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The Change of Children and Adolescents Growth and Development in 20 Years in Shenmu City, China

Juan Liu[1]
Yonglin Liu[2*]
Meiyun Du[3]
Yan Niu[1]
Zhilong Liu[2]
Shujiao Su[1]

[1]Department of Children's Health Care, Shenmu City Hospital, Shaanxi, Shenmu, China
[2]Department of Pediatrics, Shenmu City Hospital, Shaanxi, Shenmu, China
[3]Department of Statistics, Shenmu City Hospital, Shaanxi, Shenmu, China

Abstract

Objective: To understand the changing trend of growth and development of children aged 6-13 in Shenmu City, and to provide a theoretical basis for further improving the health level of children in this area and formulating scientific nutrition intervention measures.

Method: The height and weight of 6-13-year-old children in 5 primary and secondary schools and kindergartens in Shenmu citywere measured in 1998 and 2018 respectively by sampling survey, and the growth trend of children's physique was analyzed and compared.

Result: During the past 20 years, the height and weight of boys and girls aged 6-13 have increased significantly.The proportionof malnutrition was increased (χ^2= 80.171, P=0.001). The proportion of excess nutrition was increased (χ^2 = 76.294, P =0.001).

Conclusion: Growth and development showed a significant growth trend, but faced with the dual challenges of malnutrition and excess nutrition.By increasing the input of nutrition management, carrying out food, education into school activities, changing children's own nutrition concept, so as to improve children's health level.

Keywords

Children; Adolescents; Growth and Development ShenmuCity

Introduction

Growth and development are the most basic life phenomena and characteristics of children, With the rapid development of Shenmu's economy and the change of dietary structure and lifestyle, the growth and development level of school-age children and adolescents have been continuously improved, and the nutritional status has been continuously improved [1,2]. In order to understand the growth and nutrition, health status of children and adolescents in shenmu city, this paper analyzes the growth and development trend of students in the past 20 years, and provides the basis for the further development of scientific nutrition intervention measures.

Materials and Methods

Target

Based on the economic situation, geographical location and geomorphology the whole group stratified sampling method was adopted to select the children and adolescents of 5 primary and secondary schools.

Method

Uses the lever scale and height gauge in accordance with the nationalstandard for field investigation. Take off your shoes, socks, hat, and coat, and measure in centimeters (cm) with a reading accurate to 0.1 cm. The weight was measured in kilograms (kg), recorded to two decimal places, and the weight was accurate to 0.5 kg. Body Mass Index (BMI)= weight/ height 2 (kg/m2).

Referral criteria for physical growth assessment

Malnutrition refers to the age group of BMI below the screening criteria.Children aged 7 and above are screened for over-nutrition, including overweight and obesity according to the national standard "technical specifications for student health examination" [3].

Quality control

Centralized trainings of child health workers, unified inspection methods; Timing

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***Corresponding author:**
Yonglin Liu
Department of Pediatrics
Shenmu City Hospital
Shaanxi, Shenmu, China
Tel:13389120319
E-maillylsmxyy@163.com

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calibration of scale and height gauge; Synchronously retest 10 survey objects randomly every day to reduce the error.

Statistical methods

SPSS 19.0 was used for statistical analysis, using the independent sample t test and variance analysis, and multiple comparisons between multiple sample mean were performed using LSD-t test. P <0.05 was statistically significant.

Results

Basic information

904 and 1718 students aged 6-13 were enrolled in 5 primary and secondary schools and kindergartens in 1998 and 2018, respectively. The sample size of each gender group was 489 ~ 969 males and 415 ~ 749 females.

Height increase

Over the past 20 years, the average male height of children between the ages of 6 and 13 increased by 9.60 cm (t =14.185, P =0.001); The average female growth was 6.41 cm, with a statistically significant difference (t =8.199, p =0.001, Table 1).

Weight gain

Over the past 20 years, the average male weight of adolescents aged 6 to 13 has increased by 4.60 kg, with a statistically significant difference (t =9.483, P =0.001); The average growth of girls was 1.68 kg, the difference was statistically significant (t =3.190, p =0.001, Table 2).

Detection of malnutrition

The detection of malnutrition in children and adolescents aged 6 to 13 years before and after 20 years is shown in Table 3. The total malnutrition ratio of children aged 6-13 was 2.10% in 1998 and 13.04% in 2018, and the difference was statistically significant (2=80.171, P=0.001).

