

Research Article

Nutrition Knowledge, Attitude, Behavior and Influencing Factors of Secondary School Students in Southwest China

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Abstract: The purpose of this study was to investigate the nutrition knowledge, attitude, behavior and influencing factor of middle school student in Southwest China. A questionnaire survey have been conducted on the nutrient knowledge, attitude, behavior of subjects in middle school students and high school students of Southwest Chongqing and process the data in the methods of descriptive analysis, Pearson correlation and linear regression, etc. The results indicated that the scores of middle school students' nutrition knowledge, attitude, behavior were low, except that the response of nutrition attitude was positive, the responses of nutrition knowledge and nutrition behavior were negative; Except that there was no gender difference in nutrition knowledge, there were obvious gender difference in nutrition attitude and behavior, which showed that nutrition attitude and behavior were better than that of boys; the nutrition knowledge and attitude of middle school students were influenced by gender, Grade, school position and nutrition related Grades, besides, the former one was influenced by the special influence of the living status of students and the latter one was influenced by the special influence of BMI and family communication; except the influences of gender, grade, school position, nutrition related grades, family economy, family management and control, family communication, the nutrition behavior of middle school students were also influenced by the nutrition attitude of teenagers. The conclusion was drawn that the nutrition related knowledge aimed to improve the dietary behavior of middle school students, it is required to highlight the attitude of the overall school system. In addition, family should play a positive role in improving the relationships among children.

Keywords: Family communication, family discipline, nutrient attitude, nutrient behavior, nutrient knowledge

INTRODUCTION

Healthy dietary behavior was helpful in reducing the disease incidence of children and middle school students and improving their living quality in adulthood (Zhou *et al.*, 2009a, 2009b; Li and Han, 2010; Wang *et al.*, 2012; Tian, 2010). High fat diet and low physical activities would increase the weight of middle school students and the problem was common among urban middle school students (Mikkilä *et al.*, 2004; Zhai *et al.*, 2008). If we analyze from the angle of national diet and nutrition and health survey data, the trend of insufficient intake of vitamin and mineral substance existed among the middle school students at the age of 13-17 and there was a severe phenomenon that middle school students always ate fried food and sweet drinks and they don't like eating meals, especially the breakfast. Many studies reported (Hung, 1994; Huang, 2011; Huang and Chen, 1999; Story *et al.*, 2002) that the food preference, gender, age, body mass index,

nutrition knowledge, nutrition attitude and nutrition belief are the main factors influencing the dietary behavior of middle school students. For family was the main supplier of the food in a great amount of middle school students, the socioeconomic status of family, dietary behavior of family members, communication among family members and the control of the diet of children from parents would influence the dietary behavior of middle school students as well (Neumark-Sztainer *et al.*, 1998). Therefore, to investigate the influence of family to the nutrition knowledge, nutrition attitude and nutrition behavior would help to teach middle school students the knowledge of nutrition and conduct efficient intervention. The study aims to provide important method direction for the dietary behavior of middle school students by conducting investigation and survey to the influencing factors of nutrition knowledge, attitude and behavior with the middle school students in Southwest China as the objects.

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MATERIALS AND METHODS

Materials:

Subjects: The southwest sub-research group determined to select primary and middle schools in Chongqing as the representative of the area based on the general requirements of research group of National Science and Technology Support Program. Reasons for selection were:

- Chongqing is the only area approved to establish "National Experimental Zone of Comprehensive Coordinated Reforms Balancing the Urban and Rural" in the unit of "province (municipality)".
- Chongqing is the typical mountain megalopolis "metropolis driving vast countries" with big developmental difference of areas, severe conflict of urban-rural dual structure, occupancy of above 80% of rural residents in the population of 31 million and the proportion of 4:1 of the income of urban and rural residents.

Sampling method: The method of stratified group sampling was adopted based on the implementation plan of the experiment of research group of National Science and Technology Support Program: Students of middle school group (middle school Grade 2) and high school group (high school Grade 2) were selected with the proportion of males and females close to each other as soon as possible. School positions were divided into three classes: Downtown area (metropolis), urban area of districts and counties (center of counties and districts) and villages and towns in rural areas. The questionnaire issuing units and sample quantity were confirmed with repeated discussion of related personnel in the sub-research group, based on the school condition provided by the sports bureau of each district and county, in the sequence determined based on the distances to the main urban area and in the method of random sampling. 3 Classes were selected in each school to guarantee more than 100 samples for each school. The questionnaires were issued by the course teacher after the completion of the course and shall be filled and collected immediately. 3326 questionnaire were issued and 3215 questionnaire were collected. Valid response rate was 96.6%.

