

# **Analysis of Students' Nutritional Status of in the "Nutrition Improvement Program for Rural Compulsory Education Students" Area**

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**Abstract.** To assess the nutritional development of China's "compulsory education phase" by investigating the students' nutrition status in the "Nutrition Improvement Program for Compulsory Education Students in Rural Areas". The implementation effect of the plan provides a scientific basis for the relevant departments to improve the nutrition improvement plan. Methods: A multilevel stratified cluster random sampling method was used to collect 3,358 people from 3 provinces, 7 counties, 35 primary and secondary schools. Uses excel for data entry, sorting, SPSS23.0 statistical software for statistical analysis of data. Results the rate of malnutrition among primary and secondary school students in the "planning" area was 5.8%, which was significantly lower than the 2012 pilot area(16.2%),and there was gender and regional difference ( $p < 0.05$ ); The overweight/obesity rate of students was 11.1%, which was slightly higher than the pilot area in 2012 (10.2%) Conclusion: After the implementation of the nutrition improvement program, the malnutrition rate has dropped by 10.4 percentage points compared with 2012. The "nutrition improvement plan" has obvious effects, but at the same time there was an increase in the overweight rate of obesity; anemia rate also showed a downward trend. The implementation of the "nutrition improvement plan" in China's compulsory education stage has achieved significant results, and the nutritional status of primary and secondary school students has been improved.

**Keywords:** rural compulsory education, nutrition improvement program, nutritional status, implementation effect.

## **1. Introduction**

Nutrition is the basis of individual growth, development and survival, while primary and secondary students are at a critical stage of growth and development[1], the nutritional level and health status of this period not only affect adolescents' intelligence and physical development, but also affect the nutritional status of adulthood, it is also of important significance for adolescents to develop good diet habits, prevent obesity, cardiovascular and cerebrovascular diseases and other chronic diseases[2-3]. In order to improve the nutritional status of primary and secondary students, many developed countries of Europe and Europe and America had implemented nutrition improvement program in the last century [4]. Due to the low living standards and cultural quality of poor rural areas in China, China's adolescents have various problems such nutritional deficiency, over nutrition and deficiency of nutrient intake[4], the situation is more severe than that of developed countries, for this reason, on October 26, 2011, China launched and implemented the "Nutrition Improvement Program for Rural Compulsory Education Students", which subsidized 3 yuan per student every study day for the 26 million rural compulsory education students in 699 counties of 22 provinces across the country[5]. Since the implementation of the Nutrition Improvement Program, the nutritional status of primary and secondary students has improved [6]. In order to more accurately and comprehensively understand the actual improvement situation of students' nutritional status in the five years since the implementation of this program, from May 2016 to May 2017, we selected 35 primary and secondary schools in 7 urban districts of three areas for conducting relevant research: Guizhou (southwest), Hubei (central) and Heilongjiang (north), and provided scientific basis for relevant departments to improve relevant policies and plans.

## 2. Objects and Methods

### 2.1 Objects

The multi-stage stratified cluster random sampling method was used; first of all, the provinces in China were divided into eastern, central and western three stage, one province was selected at each stage, Heilongjiang Province (eastern) and Hubei Province (central) and Guizhou Province (western) were selected in accordance with typical sampling methods; then, two counties/districts were selected from each province by random sampling method, each county randomly selected two towns, each town and township randomly selected 1 junior high school, 1 town primary school, 1 rural primary school and 1 teaching point. Students from grade 5 to grade 6 in primary school and grade 7 to grade 8 in middle school were selected from each school, students from 1-2 classes were randomly selected according to the size of students each grade to conduct a questionnaire on nutrition-related knowledge and practice and collect the nutrition monitoring data of the above students.

35 primary and secondary schools were investigated and surveyed in 7 counties and districts in 3 provinces, including grade 5 and grade 6 students in primary schools and grade 7 and grade 8 students in middle schools. Among them, 1255 students were from Guizhou Province, 1688 students were from Hubei Province, and 415 students were from Heilongjiang Province, there were 3358 people altogether, among them, 1755 students were male, which account for 52.3%, and 1603 students were female, which account for 47.7%. The investigation involves many nationalities; there were mainly the Han nationality and the Tujia nationality. As shown in Table.1.

Table 1. basic situation of the study population (n=3358)

	demographic feature	number of people	constituent ratio (%)
age	6--9	55	1.6
	10	288	8.5
	11	642	19.1
	12	827	24.6
	13	870	25.9
	14	565	16.8
	15	95	2.8
	16-20	16	0.4
grade	1--2	31	0.9
	5	811	24.2
	6	693	20.6
	7	983	29.3
	8	840	25.0
gender	male	1755	52.3
	female	1603	47.7
province	Guizhou	1255	37.4
	Hubei	1688	50.3
	Heilongjiang	415	12.3
nationality	the Han nationality	1317	39.2
	the Tujia nationality	1721	51.3
	others	320	9.5

## **2.2 Research Materials**

### **2.2.1 Nutritional Information**

nutritional data were nutritional status monitoring data of the target population monitored by the local health insurance center or disease control center. The main contents were the student's age, grade, height and weight.

