emerging agenda of chronic diseases and injuries should be a political priority and central to national consciousness, if universal health care is to be achieved (Patel V.et al., 2011). Omega-3 PUFA are synthesized by dietary shorter-chained omega-3 fatty acid alpha-linolenic acid (ALA) to form the more important long-chain omega-3 fatty acids: eicosapentaenoic acid (EPA) and docosahexaenoic (DHA) (Giuseppe Grosso et al., 2014). Fish and fish oils are the most concentrated sources of EPA and DHA, individuals who do not eat fish or fish oils (e.g., vegans and non-fish-eating vegetarians and meat-eaters) could be at risk of low or inadequate n-3 PUFA status(Ailsa A Welch, 2010). Omega-3 fatty acids exert anti-inflammatory properties through different mechanisms (Mohebi-Nejad, A. et al., 2014). Increased intake of very long-chain (n-3) fatty acids is associated with a reduced risk of cardiovascular morbidity and mortality (Philip C. Calder, 2011). A large body of evidence supports a potential protective effect of seafood omega-3 (n−3) fatty acids, particularly EPA and DHA, on coronary heart disease (CHD) (Pan A et al., 2012). The appropriate dosage and compositions of omega-3, the optimized cooking method, and early omega-3 supplementation might be beneficial for type 2 diabetes prevention (Chen C. et al., 2017). Omega-3 fatty acids of marine origin therefore have the potential to alter human diseases including the physical decline associated with aging (Stewart Jeromson et al., 2015).The Omega-3 Index has been shown to be an independent risk predictor for cardiac disease, cellular aging, and cognitive dysfunction (Clemens von Schacky, 2014).

II. METHODOLOGY: Comparative study was carried on 100 study participants (50 vegetarian and 50 non-vegetarian participants) from age group 30-50 years. Inclusion criteria considered the subjects who were educated, middle income group, and were in the age group 30-50 years. The exclusion criteria considered the **s**ubjects from low income group and who were uneducated. Predesigned questionnaire was used. Anthropometric measurements were collected using standard tools. Three-day dietary recall taken included two weekdays and one weekend. Analysis was performed using IBM SPSS software 20.0 version. The data was analyzed using t-test and chi-square association test. $P < 0.05$ was considered to be statistically significant.

III. RESULTS: Data obtained on the basic characteristics of the 100 study participants showed that 50% participants were male and 50% participants were female in both the vegetarian and non-vegetarian group.

ANTHROPOMETRIC MEASUREMENT

Table I: Anthropometric measurements of 100 study participants

Veg/Nonveg		Age (years)	No of members in family	Height (cm)	Waist circumference (cm)	Waist to hip ratio	Weight (kg)	Hip circumference (cm)	BMI Kg/m2
Veg	Mean	38.30	3.36	162.0	78.24	0.81	64.06	96.00	24.62
	N	50	50	50	50	50	50	50	50
	Std. Deviation	5.036	1.025	9.091	7.427	0.056	8.716	4.794	3.428
Non-Veg	Mean	40.74	3.44	163.06	83.94	0.840	69.32	99.64	26.10
	N	50	50	50	50	50	50	50	50
	Std. Deviation	5.989	0.760	8.677	6.106	0.039	6.545	4.702	2.460
Total	Mean	39.52	3.40	162.5	81.09	0.827	66.69	97.82	25.36
	N	100	100	100	100	100	100	100	100
	Std. Deviation	5.640	.899	8.857	7.346	0.049	8.111	5.066	3.060
t-value		-2.205	-.443	-.596	-4.19	-2.660	-3.412	-3.833	-2.480
df		98	98	98	98	98	98	98	98
p-value		0.03*	0.65	0.55	0.0*	0.009*	0.001*	0.01*	0.01*

According to Table I, there was significant difference in age ($p<0.05$) with mean age being more in non-vegetarian group (40.74 years ± 5.98). There was significant difference in waist circumference in cm ($p<0.05$) with mean waist circumference in cm being more in non-vegetarian group (83.94 cm ± 6.10). There was significant difference in weight in kg ($p<0.05$) with mean weight in kg being more in non-vegetarian group (69.32 kg ± 6.54). There was significant difference in hip circumference in cm ($p<0.05$) with the mean hip circumference in cm being more in non-vegetarian group (99.64 cm, ±4.702). There was significant difference in BMI ($p<0.05$) with mean BMI being more in non-vegetarian group (25.36 kg/m2 ± 2.46). There was no significant difference in no. of members in family ($p>0.05$) and height in cm ($p>0.05$).

