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Associations of Obesity, Exercise Pattern and Nutrient Intakes in Korean Americans Living in North Western Parts of USA

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Abstract

This study was conducted to find associations of obesity, exercise pattern and nutrient intakes in Korean American immigrants residing in North Western parts of USA. The structured survey forms and food frequency questionnaire that covered 67 food items were used. There was a significant difference in height for subjects by gender and age. However, the weight of females became heavier with increasing age in contrast to males. There was a great difference in BMI between the male and female group in the youngest adult group compared to the aging adults. Significant age difference in exercise pattern was shown. Dietary fiber and sodium intakes were higher in the elderly than young ones in female group. In the same young adult group Zn intakes was the highest in the male group and the lowest in the female group. Folate intakes were higher in females than in males. Strong positive correlations among height, weight and BMI were shown. Zn intake was significantly correlated with weight, height, and exercise pattern in the study. Furthermore, Zn was correlated with sodium, vitamin B6, folate, vitamin E and cholesterol.

Key words : BMI, Nutrient intakes, Korean Americans

1. Introduction

Epidemiological studies have clearly identified that dietary and life style factors are associated with a greater risk of most leading causes of death such as cancer, hypertension, coronary heart disease, cardiovascular disease and type II diabetes mellitus.[1-3] These chronic diseases have complicated origins arising from interactions between genetics, age, gender, life styles, environments and diet.[4] Especially, diet, nutrition, physical activity, health and disease are related each other.

More than 1.3 million Korean immigrants have lived in the US since Korean Americans arrived in Hawaii in 1903.[5] As the US immigrant population is growing rapidly, the health status of racial / ethnic minorities becomes an important public issue.[6] Immigration to host country is usually accompanied by environmental and life style changes that may markedly increase risk factors of chronic disease.[7] Disease patterns of immigrants to the United States are closely resemble those of home country.

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However, little is known about the health and nutritional status of Korean Americans except that traditional culture, language and food habits have been maintained. Some studies indicated that immigrants were more likely to consume traditional foods at dinner whereas breakfast and lunch were more likely to be westernized.[8,9] Dietary acculturation can result in healthful and unhealthful dietary changes.

Since populations frequently develop a disease, looking for factors that tend to be associated with that disease - such as diet choices, exercise pattern, obesity, family history is important. Such associations suggest that when these risk factors are present, the likelihood of developing the disease is increased. In this study health related factors such as nutrition, exercise obesity are examined in Korean Americans. The results of this study will help solve health related problems of Korean Americans in the community.

2. Materials and methods

2.1. Subjects and experimental design

Subjects were 277 Korean Americans residing in the state of Washington, Oregon and California. Subjects were asked to fill out the structured survey forms or

interviewed. The survey forms contain demographic information, data on food habits and health related factors. Self administered food frequency questionnaire was devised to find out information on usual food intake. Sixty seven food items consumed frequently by immigrants were chosen for the study. Nutrient intake analysis was done with the CAN program[10] and food composition tables by USDA.[11] All the survey forms and food frequency questionnaire were prepared either in English or Korean. Body mass index(BMI) was calculated from the reported height and weight. Respondents who had a BMI of less than 25 was considered to be normal. To estimate physical exercise pattern, four exercise levels determined by intensity were.[12,13]

① no exercise
② light exercise
③ moderate exercise
④ vigorous exercise

2.2. Statistical Analysis

All statistical analyses were performed using SPSS to compute mean, frequency and standard deviation. ANOVA, χ^2 test were used to find the statistical significance.

Pearson's correlation was used to compute correlation between variables. A probability value of 0.05 was chosen as the level of significance.

3. Results and Discussion

3.1. Anthropometry

The mean heights and weights for subjects by gender and age are given in Table 1. There was a signigicant difference in height for subjects by gender and age. Regardless of gender, age is a significant contributing factor to determine height in the study. Thus the older subjects are, the shorter their heights are. However, the different pattern was shown in the weight of subjects regarding gender. In females they became heavier with increasing age in contrast to males.

Table 2 shows body mass index(BMI) of subjects. Obesity is one of the major risk factors closely associated with the chronic degenerative diseases and cancer. Though there are some parameters to measure obesity, BMI has been known to be correlated with estimates of body fatness.[14] Because of its reliability and convenience, BMI is the most widely used height-weight index. In this study there was a great difference in BMI between the male and female group in the youngest adult group compared to the aging adults.