### **2.2.2 Interviews with School Leaders, Managers, Canteen Staff and Related Teachers**

The interview contents mainly focus on feeding mode, the construction condition of canteen and the problems during the operation of the nutritious lunch.

## **2.3 Statistical Analysis Methods**

All data was input by using excel, and SPSS 23.0 statistical software for processing and analysis.

## **3. Results**

### **3.1 Students' Nutritional Status in the "Program" Areas in 2016**

The body mass index  $BMI = \text{body weight(kg)} / [\text{height(m)}]^2$  was calculated in accordance with height and weight, and students' nutritional status was judged by the national student physical health standard (revised in 2016). The influence of gender, nationality and region on students' nutritional distribution was tested through the chi-square test.

There was a significant difference in the distribution of body mass index between boys and girls in gender differences. The results show that boys (7.1%) were larger than girls (4.4%). In addition to malnutrition, the boys' (11.2%) overweight and obesity rate was higher than girls (10.9%), and girls' nutritional status is better than that of boys.

There was a significant difference in the distribution of body mass index of the Han nationality, the Tujia nationality and other nationalities. In malnutrition rate, other minority nationalities (8.4%) were, higher than the Han (6.4%) and Tujia students (4.9%). The overweight and obesity rate (9.8%) was also lower than that of the Han nationalities (14.0%) and other minority students (11.7%). The normal rate nutritional status of Tujia students (85.3%) was higher than that of the Han students (79.6%) and other minority nationalities (80.0%). The nutritional status of the Tujia students was better than the Han students.

There was also significant difference in body mass index in the southwest, northeast, and central region in regional differences. The normal weight rate of southwestern region (83%) was higher than that of the central (79.6%) and the northeastern region (75.4%). In the overweight and obesity rates, the southwestern region (10.3%) was lower than the central (14.0%) and Heilongjiang (18.6%). In malnutrition rate, the gap of the three regions was small. In general, the nutritional status of the southwest region was better than that of the central and northeastern region.

### **3.2 Nutritional Status of Primary and Secondary Students before and after the Implementation of the "Nutrition Improvement Program"**

Through the Z test, the results of this survey were compared with the baseline data in 2012[7], the malnutrition rate was significantly lower than the 16.2% of the 2012 compulsory education nutrition improvement pilot area, which decreased by 10.4 percentage points. The overweight and obesity rate was higher than that of the pilot area in 2012 (9.2%).

The results of gender differences and regional differences were shown in Table.3. It can be seen from distribution of body mass index of boys and girls that the malnutrition rate of boys and girls has decreased, and the normal rate of nutrition has increased, while the overweight and obesity rates of boys and girls have increased.

Table 2. comparison of nutritional status of students with different genders, nationalities and regions in the nutrition improvement program region

classification		number of people	malnutrition	normal	overweight	obese	c2	p
gender	male	1755	124(7.1)	1434(81.7)	123(7.0)	74(4.2)	12.23	<0.05
	female	1603	71(4.4)	1357(84.7)	119(7.4)	56(3.5)		
nationality	Han	1317	84(6.4)	1048(79.6)	104(7.9)	81(6.1)	44.99	<0.05
	Tujia	1721	84(4.9)	1467(85.3)	109(6.3)	41(3.5)		
	others	320	27(8.4)	256(80.0)	29(9.1)	8(2.5)		
region	Guizhou	1255	84(6.7)	1043(83.1)	97(7.7)	31(2.5)	45.22	<0.05
	Hubei	1688	84(6.4)	1048(79.6)	104(7.9)	81(6.1)		
	Heilongjiang	415	25(7.0)	313(75.4)	41(9.9)	36(8.7)		
total		3358	195(5.8)	2791(83.1)	242(7.2)	130(3.9)		

The malnutrition rate and overweight and obesity rate in the central region all decreased in regional differences, while the normal nutrition rate increased, in the western region, the normal nutrition rate increased, the malnutrition rate decreased, and the overweight and obesity rate did not have significant difference, the normal nutrition rate in the eastern region rose, the obesity rate decreased and the malnutrition rate did not change. Overall, whether in the central, western or eastern regions, the nutritional status of students had improved.