Questionnaire method:

Questionnaire design: Structural questionnaire design was adopted with five aspects developed by the researchers themselves included:

- The part to be filled by the objects, including demography and family data
- Nutrition knowledge evaluated by testing
- Scale of nutrition attitude
- Scale of nutrition activities
- Behaviors for controlling weight

Objects were divided into classes (underweight, normal, overweight and obese) based on the height and weight of the objects, calculated body mass indexes and the BMI model value of the body form and physical fitness of the middle school students in our country. Related parent information, parent education, parent vocation, parent control and family communication were obtained from the family information filled by the students. Social and economic status of the family (SES) was calculated into three classes of upper income, middle income and lower income based on the quantity of the annual income of the family. The information of parent control and family communication were obtained based on a scale in the form of three questions, which adopts the Likert form of 5 points was adopted for answering the questionnaire from "never" to "always" with the score of 1-5 respectively. The results were divided into three level based on the total scores of the three items, which are score higher than 10, score between 7 and 10 and score lower than 7.

There were 57 knowledge items for the investigation of nutrition knowledge: 12 items for different food groups, 10 items for special nutrition substance, 30 items for the relationship among nutrition, food and disease and 5 items for personal weight control. The method of two-dimension response were adopted, which are "yes" or "no", therefore, the highest score for the test of nutrition knowledge is 57 and the lowest score is 0.

There were 18 items in the scale of nutrition attitude divided into four dimensions, in which, 5 items for the attitude of food selection, 2 items of emotional eating, 8 items for balanced diet and 3 items for the nutrition concern from the objects. The response mode of Likert-type of 6 points was adopted for answering the questionnaire from "strongly disagree" to "strongly agree" with the score of 1-6 respectively. The scores were on the contrary for reverse question. Therefore the highest score for the nutrition attitude scale was 108.

There were 17 items in the scale of nutrition behavior divided into four dimensions, in which, 6 items for food selection behavior, 4 items for emotional eating behavior, 2 items for balanced dietary behavior and 5 items for nutrition related knowledge behavior. The Likert-type of 5 points was adopted for answering the questionnaire from "never" to "always" with the score of 1-5 respectively. Therefore the highest score for the dietary behavior scale was 85.

Validity and reliability: The reliability of three scales of nutrition knowledge, nutrition attitude, nutrition behavior were inspected and 8 famous domestic experts were invited to evaluated the accuracy, applicability of questionnaire content validity and the representativeness of each question after the completion of the first draft of the questionnaire design. 237 students from three kinds of schools were selected to

fill the questionnaire for trial with the Cronbach α coefficient of three scales of nutrition knowledge, nutrition attitude and nutrition behavior of 0.78, 0.86 and 0.81.

Data processing: The data were analyzed with SPSS17.0 software. Methods of descriptive analysis, Pearson correlation and correlation analysis were adopted for the comprehensive processing of the investigation data with the significance level of variable amount of statistical tests confirmed as $\alpha = 0.05$.

RESULTS AND DISCUSSION

Analysis for the basic condition of objects: Table 1 shows that:

- In this study, there were 3215 valid samples, in which there were 1572 boys and 1642 girls accounting for 48.9 and 51.1% of the total quantity of the samples respectively. The number of middle school students in central urban area, cities of districts and counties, villages and towns were 1107, 1034 and 984 respectively. Underweight, normal, overweight and obese population accounted for 26.0, 54.2, 9.7 and 10.1%, respectively of the total quantity of the samples respectively. 82.4% of the objects didn't select nutrition class.
- 5.7% of the children had no parent, the family condition of most children were in the middle level (accounting for 70.0%) and the proportion of the high income family only accounted for 11.2, 47.0%, respectively of the parents controlled their children strictly, 37.2% of the parents controlled their children at a middle level and only 18.8% children were under a low level control of their parents; about 36.0% of the students thought that they had a good communication with their family, while 40.62% of the students thought that their communication with their family were at a middle level and 23.% of the students thought that their communication with their family were at a low level.