Table II: Nutrient intake of study population

Nutrients	Categories	N	Mean	Standard Deviation	t-value	df	p-value
Energy(Kcal)	Veg	50	1498.5	80.925	-2.131	98	0.001*
	Non-Veg	50	1503.2	76.16			
Carbohydrates(g)	Veg	50	225.18	15.25	.628	98	0.531
	Non-Veg	50	217.06	10.85			
Proteins(g)	Veg	50	40.68	6.95	-3.013	98	0.003*
	Non-Veg	50	47.68	5.38			
Fats(g)	Veg	50	48.34	4.12	-1.913	98	0.248
	Non-Veg	50	49.36	5.40			
ALA(mg)	Veg	50	308.58	16.42	-.698	98	0.487
	Non-Veg	50	335.40	18.77			
EPA(mg)	Veg	50	0.00	.000	-4.441	98	0.000*
	Non-Veg	50	33.42	2.67			
DHA(mg)	Veg	50	0.00	.000	-4.899	98	0.000*
	Non-Veg	50	90.58	5.52			
TotalOmega3(mg)	Veg	50	308.58	16.42	-3.299	98	0.001*
	Non-Veg	50	462.68	25.13			

According to Table II, mean energy intake ($p<0.05$) was more in non-vegetarian (1503.2 Kcal) study participants as compared to vegetarian (1498.5 Kcal) study participants. Carbohydrate intake ($p>0.05$) was found to be more in vegetarian (225.18 gm) study participants as compared to (217.06 gm) in non-vegetarian study participants. Protein intake ($p<0.05$) is found to be high in non-vegetarian (47.68 gm) study participants as compared to vegetarian (40.68 gm) study participants. Fat intake ($p>0.05$) was found to be high in non-vegetarian (49.36 gm) study participants as compared to vegetarian (48.34 gm) study participants.

Mean ALA intake was 308.58 mg in vegetarian and 335.40 mg in non-vegetarian study population ($p>0.05$). Mean EPA intake was 0.0 mg in vegetarian and 33.42 mg in non-vegetarian study population($p<0.05$).Mean DHA intake was 0.0 mg in vegetarian and 90.58 mg in non-vegetarian study population.($p<0.05$).Mean total Omega-3 intake 308.58 mg in vegetarian and 462.68 mg in non-vegetarian study population.($p<0.05$).

