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The Selenium Status in Thalassemia Patients in South East of Iran

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ABSTRACT

Introduction: There are limited reports about selenium status in major thalassemia patients. The aim of this study is evaluation of selenium status in patients with major thalassemia south east of Iran with large sample size and wide range of age. This study compared selenium status with other sites of the world.

Methods: In this study 369 cases that had major thalassemia for more than 5 years were enrolled in the study. Selenium level was measured in all eligible patients after 12 hours fasting by graphite enstrum furnace atomic absorption spectrometry in south east of Iran in 2012.

Results: Of 369 cases, 333 eligible patients were evaluated. Mean age was 15.63±7.4 years. One hundred ninety two cases were male and others were female (141 Cases). About 27% (90) of the cases were 5-10 years-old, 24 % (80) were 10-15 years-old and 49% were more than 15 years-old. Iron chelator in 62.2% was Dessferrioxamine, in 15.5% was Deferiprone and in 22.3% was combination of Dessferioxamine and Deferiprone. Totally 85 cases (25.52%) had Selenium deficiency, 35.43% (118 cases) had normal levels and 39 %(130 cases) had selenium excess.

Conclusion: Our study on 333 major thalassemia cases documented variable status of selenium from deficiency to higher than normal levels. It was different with other reports in the world.

KEYWORDS: Major thalassemia, Selenium, South-east of Iran

INTRODUCTION

Thalassemia is the most common anemia with hereditary base.[1,2,3] Iran is one of the most common countries in terms of major thalassemia.[4,5] This severe hereditary anemia needs lifelong blood transfusion. According to this modality of treatment, secondary iron overload leads to oxidative stress within the erythrocytes and multiple abnormalities such as metabolic, endocrine and growth abnormalities will occur.[6,7]

Chronic blood transfusion in major thalasssemia or other hemolytic disorders such as Sickle cell anemia could decrease chronic hemolysis and change the micronutrient status.[8-10] Selenium is a trace element which founded mainly in seafood, meat, and cereals.[11] Selenium is a component of some enzymes such as glutathione peroxidase and iodothyronine deiodinase.[12,13] Selenium is a component of selenocysteine amino acid which had a role in tissue protection of some free radical such as ferrous choloride and selenium deficiency could lead to tissue damage.[14,15] Low level of selenium is associated with increased risk of some cancers, infertility, immune dysfunction, viral infection, cardiovascular disease and inflammatory conditions.[16,17] Some studies propounded that chronic iron overload complications in thalassemia major patients may be due to decreased

concentrations of selenium.[14] Different levels of selenium treatments have had different effects on Natural Killer (NK) cell activity in vitro in patients with beta-thalassemia major, as low-dose treatment increased NK activity and vice versa. The study emphasized on the careful use of selenium dosage in these patients.[18] Relationship between the levels of selenium and some infectious diseases[17] beside all the effects that mentioned previously is one of the most important causes that we should know the status of selenium in these patients.

The aim of this study is evaluation of selenium status in a large group of major thalassemia patients and finding a response for the question that "how many patients and whom need micronutrient supplement?"

MATERIALS AND METHODS

This cross-sectional study was carried out on major thalassemia patients in Ali Asghar Hospital in South East of Iran between February and September of 2012. The study was approved in ethic committee of Zahedan medical university. We calculated the sample size with 80% power at the 5% significance level. This could be obtained with 296 cases. We enhanced the sample size in order to ensure that the required sample size would be achieved in case of missing data and to improve the power of the study.

Indeed, we enrolled all major thalassemic patients who were eligible in this period of time. Inclusion criteria were: age above 5 years, documented major thalassemia (with hemoglobin electrophoresis), transfusion dependency, normal kidney and liver function tests. Exclusion criteria were: known liver disease, kidney disease, gastro-intestinal disease, specific diet habit such as vegetarians, and consumption of selenium supplements in any forms. Informed consent was taken from all the participants or their parents in children cases. Blood samples were collected from the selected patients after 12 hours fasting. All blood samples were centrifuged after 45 minute spontaneous coagulation and then stored at -20 degree of centigrade. Selenium was measured by graphite enstrum furnace atomic absorption spectrometry Varian, Australia (Spectr AA 240fs, 2009, USA) in non-metal tubes. The normal range of selenium according to this instrument was 95-140µgr/L. Levels less than 95µgr/L were defined as selenium deficiency and ones higher than 140µgr/L were defined as selenium excess. Data were analyzed by SPSS software and were reported according to mean and Standard Deviation. Statistical analysis was done using T-test, ANOVA and chi-square tests.

