ระดับของสังกะสีในซีรัมของประชากรในขอนแก่น ภาคตะวันออกเฉียงเหนือของประเทศไทย

Serum zinc levels of people in Khon Kaen, the northeast of Thailand

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บทคัดย่อ

สังกะสีเป็นธาตุจำเป็นที่มีผลต่อการทำงานของระบบภูมิคุ้มกัน ระดับของสังกะสีในซีรัมสามารถสะท้อนสถานภาพของสังกะสีในร่างกาย งานวิจัยนี้จึงมีจุดมุ่งหมายที่จะทำการตรวจวิเคราะห์ระดับสังกะสีในซีรัมของกลุ่มตัวอย่าง ซึ่งเป็นประชากรปกติ อาศัยอยู่ในจังหวัดขอนแก่น ที่เข้าร่วมโครงการตรวจคัดกรองมะเร็งเคลื่อนที่ ของโรงพยาบาลศรีนครินทร์ จำนวน 345 คน โดยใช้อะตอมมิคแอบซอบชันสเปคโตโฟโตมิเตอร์ พบว่าค่ามัธยฐาน (ค่าต่ำสุด-ค่าสูงสุด) เท่ากับ 96.0 (10.5-281) แม้ว่าระดับสังกะสีในซีรัมของเพศชายสูงกว่าในเพศหญิง คือ เท่ากับ 98.0 (55-265) μg/dl และ 93.0 (10.5-281) μg/dl ตามลำดับก็ตาม แต่ไม่มีความแตกต่างทางสถิติ และยังพบว่าระดับสังกะสีในผู้ที่มีช่วงอายุต่าง ๆ ไม่แตกต่างกัน การศึกษานี้ไม่พบความแตกต่างทางสถิติของระดับสังกะสีในซีรั่ม เมื่อเปรียบเทียบระหว่างผู้ที่มีพฤติกรรมสูบบุหรี่ กับผู้ที่ไม่สูบบุหรี่ ผู้ที่ดื่มเหล้า กาแฟ/ชา กับผู้ที่ไม่ดื่ม แม้ว่าระดับสังกะสีของผู้สูบบุหรี่ สูงกว่าผู้ไม่สูบบุหรี่เล็กน้อย และผู้ที่ดื่มแอลกอฮอล์ กาแฟ/ชา มีระดับสังกะสีในซีรัมสูงกว่าผู้ไม่ดื่มเล็กน้อย ส่วนการเคี้ยวหมากกลับพบว่าผู้ที่ไม่เคี้ยวหมากมีค่าระดับสังกะสีสูงกว่าผู้ที่เคี้ยวหมาก แต่ก็ไม่มีความแตกต่างทางสถิติเช่นกัน ค่าระดับสังกะสีในซีรัมที่ได้จากการศึกษาครั้งนี้ อาจเป็นประโยชน์สำหรับใช้เป็นค่าอ้างอิงของประชาชนไทยในภาคตะวันออกเฉียงเหนือได้ต่อไป

Abstract

Zinc is an essential element that involved in immune function. Serum zinc level can reflect the body zinc status. This study was aimed to investigate the serum zinc levels of 345 normal people living in Khon Kaen province, who joined the mobile cancer unit, Srinakarind Hospital. Atomic absorption spectrophotometry was used to determine serum zinc level. The medium (range) values were 96.0 (10.5-281) μg/dl. The values for males were slightly higher than in females, which were 98.0 (55-265) and 93.0 (10.5-281) μg/dl, respectively. However, there were no statistical significant differences. Serum zinc levels of subjects with various age groups did not show any differences. The cigarette smoking or alcohol, coffee/tea drinking subjects seemed to have slightly higher serum zinc levels than the non-smokers or non drinkers , but there were no any statistical significant differences. In contrast, the betel nut chewing people showed slightly lower zinc levels than the non-chewers. The serum zinc levels as reported in this study may be useful as reference values of people in the northeast of Thailand.