Analysis on the nutrition knowledge, attitude and behavior of objects: Table 2 shows that:

- As for the score of the nutrition knowledge, there was no gender difference in the total score, but the accuracy that the objects answered for each knowledge point was low; from the score of each scale, there was no gender difference in the scores of three dimensions of food group distinguishing, special food nutrition and nutrition and disease with the accuracy of the answers of 34.26, 72.74 and 51.44%, respectively. There was obvious gender difference in the dimension of weight

Table 1: Basic information summary of participant in this study

Item	Male N = 1572	Female N = 1643
grade		
Eleventh grade	20.8% (669)	28.0% (900)
Eighth grade	28.1% (903)	23.1% (743)
Location		
Downtown	20.9% (644)	15.1% (463)
Central Suburb	14.8% (456)	17.2% (578)
Outskirt of town	13.8% (425)	18.2% (559)
BMI		
Lean	12.4% (399)	13.6% (437)
Normal	23.5% (756)	30.7% (986)
Overweight	5.4% (174)	4.3% (138)
Obese	6.9% (222)	3.2% (103)
Nutrient learning		
Participation in learning	3.1% (100)	5.5% (177)
No learning	41.2% (1235)	41.2% (1225)
Family life		
With parents	46.3% (1489)	48.0% (1542)
Without Parents	2.6% (84)	3.1% (100)
Family finances		
SES high	5.1% (164)	6.1% (197)
SES middle	33.5% (1077)	36.5% (1173)
SES low	9.3% (299)	9.5% (305)
Family discipline		
High	23.2% (746)	23.8% (765)
Middle	17.8% (572)	19.4% (624)
Low	7.7% (248)	8.1% (260)
Family communication		
High	15.5% (498)	20.5% (659)
Middle	19.4% (624)	21.2% (682)
Low	13.7% (440)	9.6% (309)

control, which showed that girls paid more attention to weight control and management than boys.

- It can be inferred from the score of nutrition attitude that: Middle school students in Southwest Chongqing generally held a positive attitude toward nutrition condition, the positive response proportion of the average value of the total score was 66.55% (pass) and there was obvious gender difference in the attitude toward nutrition condition, which showed that the girls were more positive than boys; from the four dimensions of nutrition attitude, there was gender difference in the three aspects of food selection attitude, balanced diet attitude and nutrition knowledge attitude, which showed that girls paid more attention to food selection and nutrition knowledge, while there was no gender difference in emotional eating attitude. Response rates of the four dimensions were 56.71, 60.88, 66.73 and 74.59%, respectively.
- From the score of nutrition behavior: Middle school students in Southwest Chongqing generally held a negative attitude toward nutrition behavior with only 56.11% (negative) response rate of the total score; there was also gender difference with the nutrition behavior of girls better than boys; from the four dimensions of nutrition behavior, there was obvious gender difference in food selection behavior and balanced dietary behavior, which showed that girls gave more active responses than boys; while there was no gender

Table 2: Characteristics statistical information of nutrient knowledge, attitude and behavior of participants

Item	Male	Female	t	Active response (%)
Nutrient knowledge				
Total	27.36±8.54	28.09±7.68	p>0.05	48.74
Foods category	3.18±1.64	3.67±1.85	p>0.05	34.26
Special nutrient	6.89±2.23	7.08±2.58	p>0.05	72.74
Nutrient and disease	15.57±6.14	15.85±6.36	p>0.05	51.41
Weight control	2.59±1.47	3.87±1.64	p<0.05	64.67
Nutrient attitude				
Total	67.24±12.47	72.31±13.21	p<0.05	66.55
Food choice attitude	16.23±6.24	17.68±7.51	p<0.05	56.71
Emotional eating attitude	7.45±3.15	7.16±3.45	p>0.05	60.88
Balanced eating attitude	30.68±6.59	33.38±6.09	p<0.05	66.73
Nutrient knowledge concern	12.77±2.74	14.08±2.79	p<0.05	74.59
Nutrient behavior comparison				
Total	46.45±7.79	50.26±8.02	p<0.05	56.11
Food choice behavior	15.59±5.2754	17.06±5.2354	p<0.05	54.44
Emotional eating behavior	14.11±4.56	14.58±4.14	p>0.05	71.77
Balanced eating behavior	5.11±1.97	6.88±1.91	p<0.05	59.96
Nutrient knowledge purchase	11.63±5.35	11.87±5.14	p>0.05	47.13

Table 3: The relationship between nutrient knowledge, attitudes and behavior of participants