RESULTS & DISCUSSION

From all patients (369 cases) with major thalassemia who had more than 5 years-old, 333 cases were eligible and evaluated for selenium status. Demographic, hematological and biochemical parameters of major thalassemic patients are demonstrated in table 1. Mean age of male and female cases were 15.52±5.99 and 15.78±9.16 years, respectively. The mean age for blood transfusion was 11.48 ±15.39 months; mean duration for iron chelator therapy was 64.64±47.03 months. Mean ferritin level was 4053.162± 2523.058 µg/ml. Mean BMI was 16.55±3.31 kg/m^2. In All eligible cases (333 cases) mean selenium level was 158.0±85.2µgr/dl (3µgr/dl-444µgr/dl). Totally 85 cases (25.52%) had selenium deficiency, 118 cases (35.43%) had normal levels and 130 cases (39%) had selenium excess. Mean level of selenium was 155.8±79.8 µg/dl in males and 161.0±92.4 µg/dl in females (P=0.585). Details of mean selenium levels according to patients' characteristics are shown in table 2. Mean Selenium status according to type of iron chelator was not significantly different (P<0.093). Mean number of packed RBC transfusions was 2.48±1.06/ month.

Table 1: Demographic, hematological and biochemical parameters of thalassemic patients

		Thalassemic patients	
		No	%
Sex	Male	192	57.7
	Female	141	42.3
Age	5-10 year-old	90	27
	10-15 year-old	80	24
	>15 year-old	163	49
Iron chelator	Desferal	207	62.2
	Deferiprone(L1)	52	15.5
	Desferal&L1	74	22.4

Table 2: Selenium status according to patients' characteristics

		deficiency		Normal status		Excess		P value
		No	%	No	%	No	%	
Sex	Male	44	22.9	75	39.1	73	38	0.222
	Female	41	29.1	43	30.5	57	40.4	
Age	5-10 year-old	26	28.9	30	33.3	34	37.8	0.887
	10-15 year-old	21	26.3	27	33.7	32	40	
	>15 year-old	38	23.3	61	37.4	64	39	
BMI	$<20\ ^{kg}/_{m2}$	72	24.9	101	35	116	40.1	0.623
	$20\text{-}25\ ^{kg}/_{m2}$	10	27	14	37.9	13	35.1	
	$25\text{-}30\ ^{kg}/_{m2}$	3	42.8	3	42.8	1	14.4	
Iron chelator	Desferal	38	24.8	60	39.2	55	36	0.345
	Deferiprone(L1)	23	24	26	27	47	49	
	Desferal&L1	19	28.4	25	37.3	23	34.3	

This cross-sectional large study on 333 cases with major thalassemia showed various level of selenium (deficit to excess) in this area in Iran. These results are different with other reports. This variation in selenium status especially, selenium excess is one of the important finding in this large sample size study. In study of Sherief et al,[19] 108 cases of major thalassemia with mean age 9.85 ± 4.3 enrolled and evaluated. The majority of cases had selenium deficiency and mean selenium level was 31.5±19.5 µg/L. Different sample size and mean age was differences between out study and their study. In another study in California selenium deficiency was reported in 75% of major thalassemic patients. [20]

In study of Claster et al.,[21] 43 cases with sickle cell anemia and 24 cases with major thalassemia were evaluated. Mean age was 14.5 years-old; iron chelator in majority of cases was deferasirox. Selenium deficiency in this study was 67.5% in SCD and 75% in major thalassemia patients. Some possible reasons for these differences may be different sample size, wider age distribution and different types of iron chelator.[20]

CONCLUSION

Reports about Selenium status in major thalassemia patients are limited and majority of studies showed low level of selenium in their studied patients. Our study revealed a wide range of selenium level in major thalassemia patients from deficit to excess. Large sample size and wide age distribution are some powers of this study. However, we had some limitations in this study. Since we had a wide range of ages, it was difficult for us to choose a suitable control group for the study and design a case-control study. We did not evaluated diet of the patients, so we do not know possible effect of the diet on the results. It needs further studies to evaluate effect of diet on the selenium level in such study.

Based our results, administration of selenium as an antioxidant to reduce the extent of oxidative damage and related complications in beta thalassemia major still needs further evaluation.

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CONFLICT OF INTEREST

All authors declare no conflict of interest.

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