

Erythrocyte Membrane Fatty Acid Composition in ESRD Patients

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INTRODUCTION

- End stage renal disease (ESRD) patients have a higher cardiac mortality rate than age matched controls. Between the first year and fifth year of dialytic therapy, the rate of sudden cardiac death increases from 62.5 deaths per 1000 patient years to 75.4 deaths per 1000 patient years.
- Low omega-3 and high trans fatty acid consumption has been linked to an increased incidence of cardiovascular disease in the general population.
- Elevated Trans-fatty acid (FA) levels and lowered blood cell membrane levels of omega-3 fatty acid identify individuals at high risk of sudden cardiac death (SCD).
- The Omega index (OMX), the sum of EPA (C20:5n3) and DHA (C22:6n3) in red blood cell membranes can be used to risk stratify individuals.
- An OMX $\geq 8\%$ conveys a low risk of SCD.

METHODOLOGY

We studied 38 hemodialysis patients from a free standing community out-patient dialysis clinic in the northeast. All patients gave informed consent. RBC fatty acid analysis included measurement of RBC omega-3 fatty acid, trans fatty acid omega-6 fatty acids, saturated fatty acids, monounsaturated fatty acids and polyunsaturated fatty acids. RBCs were isolated from EDTA blood samples and treated with 14% born trifluoride in methanol at 100degrees C for 10 minutes to generate fatty acid methyl esters. These were extracted with hexane and analyzed by gas chromatography using a Shimadzu GC2010 equipped with a 100m capillary column (SP-2560). Nutritional assessments were performed.

RESULTS

The mean age was 61 and the median duration of dialysis was 27 months ranging from 8-339 (Table 1). Patients were medically stable with a median albumin of 4.0 ± 0.3 mg/dl, an Hs-CRP of 1.2 ± 2.3 mg/dl and a KT/V of 1.69. 4. The average Omega Index was 6.4%. Although 20 patients had an Omega Index $\geq 6\%$, only 4 patients had an index $\geq 8\%$ (Figure 1). Red blood cell membrane fatty acid analysis demonstrated that Monounsaturated fatty acid (C16:1, C18:1) were low normal. Trans Fatty (C18:1t, C18:2t) acid levels were not elevated (Table 2).

Table 1: Baseline Characteristics

	N=38
Total patients	N=38
Age (years)	61(range 27-86)
Males/females	25/13
Diabetics/Smokers	12/4
Months on dialysis	43.5(range 8-339)
# with native AV fistulas	30
# on statins	15
Kt/V	1.69 \pm 0.34
Total cholesterol	152 \pm 57mg/dl
LDL cholesterol	73.4 \pm 41.3mg/dl
HDL cholesterol	38.9 \pm 9.5mg/dl
Hs-CRP	1.2 \pm 2.3 mg/dl
BMI	27.6 \pm 8.5kg/m2
TSFT	18.5 \pm 11 mm
MAMC	25.3 \pm 6 cm
HGS	19.8 \pm 11 kg
SGA(range1-7)	5.5 \pm 0.86
Fish meals/week	0.81 \pm 0.9
# Omega 3 supplements	2

Table 2: FA levels in RBC membranes

Group	Fatty Acid	Patients' Values	Reference Values
Monounsaturated	C16:1	0.7 \pm 0.5%	0.2-2.8%
Monounsaturated	C18:1	12.8 \pm 1.4%	12.0-22%
Omega-6	C18:2n6	14.1 \pm 2.4%	11.5-21.6%
Omega-6	C20:4n6	22.1 \pm 3.1%	8.8-18.0%
Omega-3	C18:3n3	0.3 \pm 0.2%	0.1-1.0%
Omega-3	C20:5n3	1.8 \pm 0.4%	0.1-1.9%
Omega-3	C22:5n3	2.8 \pm 0.5%	0.8-2.7%
Omega-3	C22:6n3	5.5 \pm 1.6%	0.6-6.6%
Omega-3	OMX	6.4 \pm 2.2%	2.0-10.1%
Trans-Fatty Acids	C18:1t	1.3 \pm 0.5%	0.9-4.0%
Trans-Fatty Acids	C18:2t	0.2 \pm 0.1%	0.1-0.7%

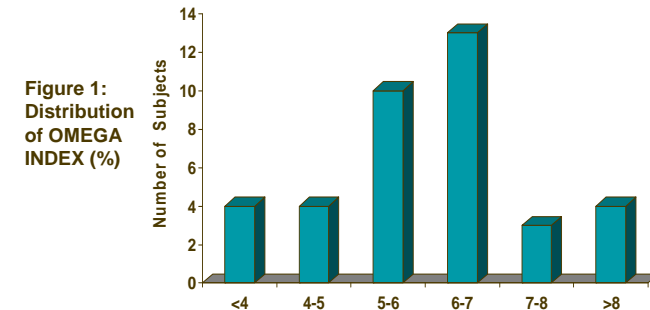


Figure 1: Distribution of OMEGA INDEX (%)

CONCLUSION

- Fish consumption was low, with fewer than half of the chronic hemodialysis patients consuming more than 1 serving per week. One third of patients did not eat fish at all.
- The average Omega index was 6.4%. Only 4 out of 38 patients had an index $\geq 8\%$.
- This study suggests that there is an opportunity to supplement the diet of ESRD patients with omega-3 fatty acids. Only a large prospective randomized clinical trial would answer whether omega-3 fatty acid therapy would decrease the rate of sudden cardiac death in ESRD patients.

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