Variables	Regression equation 1 nutrient knowledge	Regression equation 2 nutrient attitude	Regression equation 3 nutrient behavior 1	Regression equation 4 nutrient behavior 2
Sex (0 = f; 1 = m)	0.118**	0.174**	-0.045	-0.081**
Grade(0 = 8 th , 1 = 12 th)	0.201**	-0.162**	-0.174**	-0.112**
Downtown (rural = 0)	0.014	-0.008	0.077**	-0.086**
Suburbs (rural = 0)	0.113**	0.004	-0.016	-0.012
BMI	0.028	0.092**	0.068**	0.029
Nutrient learning (yes = 1; No = 0)	0.084**	0.068**	0.074**	0.041*
Life status (yes = 1; No = 0)	0.058**	0.022	-0.027	-0.030
Family finance SES	0.004	-0.007	0.031	0.051*
Family discipline	-0.028	0.033	0.311**	0.224**
Family communication	-0.043	0.073**	0.195**	0.178**
Nutrient knowledge				-0.027
Nutrient attitude				0.336**
Test				
R	0.281	0.266	0.457	0.561
R ²	0.079	0.071	0.209	0.315
F	22.19**	19.45**	55.21**	81.36**

difference in two aspects of emotional eating behavior and purchasing behavior of nutrition knowledge. Response rates of the four dimensions were 54.44, 71.77, 59.96 and 47.13% respectively, in which the response rates of three dimensions were negative.

Analysis on the relationship among nutrition knowledge, nutrition attitude and nutrition behavior of objects:

The study took nutrition knowledge, nutrition attitude and nutrition behavior as the dependent variable (variable Y) and variables of gender, Grade, position of schools, living status, selection of nutrition class, family economy condition, parent control and family communication as influencing factors (independent variable X) and adopted coercive introducing method to establish multiple linear regression equation, in which, nutrition knowledge and nutrition attitude were not incorporated in the first regression equation at first to establish the first regression equation and then incorporated two variables into the regression equation to establish the second regression equation for the regression equation of nutrition behavior.

Table 3 shows that:

- The four regression equations were at a significance level, in which the corresponding values F of test statistics were 22.19, 19.45, 55.21 and 81.36 and the corresponding values P were all smaller than 0.05.
- The regression Eq. (1) shows that: The nutrition knowledge of middle school students was influenced by gender, Grade, position of the school, nutrition related courses selected by the students and living condition and it was indicated that 7.9% of the variation of nutrition knowledge of middle school students was caused by these factors based on R² = 0.079; It can be inferred from the sign symbol and the magnitude of standardized regression coefficient that students of female, high school students of Grade II, students in schools of districts and counties, students often taking nutrition classes and students always living with parents held better nutrition knowledge.
- The regression Eq. (2) shows that: The nutrition attitude of middle school students was influenced by gender, Grade, Body Mass Indexes (BMI), nutrition related courses and family communication, it was indicated that 7.1% of the

variation of nutrition attitude of middle school students was caused by these factors based on $R^2 = 0.071$; it can be inferred from the sign symbol and the magnitude of standardized regression coefficient that students of female, middle school students of grade II, students with relatively high BMI, students often taking nutrition classes, students with good family communication held better nutrition attitude.

- The regression Eq. (3) shows that: The nutrition behavior of middle school students was influenced by grade, central urban area, Body Mass Indexes (BMI), nutrition related courses, family control and family communication before nutrition knowledge and nutrition attitude were introduced, it was indicated that 20.9% of the variation of nutrition attitude of middle school students could be explained by these factors based on $R^2 = 0.209$; it can be inferred from the sign symbol and the magnitude of standardized regression coefficient that middle school students of Grade II, students in central urban area, students with relatively high BMI, students taking nutrition classes, students under strict family control and students with good family communication held better nutrition behavior.
- The regression Eq. (4) shows that: The nutrition behavior of middle school students was influenced by gender, Grade, central urban area, nutrition related courses, family economy SES, family control and family communication after nutrition knowledge and nutrition attitude were introduced, it was indicated that 31.5% of the variation of nutrition attitude of middle school students could be explained by these factors based on $R^2 = 0.315$; It can be inferred from the sign symbol and the magnitude of standardized regression coefficient that students of female, middle school students of Grade II, students in middle school of villages and towns, students taking nutrition classes, students with sound family economy condition, students under strict family control, students with good family communication and students with positive nutrition attitude held better nutrition behavior.
- It is easy to infer by further comparing regression Eq. (3) and (4) that: Adjusted coefficient of determination R^2 increased rapidly from 0.209 to 0.315, i.e., The influence of introduction factor improved about 10.6% after Eq. (4) introduced nutrition knowledge and nutrition attitude, from which we could infer that the nutrition attitude of middle school students would greatly influence their nutrition behaviors, while although nutrition knowledge had some influence, the influence was limited and not remarkable.