Figure I: Omega-3 intake in study population

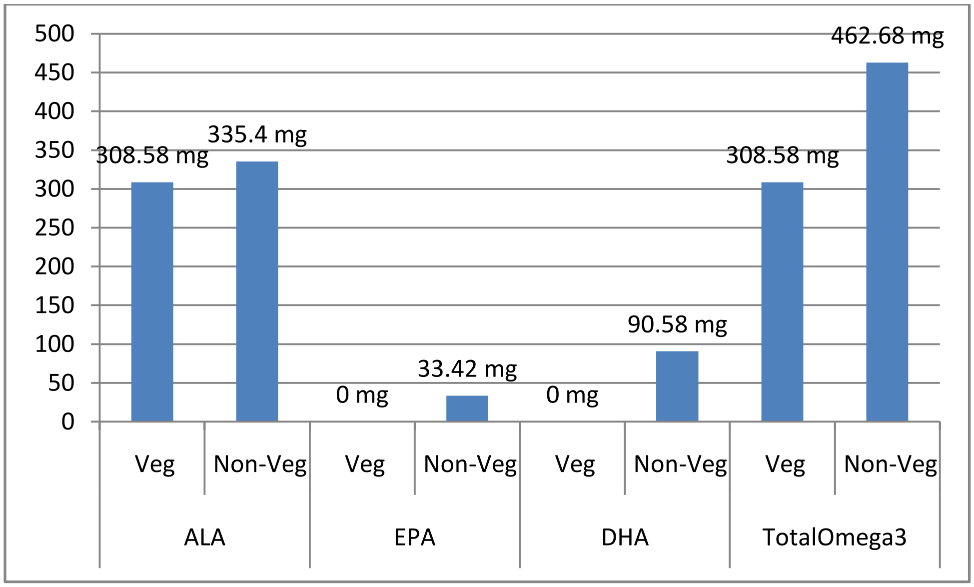

Figure I shows ALA intake to be 335.40 mg in non-vegetarian study participants and 308.58 mg in vegetarian study participants, ($p>0.05$). The mean total Omega-3 intake was 308.58 mg in vegetarian and 462.68 mg in non-vegetarian study population ($p<0.05$).

Consumptions of the plant version of omega-3 fats, alpha-linolenic acid, are also low in vegans. Adequate intake of n-3 fats is associated with a reduced incidence of heart disease and stroke (Philip J Tuso, MD; 2013).

Vegan diets are relatively deficient in the long-chain omega-3 fatty acids docosahexaenoic acid (DHA) and eicosapentaenoic acid (EPA), which are found largely in fish, seafood and eggs (M Amit; 2010).

Figure II: Chronic diseases in study population

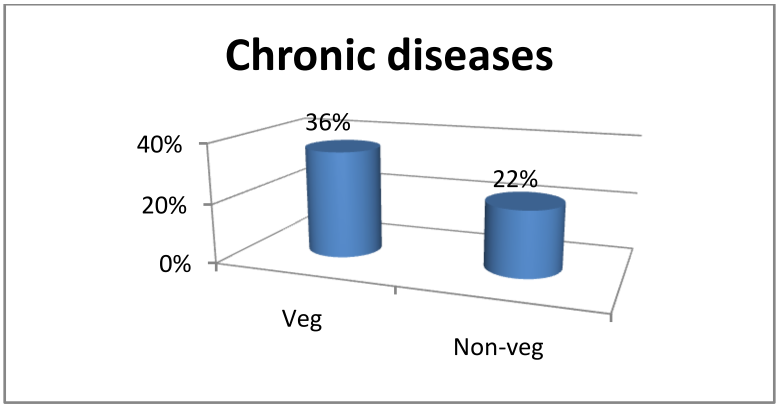

Figure II shows incidence of chronic diseases to be 36.0% in the vegetarian study population and 22% in the non-vegetarian study population (p>0.05).

Fish consumption was associated with a lower risk of metabolic syndrome. The intake of long-chain n-3 FAs was inversely associated with self-reported T2D. Experimental studies reported that fish or fish oil supplements may improve insulin secretion and insulin sensitivity (Marushka L, et al.,2017).

Figure III: Types of chronic diseases in vegetarian and non-vegetarian study population