Table 1. Anthropometry of subjects

Height (cm)				
age (y)	sex	mean ± SD	range	F
19 ~ 29	m	177.5 ± 6.3	167.6 ~ 190.5	64.071
	f	162.1 ± 5.6	152.0 ~ 175.3	(P<0.01)
30 ~ 49	m	174.2 ± 5.4	162.6 ~ 184.0	
	f	160.2 ± 6.0	139.7 ~ 175.3	
50 ~ 64	m	172.1 ± 6.8	162.6 ~ 191.8	
	f	157.6 ± 4.1	150.0 ~ 167.6	
≥ 65	m	169.0 ± 6.1	160.0 ~ 184.0	
	f	156.4 ± 5.3	142.2 ~ 165.1	
Weight (kg)				
age (y)	sex	mean ± SD	range	F
19 ~ 29	m	79.1 ± 10.1	61.2 ~ 99.8	55.4
	f	52.0 ± 4.1	40.8 ~ 59.9	(P<0.01)
30 ~ 49	m	73.1 ± 7.0	63.0 ~ 90.0	
	f	55.0 ± 6.9	43.5 ~ 72.0	
50 ~ 64	m	71.2 ± 8.4	61.2 ~ 94.3	
	f	55.7 ± 7.1	43.1 ~ 74.8	
≥ 65	m	71.9 ± 10.8	54.4 ~ 95.3	
	f	58.8 ± 7.8	47.0 ~ 83.9	

Table 2. BMI of subjects

age (y)	sex (number)	mean ± SD	range
19 ~ 29	m (26)	25.1 ± 2.7	20.4 ~ 29.8
	f (37)	19.8 ± 1.3	16.4 ~ 22.3
30 ~ 49	m (24)	24.1 ± 2.2	20.5 ~ 28.3
	f (54)	21.4 ± 2.7	17.2 ~ 29.1
50 ~ 64	m (19)	24.0 ± 2.0	19.7 ~ 28.2
	f (39)	22.4 ± 2.8	16.5 ~ 29.7
≥ 65	m (28)	25.2 ± 3.6	18.6 ~ 32.8
	f (46)	24.1 ± 3.2	19.3 ~ 32.0

In female group, age difference was shown with BMI but this kind of age related pattern was not demonstrated in males. BMI in males was higher than those of females' in the same age group. However this tendency was not significant. Actually the young and the elderly male showed slight overweight by BMI. Range of BMI in young male was 9.4 which suggested that there was a great individual variation.

Table 3 shows exercise pattern of subjects. 23,8% of subjects did not engage in any exercise at all. However, 43.0% of subjects engage in light activity. 59.2% of elderly subjects engage in light activity while no vigorous

Table 3. Exercise Pattern of subjects by age n(%)

age (y)	None	Light Exercise	Moderate Exercise	Vigorous Exercise	Total	X^2
18 ~ 29	11(17.5)	19(30.2)	18(28.6)	15(23.8)	63(100.0)	39.781**
30 ~ 49	22(27.8)	32(40.5)	20(25.3)	5(6.3)	79(100.0)	
50 ~ 64	21(35.6)	23(39.0)	11(18.6)	4(6.8)	59(100.0)	
≥ 65	12(15.8)	45(59.2)	19(25.0)	0(0)	76(100.0)	
Total	66(23.8)	119(43.0)	68(24.5)	24(8.7)	277(100.0)	

P<0.01

Table 4. Nutrient intakes by gender and age

	Age (yr)	Gender		F
		male	female	
Dietary Fiber (g)	18 ~ 29	9.0 ± 2.1	8.2 ± 3.3	2.267(0.000)
	30 ~ 49	10.6 ± 4.6	10.4 ± 3.2	
	50 ~ 64	10.6 ± 3.5	10.0 ± 3.1	
	≥ 65	10.4 ± 3.9	11.3 ± 3.4	
Sodium (mg)	18 ~ 29	4608.5 ± 1256.9	3547.0 ± 1310.3	2.629(0.012)
	30 ~ 49	4869.7 ± 1861.2	4320.6 ± 1272.4	
	50 ~ 64	4323.0 ± 1492.8	3634.5 ± 1682.7	
	≥ 65	4418.1 ± 1448.4	4425.8 ± 1192.4	
Zn (mg)	18 ~29	15.1 ± 2.1	9.8 ± 2.3	12.562(0.000)
	30 ~ 49	13.4 ± 4.1	11.3 ± 2.4	
	50 ~ 64	12.5 ± 2.6	9.9 ± 2.3	
	≥ 65	10.6 ± 2.4	10.0 ± 1.9	
Vitamin B_6 (mg)	18 ~29	3.1 ± 0.6	2.6 ± 1.0	1.609(0.134)
	30 ~ 49	3.1 ± 0.9	3.1 ± 0.8	
	50 ~ 64	3.1 ± 0.8	3.1 ± 0.8	
	≥ 65	3.0 ± 1.0	3.2 ± 0.8	
Folatee	18 ~29	504.4 ± 145.9	503.0 ± 210.1	0.806(0.583)
	30 ~ 49	536.6 ± 215.2	592.1 ± 178.0	
	50 ~ 64	570.5 ± 197.9	583.2 ± 160.3	
	≥ 65	550.9 ± 276.7	572.9 ± 185.0	
Vitamin E (mg)	18 ~29	18.1 ± 6.0	16.1 ± 5.9	2.636(0.012)
	30 ~ 49	19.9 ± 11.5	17.7 ± 5.5	
	50 ~ 64	13.5 ± 6.5	15.6 ± 7.3	
	≥ 65	12.9 ± 6.2	14.9 ± 7.6	
Cholesterol (mg)	18 ~29	482.1 ± 99.1	326.5 ± 105.9	11.254(0.000)
	30 ~ 49	462.3 ± 116.1	357.8 ± 127.9	
	50 ~ 64	348.5 ± 156.6	282.4 ± 108.0	
	≥ 65	278.6 ± 122.0	253.4 ± 120.9	

activity at all to the elderly. Thus, significant age difference in exercise pattern was shown in the study.