Detection of overnutrition

Overnutrition among children and adolescents aged 6 to 13 years before and after 20 years is shown in Table 4. In 1998, the proportion of children aged 6-13 years was 9.96%, and in 2018, the proportion of children aged 6-13 years was 24.10%. There was a statistically significant difference in the composition ratio of overnutrition (χ^2=76.294, P=0.001).

Discussion

Growth in height and weight

The growth and development level of children and adolescents is the main index reflecting the nutrition and health status of children and the comprehensive reflection of the national economic and social development level. In the 20th century, due to the development of social economy and theimprovement of medical care, the height and weight of children increased significantly compared with the 19th century [4,5]. By analyzing the changing trend of the growth and development level of children and adolescents in Shenmu City from 1998 to 2018, it was found that the average height of children and adolescents aged 6 to 13 years in Shenmu City increased by 9.60 cm (male) and 6.41 cm (female), and the average weight increased by 4.60 kg (male) and 1.68 kg (female) in 20 years. The improvement of its growth and development level reflects the rapid development of the economy to create a good living environment for children, and improve the level of health care.In particular, since March 1,2009, Shenmu County has implemented “free medical care for the whole people “, covering more than 99% of the total population of the

	Boys				Girls			
	1998	2018	T value	P value	1998	2018	T-value	P value
6	108.61 ± 3.38	117.98 ± 7.02	5.299	0.001	106.97 ± 4.78	116.33 ± 5.06	6.195	0.001
7	113.49 ± 5.08	124.88 ± 5.46	14.733	0.001	113.47 ± 4.50	123.43 ± 5.22	12.356	0.001
8	118.9 ± 6.38	130.36 ± 6.06	12.101	0.001	117.78 ± 4.45	128.65 ± 6.136	9.684	0.001
9	124.46 ± 5.49	135.73 ± 7.23	11.631	0.001	122.74 ± 6.21	133.94 ± 5.83	11.491	0.001
10	128.3 ± 5.02	141.43 ± 6.88	12.997	0.001	128.09 ± 6.34	139.92 ± 6.76	11.389	0.001
11	133.87 ± 5.09	144.91 ± 7.35	10.084	0.001	136.6 ± 8.918	144.07 ± 14.24	3.622	0.001
12	138.93 ± 7.37	150.22 ± 7.82	8.237	0.001	138.69 ± 7.42	150.62 ± 6.28	8.576	0.001
13	142.01 ± 5.71	159.43 ± 10.34	8.858	0.001	143.63 ± 6.42	156.48 ± 2.95	5.437	0.001
Grand total	125.38 ± 12.60	134.98 ± 11.60	14.185	0.001	127.74 ± 13.53	134.15 ± 12.38	8.199	0.001

Table 1: Height distribution and comparison of children aged 6-13 years before and after 20 years (±S, cm)

	Boys				Girls			
	1998	2018	T value	P value	1998	2018	T value	P value
6	18.97 ± 1.73	22.71 ± 3.36	8.251	0.001	18.21 ± 1.96	22.71 ± 3.36	6.875	0.001
7	21.48 ± 2.58	25.75 ± 5.16	6.495	0.001	20.56 ± 2.07	23.87 ± 3.77	6.195	0.001
8	23.94 ± 3.64	28.98 ± 7.60	4.747	0.001	22.00 ± 1.78	26.38 ± 5.77	4.423	0.001
9	25.75 ± 2.79	31.5 ± 7.93	5.835	0.001	24.53 ± 2.94	29.08 ± 6.59	4.711	0.001
10	28.17 ± 2.88	35.55 ± 9.43	5.702	0.001	27.58 ± 3.54	32.98 ± 8.17	4.801	0.001
11	30.22 ± 3.17	37.77 ± 9.36	5.782	0.001	31.42 ± 4.49	36.25 ± 8.623	3.958	0.001
12	34.44 ± 4.707	41.58 ± 8.77	5.728	0.001	35.4 ± 7.63	40.35 ± 8.76	3.094	0.003
13	37.04 ± 5.37	46.28 ± 10.87	4.691	0.001	39.48 ± 6.80	45.74 ± 9.12	2.534	0.014
Grand total	27.17 ± 6.75	31.77 ± 9.59	9.483	0.001	28.39 ± 8.43	30.07 ± 8.71	3.19	0.001