DISCUSSION

The study found out that: It was the nutrition attitude of middle school students rather than nutrition knowledge that greatly influence the nutrition behaviors of middle school students directly. Therefore, it is more important to guarantee middle school students keeping positive nutrition attitude than to increase nutrition knowledge of middle school students when implanting nutrition ideas to middle school students. Some studies (Moreno *et al.*, 2002) held the opinion that: nutrition knowledge was the precondition determining health related behavior and nutrition knowledge could change the eating motivation of middle school students, so as to cause the variation of nutrition behaviors. But the study didn't support these conclusions. Nutrition knowledge was divided into two classes of why and how from the features of nutrition knowledge itself. The nutrition knowledge of why class was mainly about how to improve nutrition motivation and how class was mainly about how to take actions. In the study, about half of the middle school students tried to lose weight, but they have insufficient nutrition knowledge, especially the knowledge about the relationship among nutrition, food and diseases, let along the knowledge about six food group distinguishing and weight control. Just as the conclusion of many studies (Young and Fors, 2001; Yang *et al.*, 2009; Jebb *et al.*, 2004): many adolescent girls would like to lose weight by the method of dieting. In the knowledge system of the girls, taking less energy or nutrition could control weight, this is the embodiment of insufficient knowledge of nutrition, diet and weight control and many medical incidents caused by dieting for losing weight emerged in endlessly among the middle school students in the whole world.

Many scholars (Thompson *et al.*, 2013; Schnoll and Zimmerman, 2001; Yannakoulia *et al.*, 2004) believed that: Students often taking nutrition related courses held better nutrition knowledge, nutrition attitude and nutrition behavior than students without taking the classes. Therefore, since nutrition related courses had positive influence on the nutrition knowledge, nutrition attitude and nutrition behavior of middle school students, then training intensity about nutrition should be reinforced in the quality-oriented education system of schools. In the current course offering of domestic schools in our country, there was no specially opened course about diet nutrition and health, the school could open some optional courses about health teaching, nutrition and health in the form of special lecture based on the actual condition, but there was no hard and fast rules specified in the macro-policies of schools. For the macro-policies of schools, college entrance examination is the most important thing for middle school students, especially students in central urban area schools, they had to take more pressure from examination and therefore, even thought

there would be a lecture about nutrition, they would pay little attention to it. It would influence the nutrition knowledge and attitude of students if students had insufficient nutrition knowledge. The only way to make up the insufficient knowledge would be the teaching from parents and the communication among family members. Therefore, the more frequent parents monitor the nutrition attitude of middle school students, the higher the enthusiasm the children would hold toward nutrition knowledge; similarly, if middle school students communicate with their families more frequently, they would hold much more positive nutrition attitude and behaviors.

In conclusion, in the current course offering of domestic schools in our country, it is necessary to open a course of "nutrition and health". Only the middle school students attend some formal courses related to nutrition, can they comprehensively and deeply understand nutrition knowledge, so as to change their nutrition attitude and behaviors. And it is not reasonable to complete the task only by parents and family members.

CONCLUSION

- The scores of the nutrition knowledge, nutrition attitude and nutrition behavior of middle school students were not high, in which the response of nutrition attitude was positive, while the response rate of nutrition knowledge and nutrition behavior was negative, therefore, the situation is not optimistic; except that there was no gender difference in the total score of nutrition knowledge, there was gender differences in nutrition attitude and behavior of middle school students, which showed that girls performed better than boys; the specific embodiment of the conclusion was that girls held better nutrition attitude, paid more attention to weight control and management, food selection, nutrition knowledge, better food selection behavior and balanced diet.
- The nutrition knowledge of middle school students was influenced by position of the school, nutrition related courses selected by the students and living condition, therefore, students of female, high school students of Grade II, students in schools of districts and counties, students often taking nutrition classes and students always living with parents held better nutrition knowledge; The nutrition attitude of middle school students was influenced by gender, Grade, Body Mass Indexes (BMI), nutrition related courses and family communication, therefore, students of female, middle school students of Grade II, students with relatively high BMI, students often taking nutrition classes, students with good family communication held better nutrition attitude.
- The nutrition behavior of middle school students was influenced by grade, central urban area, BMI, nutrition related courses, family control and family communication, therefore, students of female, middle school students of grade II, students in middle school of villages and towns, students taking nutrition classes, students with sound family economy condition, students under strict family control, students with good family communication and students with positive nutrition attitude held better nutrition behavior; the finding that in the influence made to nutrition behavior from nutrition knowledge and nutrition attitude, nutrition attitude was more important, while nutrition knowledge barely had no influence needed to be further discussed.

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