Table 3. constituent ratio of students' different nutritional status in nutritional program improvement area in 2016 and 2012 (%)

year	boy			girl			central			west			east		
	malnutrition	normal	overweight												
2012	19.0	69.2	11.8	15.8	75.8	8.4	14.4	73.8	11.8	20.1	71.1	8.8	5.1	60.0	34.9
2016	7.1	81.7	11.2	4.4	84.7	10.9	5.1	85	9.9	6.7	83.1	10.2	6.0	75.4	18.6
Z	12.7	11.3	0.8	12.5	8.3	3.6	10.9	10.5	2.4	12.7	9.4	1.8	0.8	6.4	7.0
P	<0.05	<0.05	>0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	>0.05	>0.05	<0.05	<0.05

## 4. Discussion

### 4.1 The Primary and Secondary Students' Nutritional Status in the "Nutrition Improvement Program Area" in China's Compulsory Education Stage is Improved Compared with before Implementation

The research results showed that the malnutrition rate of primary and secondary school students in the "program" areas decreased by 10.4 percentage points in 2016 compared with 2012 (16.2%). Since the "program" was launched, the school had provided nutritional supplements to students from various aspects such as lunch and class meals, which had improved the nutritional status of students. This study is consistent with many studies. For example, the detection rate of malnutrition of boys and girls in the "Nutrition Improvement Program" area of Hubei Province in 2016 was (5.90%, 4.14%), which was significantly lower than the detection rate of malnutrition of rural students aged 7-18 in Hubei Province in 2014 (7.73%, 5.76%) [8]. The detection rate of malnutrition of students in the "Nutrition Improvement Program" of Guizhou compulsory education in 2016 was 6.7%, which was significantly lower than the 20.1% detection rate of malnutrition of rural students aged 7-18 in Guangxi Zhuang Autonomous Region in the southwest of China in 2012[9].

The nutritional status of girls is better than that of boys. The gender difference may be mainly because the boys are at the second growth peak, their metabolic rate is higher, and the boys' exercise amount is larger than that of the girls, boys have more consumption and a good appetite, boys live in situations where they are not full and hungry quickly, and it may cause boys' malnutrition to be higher than girls.

The malnutrition of Tujia students is lower than that of Han students; the incidence of malnutrition in Southwest China is lower than that in the central and eastern China, This may be due to the fact that Tujia students are all from Hubei and Guizhou regions in the national pilot program, the Han students mainly come from the national pilot Heilongjiang Province and the local pilot Chongyang County of Hubei Province, it may be related to policy support, feeding patterns and other factors. It was found from this survey interview that the southwestern region conforms to the 4 yuan/day national unified standard for nutrition and dietary subsidies in the pilot counties of the country, while as a provincial pilot county, the central region was raised from 1 yuan/day/ to 2.5 yuan/day. But there is still a gap in the amount. And in the feeding mode, nutritional meals are mainly in southwest China, while dietary supplements are provided in the form of milk + small cakes in the central region, this scheme is not conducive for schools to carry out nutritional dietary supply according to the actual situation of the school, nor is it conducive for students to choose the most suitable nutritional dietary supplements for themselves. Therefore, the malnutrition in the southwest region is lower than that in the eastern and central regions; the malnutrition of poor Tujia students mainly in the southwestern region is lower than that of other nationalities.

### 4.2 The Overweight and Obesity Rate is Higher than before the Implementation of the Nutrition Improvement Program

The student's overweight and obesity rate increased by 1.9 percentage points compared with the pilot area in 2012, the main reasons are as follows: (1) during the on-site interview, we found that the household lunch cost of students is used by some students to buy fast food, junk food and midnight snack due to the implementation of the free nutritious lunch, and junk food is an important factor leading to adolescent obesity [9], in addition, eating midnight snack is also a major factor affecting adolescents overweight and obesity. (2) The food provided by the nutritious meal is still mainly energy boost, and there are some schools without canteens in the pilot school, single nutritious meal structure, and poor quality [11], etc. Lack of comprehensive and balanced nutrients ultimately leads to nutrient deficiencies, malnutrition, increase of overweight and obesity rate and so on. There is unreasonable food ratio and uneven nutrition distribution in "Nutrition Improvement Program", etc., which needs to be continuously improved. Follow-up can analyze the status quo and problems in the implementation process of nutrition improvement from the aspects of feeding mode, balanced

nutrition and canteen supporting equipment, and provide a reliable basis for better implementation of nutrition improvement program.

## 5. Conclusion

Since the "Nutrition Improvement Program" was implemented for 5 years, the nutritional status has been greatly improved, but moreover, there is the increase of overweight and obesity, etc. The feeding mode and nutritional balance need to be further studied and improved. In short, China's "nutrition improvement program for compulsory education" has achieved some results, but it is still not perfect, there is still much room for improvement in the aspects of feeding mode and nutrition balance, which needs further research.

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