Table 2: Weight distribution and comparison of children and adolescents aged 6-13 years after 20 years (±S, cm)

	1998		2018		χ2	P value
	Number of persons tested	wasting rate (%)	Number of persons tested	wasting rate (%)		
6	103	1.94	134	0.75	0.158	0.691
7	125	2.4	283	10.25	7.387	0.007
8	90	1.11	288	11.81	9.334	0.002
9	118	0.85	323	14.55	16.723	0.001
10	117	0	307	14.98	19.664	0.001
11	110	2.73	262	18.7	16.442	0.001
12	133	3.76	98	14.29	8.282	0.004
13	108	4.63	23	17.39	4.827	0.028
Grand total	904	2.1	1718	13.04	80.171	0.001

Table 3: distribution and comparison of malnutrition in children and adolescents aged 6-13 years before and after 20 years (n, %)

	1998		2018		χ2	P value
	Number of persons tested	Overweight rate	Number of persons tested	wasting rate (%)		
6	21	9.52	134	48.51	17.095	0.001
7	103	22.33	283	26.15	0.963	0.326
8	125	21.6	288	28.13	4.752	0.029
9	90	16.67	323	21.36	16.224	0.001
10	118	5.08	307	21.5	14.308	0.001
11	117	5.98	262	17.94	19.993	0.001
12	110	0.91	98	11.22	6.274	0.012
13	133	3.01	23	4.34	0.151	0.698
Grand total	904	9.96	1718	24.1	76.294	0.001

Table 4: Distribution and comparison of over nutrition in adolescents aged 6 to 13 years before and after 20 years (n,%)

county [6], so that the diseases that affected growth and development in the past have been controlled, the growth potential of children has been brought into full play, and the height and weight have increased. This phenomenon is also consistent with other domestic reports [7].

Malnutrition

From 1998 to 2018, the proportion of malnutrition composition was 2.10%, the total proportion of malnutrition composition was 13.04%, and the difference in malnutrition composition was statistically significant after 20 years ($\chi2=80.171$, $P<0.05$). This suggests that malnutrition is more serious than it was 20 years ago.Perrinb [8] reported in 2003 that the global prevalence of malnutrition was 1.3–20.9%. The causes of the analysis were related to: emotional abnormalities, celiac disease, thyroid diseases, eating abnormalities, malabsorption, chronic infection or immune abnormalities, gastroesophageal reflux, Inflammatory Bowel Disease (IBD), chronic lung disorders, irritable bowel syndrome, congenital metabolic abnormalities, congenital heart disease or heart failure, malignant tumors [6,9-12]. Caused by social and environmental behavior factors: due to the neglect of the child by the carriers, improper introduction of solid food, poor eating habits or eating behavior, disturbed parent-child relationship, parental anxiety, and poor feeding skills. The gap between the above and the World Health Assembly's development goal:" Eliminating all forms of malnutrition by 2030" is still large, and there is a need to continue to invest more in nutrition management.

Overnutrition

By sorting out the data of the medical examination of children and adolescents aged 6 to 13 years in the Shenmu City from 1998 to 2018, the total overweight and obesity composition ratio in 1998 was 9.96%, and that of children and adolescents aged 6 to 13 years in 2018 was 24.10%. The composition ratio of overweight and obesity was statistically significant around 20 years ($\chi2=76.294$, $P<0.05$). For the reasons for the higher proportion of over-nutrition among the respondents, consideration was given to the increase in the overall socioeconomic situation and the adequate food supply, because of the parents'erroneous nutrition concept and unreasonable dietary structure, the choice of food types was more blind, and some students liked to eat unhealthy snacks, coupled with the lack of necessary exercise, resulting in an upward trend of over-nutrition composition ratio.

In the face of the dual challenge of malnutrition and overnutrition, comprehensive intervention measures are needed [13-16]. It is particularly important to change children's self-nutrition concept. Government departments and education and health workers can enhance school teachers and students'awareness of nutrition health and cultivate their own healthy dietary behavior and lifestyle through carrying out feeding and education activities.

Conclusion

Growth and development showed a significant growth trend, but faced with the dual challenges of malnutrition and excess nutrition. By increasing the input of nutrition management, carrying out food education into school activities, changing children's own nutrition concept, so as to improve children's health level.

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