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Introduction

Zinc (Zn) is an essential trace metal which acts as a cofactor of several enzymes including antioxidant enzyme superoxide dismutase (Isoherranen et al., 1997). Zinc supplementation showed benefit effect on immune function by blocking the exercise-induced increase in reactive oxygen species (Singh et al., 1994). In zinc-deficient humans, the function of T helpher lymphocyte was changed by increasing the production of interferon-gamma, interleukin-2 and tumor necrosis factor-alpha (Beck et al., 1997). (Prasad et al.,1997) also reported the decrease in the natural killer cell lytic activity in zinc-deficient subject. All of these studies indicated the cell-mediated immune dysfunctions of zinc deficiency. Moreover, the impaired cell-mediated immune responses in an older population was improved by zinc supplementation (Fortes et al., 1998). Therefore, zinc plays an important role in the maintenance of immune function. Serum zinc concentration was critical to the stimulation of DNA synthesis and cytokine production in pokeweed mitogen-stimutated peripheral blood mononuclear cells from pateints with chronic liver disease. The critical zinc concentration was in the range of 0.5mM, which was equivalent to a daily dose of 45 mg zinc salt (Reinhold et al., 1997).

Beside environmental exposure, lifestyles and food habits affect intake of elements in human. There were several studies on blood concentration of trace elements including zinc in relation to food gender, age, residential area and socioeconomic status (Lockitch et al. 1988; Malvy et al. 1993; Rukgauer et al., 1997; Benes et al., 2000; Barany et al., 2002). The previous reports studied on serum zinc levels in Thailand were emphasized on children and patients with cancers and various diseases (Varavithya et al., 1979; Skulchan et al, 1987; Udomkesmalee et al., 1990; Songchitsomboon et al., 1999; Tungtrongchitr et al.,2003), which showed lower serum zinc levels in the younger ages and patients. So, we aimed to study the serum zinc levels of people in the northeast of Thailand and to compare the levels among gender , age and lifestyles of the subjects. This will be the base line data for adult population. This study is a part of a project on mobile screening program of cancer unit, Srinakarind hospital.

Materials and Methods

1. Sample collection

The blood samples used in this study were obtained from people in Chonnabot and Ban Fang Districts of Khon Kaen Province who had no disease history and participated in a mobile cancer screening programme during 1990. Those found with any abnormality from a physical investigation, such as oral cavity mass, breast mass, thyroid gland enlargement or from ultrasonography and Pap smear were excluded from this study.

Information of tobacco smoking, betel nut chewing and alcohol drinking was obtained from questionnaires.

Overnight fasting venous blood was drawn, transferred to a test tube and kept in an ice-box. When arrival at the laboratory in the University, the serum was immediately separated and kept at -80^{o}C until used for analysis, which was within a week of the sample collection.

2. Determination of serum zinc

0.2 ml of serum was diluted with 0.6 ml of deionized water, then the mixture was measured

for zinc content using flame atomic absorption spectrophotometer (Perkin Elmer, 2380, USA) as described by Perkin Elmer, (1980) and Areejitranusorn and Areejitranusorn (1989). The precision of this assay gave %CVs for intra- and inter-assay of 3.4 and 2.1%, respectively.

3. Statistical analysis

All the group data were statistically evaluated and significant differences by various factors were determined using non-parametric statistical methods (Hollander and Wolfe, 1973). The results were expressed as median (range) of each group. The level of statistical significance was set at $p<0.05$.

Results

The determination of serum zinc level of 345 subjects resided in Chonnabot and Ban Fang districts of Khon Kaen Province, the northeast of Thailand revealed the median (range) of 96.0(10.5-281) ml/dl. The values for males and females were 98.0(55-265) and 93.0(10.5-281) ml/dl, respectively. When analysis on four age groups the values were not stastistical differences, which were 104.0(64-187), 97.5(10.5-281), 92.0(39-201) and 94.5(57-205) ml/dl for ข35, 36-45, 46-55 and 56+ years, respectively. The values of these four age groups were not different among males and females (Table 1). The different lifestyles and behaviors did not give statistical significant differences of serum zinc levels. Although cigarette smokers had slightly higher serum zinc than non-smokers, i.e., 97.0(55-229) and 93.5 (10.5-281) ml/dl, respectively. Similarly, the values of alcohol drinkers and coffee/tea drinkers versus non-drinkers were not different, which were 96.0(51-265) versus 95.0(10.5-281) and 98.0(51-184) versus 95.0(10.5-281) ml/dl. Betel nut chewers had slightly lower serum zinc than non-chewers, i.e, 89.0(39-205) and 99.0 (10.5-281) ml/dl, respectively (Table 2).