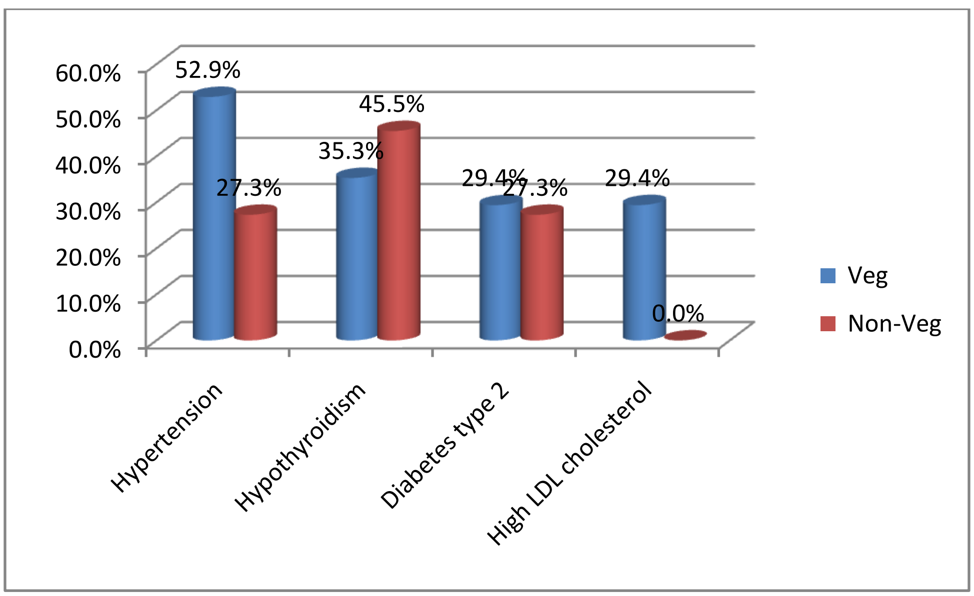

Figure III shows 52.9% vegetarians and 27.3% non-vegetarians suffered from hypertension, 29.4% vegetarians and 27.3% non-vegetarians suffered from diabetes type 2, 35.3% vegetarians and 45.5% non-vegetarians suffered from hypothyroidism, 29.4% vegetarians and 0.0% non-vegetarians suffered from high LDL cholesterol($p>0.05$).

Figure IV: Relation between omega-3 intake and chronic diseases

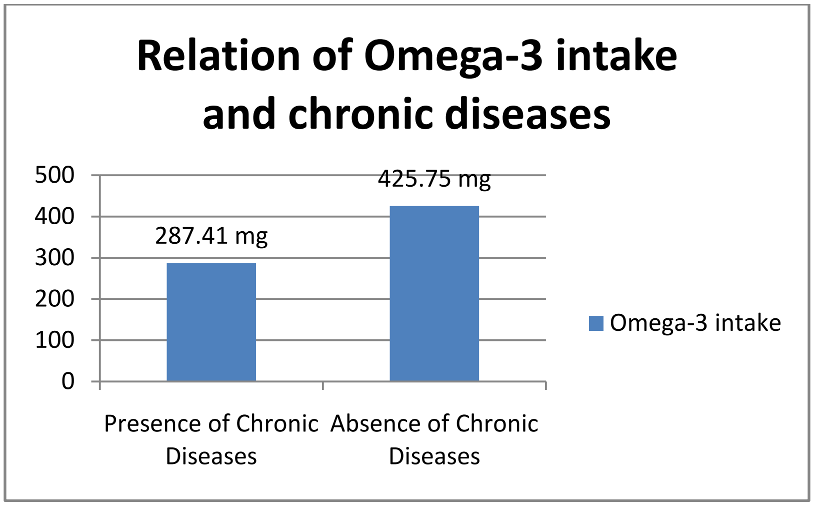

Figure IV shows the study population having chronic diseases to have mean Omega-3 intake 287.41 mg, ±123.986 which is less as compared to mean omega-3 intake of 425.75 mg, ±270.324 in study population not having incidence of chronic diseases($p<0.05$).

Dietary omega-3 long-chain polyunsaturated fatty acids (LCPUFA), eicosapentaenoic acid (EPA, 20:5n-3) and docosahexaenoic acid (DHA, 22:6n-3), have been associated with a decreased risk of chronic disease, in particular cardiovascular mortality and cognitive decline (Ken D. Stark et.al, 2016).

IV. CONCLUSION

It can be concluded from the study that the anthropometric measurements are higher in the non-vegetarian study population than vegetarian study population. The nutrient intake regarding energy, protein, EPA, DHA, and Total Omega-3 was higher in the non-vegetarian study population than vegetarian study population. Vegetarians who had less consumption of omega-3 had higher incidence of chronic diseases as compared to non-vegetarians who had higher consumption of omega-3 ($p<0.05$). There exists a relation between the mean Omega-3 intake and incidence of chronic diseases.

The World Health Organization (WHO) recommended a regular fish consumption (1–2 servings/week; providing 200–500 mg/serving of EPA and DHA) for the general population, as being protective against coronary heart disease and ischemic stroke (J. A. Tur et al.,2012).

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