3.2. Nutrient intakes

Nutrient intakes by gender and age are shown in Table 4. Significant differences were shown in dietary fiber, sodium and Zn. Interestingly dietary fiber intakes were higher in the elderly subjects than those of younger subjects in females. This pattern seems to be related to the practice of diet in young females. Sodium intakes were the highest in the elderly while lowest in the young females. It might be possible the elderly favored traditional food which contributed high fiber and sodium content. However, this trend was not

observed in the males. In the same young adult group Zn intakes was the highest in the male group and the lowest in the female group. Since male preferred more animal food consumption than female[9] it appears that high consumption of animal food contributed to higher intakes of Zn in males due to rich source in Zn from protein rich diets. In the same age group folate intakes in females were higher compared to males. This trend was consistant in the study except for the youngest adult group. Some studies reported that females preferred vegetable consumption to animal food, compared to males.[9,16] which may reflect high folate intakes in females. Clearly there are gender differences in food preference and consumption, which influence nutrient intakes.

3.3. Results of correlation analyses

Table 5, 6 presented correlations of selected variables in the subjects. Table 5 showed the stronger positive association between height and weight. Actually both height and weight were positively correlated with BMI. Moreover, weight was positively correlated with Zn intake and cholesterol intake respectively.

Table 5. Pearson correlation coefficients for height and selected variables

Selected variables	r	p
Weight	0.697	<0.05
BMI	0.127	<0.05
Exercise pattern	0.175	<0.05
Zn	0.393	<0.001
Vit.B_6	-0.025	>0.05
Folate	-0.044	>0.05
Vitamin E	0.101	>0.05
Cholesterol	0.378	<0.001

Table 6. Pearson correlation coefficients for weight and selected variables

Selected variables	r	p
height	0.697	<0.05
BMI	0.796	<0.001
Exercise	0.075	>0.05
Zn	0.317	<0.001
Vit.B_6	0.020	>0.05
Folate	-0.036	>0.05
Vitamin E	0.072	>0.05
Cholesterol	0.241	<0.001

Table 7. Significant ($p<0.05$) Pearson correlation coefficients for exercise pattern and selected variables

Selected variables	r	p
Age	-0.187	<0.001
Height	0.175	<0.001
Protein	0.137	<0.05
Zn	0.152	<0.05

Table 8. Significant ($p<0.05$) Pearson correlation coefficients for Zn and selected variables

Selected variables	r	p
Vit.A	0.295	<0.01
Vit.B_1	0.698	<0.001
Vit.B_2	0.667	<0.001
Vit.B_6	0.513	<0.01
Niacin	0.756	<0.01
Vit.C	0.191	<0.05
Folate	0.400	<0.05
Vit. E	0.354	<0.01
Cholesterol	0.565	<0.01

However, exercise itself was significantly correlated with not weight but height and Zn intake (Table 7).

Furthermore, protein intake was also positively correlated with exercise in the study. Age was negatively correlated with age which seemed to be possible from the physiological point of view. In the study Zn intake was the only nutrient which was significantly correlated with weight, height, exercise pattern variables. Furthermore, Zn itself was correlated with sodium, vitamin B_6, folate, vitamin E and cholesterol (Table 8).

Among these nutrients cholesterol ($r=0.57$, $p<0.001$) and vitamin B_6 intakes had the strongest positive correlations with Zn.

It might be due to the fact that protein rich diets are also rich in Zn[17] and cholesterol. Furthermore, body needs vitamin B_6 for metabolism of protein.

4. Conclusion

In the study, age is a contributing factor to determine height in both genders. However, weight in the female is more pronounced than in male which revealed that female became heavier with increasing age. Thus, there is a gender difference in weight pattern with age. As for

BMI, there is a great individual variation in young male. Compared to females, male showed high BMI in the young adult group. Significant age difference in exercise pattern was shown. In terms of nutrient intakes, there are gender difference in food preference and consumption which reflect differences in nutrient intakes such as folate and Zn. Nutrition education targeting different age and gender group will be developed and implemented. Since Zn was significantly correlated with a lot of different selected variables in the study, more research will be done to elucidate the role of Zn from aspects of interaction with different nutrients in the future study. Also the role of Zn related to exercise will be identified in order to promote health.

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