The analysis of gender and age groups with their lifestyles showed interesting relationship (Table3). Majority of cigarette smokers, alcohol and coffee/tea drinkers were males, whereas many betel nut chewers were females. Moreover, cigarette smoking and alcohol drinking habits were found in older age groups than in the youngers. Those who drank coffee or tea were more in 36-45 and 46-55 years than inข35 and 56+ years. In contrast, the betel nut chewers were the older females which mostly in 56+ and 46-55 years old groups.

Discussion

The determination of serum zinc of 345 adults in Chonnabot and Ban Fang districts of Khon Kaen, the northeast of Thailand showed no gender and age differences. Previous studies demonstrated the lower serum zinc levels of infants than that of childern. They reported that the beyond one year of age serum zinc levels increased with increasing age and there was no reduction of the level in prebertal subjects (Varavithya et al., 1979). The age related of serum zinc levels, that did not observe in this study confirmed the studies by Areejitranusorn and Areejitranusorn (1989). The results reflect the constant serum levels among adult population. The gender homogeneity of serum zinc levels in our studies suggests that there is no hormonal effect on zinc levels of adult. The median value of serum zince levels obtained in our study (96 mg/dl) is close to values reports on normal levels of people in other

countries (Henkin et al. 1971; Helig et al., 1966). Therefore, this may be used as a reference value for the people in the northeast of Thailand. Whether zinc intake from food interfered with the values or not needs to be further analysis on the food intake of the population. However , it is important to mention that generally high zinc content sea foods are seldomly consumed in the northeast.

The lifestyles of cigarette smoking, alcohol and coffee/tea consumption as well as betel nut chewing, which did not give any differences in serum zinc levels from the non consumption group, suggest the other factors such as types of food consumption may be more involved in zinc level than behaviors. However, this notion needs to be further clarified by doing the comparative study on serum zinc level and food consumption and more number of subjects should be included in the study.

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Table 1 Serum zinc levels of people at various age ranges

Age (year)	Male		Female		Both genders	
	No.	Median(range)	No.	Median(range)	No.	Median(range)
≤35	11	86.0(64-145)	18	109.5(80-187)	29	104.0(64-187)
36-45	76	103.5(59-265)	72	90.0(10.5-281)	148	97.5(10.5-281)
46-55	44	96.5(55-195)	54	90.5(39-201)	98	92.0(39-201)
56+	32	96.0(57-184)	38	89.5(60-205)	70	94.5(57-205)
total	163	98.0(55-265)	182	93.0(10.5-281)	345	96.0(10.5-281)

Values expressed in terms of μg/dl

Table 2 Serum zinc levels of people with various behaviors and residential area

Variables	No	Median (range)
Cigarette		
Smoking	146	97.0(55-229)
Nonsmoking	199	93.5(10.5-281)
Alcohol		
Drinking	181	96.0(51-265)
Non-drinking	164	95.5(10.5-281)
Coffee/Tea		
Drinking	64	98.0(51-184)
Non-drinking	281	90.5(10.5-281)
Betel nut		
Chewing	84	89.0(39-205)
Non-chewing	261	99.0(10.5-281)
District		
Chonnabot	195	94.0(10.5-229)
Ban Fang	150	99.5(46-281)

Values expressed in terms of μg/dl

Table 3 Number and percentage distribution of subjects with various behaviors by gender and age groups

Variables	Males	Females	Age				Total
			≤35	36-45	46-55	56+	
Cigarette							
Smoking	143(98.0)	3(2.0)	11(7.5)	66(45.2)	39(26.7)	30(20.6)	146(100)
Non-smoking	20(10.1)	179(89.9)	18(9.1)	82(41.2)	59(29.6)	40(20.1)	199(100)
Alcohol							
Drinking	130(71.8)	51(28.2)	14(7.7)	93(51.4)	47(26.0)	27(14.9)	181(100)
Non-drinking	33(20.1)	131(79.9)	15(9.2)	55(33.5)	51(31.1)	43(26.2)	164(100)
Coffee/Tea							
Drinking	43(67.2)	21(32.8)	4(6.3)	26(40.6)	24(37.5)	10(15.6)	64(100)
Non-drinking	121(43.1)	160(56.9)	25(8.9)	122(43.4)	74(26.3)	60(21.4)	281(100)
Betel nut							
Chewing	4(4.8)	80(95.2)	0(0)	16(19.1)	29(34.5)	39(46.4)	84(100)
Non-chewing	160(61.3)	101(38.7)	29(11.1)	132(50.6)	69(26.4)	31(11.9)	261(100)

Values experssed in terms of number (percentage)