

# Investigation on The Status of Physical Development, Anemia and Caries of Preschoolers in Chongqing

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## ABSTRACT

Period of preschool is important for children's growth and development, which has a far-reaching impact on children's health in the near and long term. The aim of this study was to understand the physical development, anemia and caries status of children aged 3-6 years in Chongqing, so as to provide reference for children health care work. The physical examination data of 2573 preschool children in Chongqing were collected by convenience sampling for descriptive analysis and difference test. The rates of growth retardation, underweight, emaciation, overweight, obesity, caries and anemia were 12.24%, 1.71%, 7.38%, 5.05%, 38.09% and 13.37%. Boys had lower rates of underweight and anemia than girls( $P=0.000$ ). The rates of growth retardation, underweight, caries and anemia were lower in urban areas than that of in rural areas( $P < 0.05$ ). The regional difference of body symmetry was statistically significant. Age differences in underweight and caries were statistically significant. Physical development of preschool children in Chongqing needs to be promoted, and the incidence of common diseases was high, and effective measures should be taken to intervene.

**Keywords:** *Preschool children, Physical development, Chongqing, Caries, Anemia*

## 1. INTRODUCTION

Preschool is the period of rapid development which is the key to the growth and development of preschoolers. If preschoolers cannot guarantee a balanced nutrition, adequate physical activity and good living habits, they are prone to growth retardation, underweight, overweight, obesity and other physical development deviation, and also easy to cause anemia, caries or other common diseases, which can affect children's current or long-term health. Physical growth measurement and evaluation of preschoolers is the most convenient, economical and non-invasive method for monitoring and intervening the health and nutritional status of individual and group children. The purpose of this study is to understand the physical development of children aged 3-6 years in Chongqing, and to provide reference for the health care work of preschoolers in Chongqing.

## 2. OBJECT AND METHODS

### 2.1 Object

13 kindergartens were selected from in Nanan district, Yuzhong district, Liangjiang new district, Jiangbei district, Wanzhou district and Wushan county by convenience sampling. The physical examination data of all children in the kindergarten were collected, and 2763

children participated in the physical examination, and 2573 children met the inclusion criteria. Inclusion criteria: 1) Age 3-6; 2) No organic diseases; 3) No secondary obesity; 4) No history of illness in the two weeks before the physical examination; 5) Complete physical examination data. 6) Informed consent was obtained from the parents.

### 2.2 The diagnostic criteria and evaluation methods

Weight-for-age (WAZ) below  $-2S$  is considered underweight, and height for age (HFA) below  $-2S$  is considered growth retardation. Height and weight standards refer to the reference standard for growth and development of children under 7 years old.

Body mass index (BMI) was used to assess body symmetry. BMI criteria refer to the percentile scale of body mass index of Chinese children aged 2 to 18 years in 2009. BMI below the 3rd percentile (P3) of the same age and gender is considered as emaciation; BMI higher than the 85th percentile (P85) of the same age and gender and lower than the 95th percentile (P95) is considered overweight. BMI higher than the 95th percentile (P95) of the same age and gender is considered obese[1].

The criteria of anemia refer to the diagnostic criteria of the eighth edition of Pediatrics[2]. Hemoglobin (Hb)  $< 110\text{g/L}$  at 6-59 months and Hb  $< 115\text{g/L}$  at 5-11 years old were diagnosed as anemia.

The criteria for caries refer to the methods of the 4th national oral health epidemiological survey in 2015 and the 5th

edition oral health epidemiological survey by the world health organization in 2013[3].

**2.3 Statistical Method**

SPSS20.0 was statistically analyzed. Composition ratios or rates were used for statistical description of data. Chi-square tests were used to compare differences in composition ratios or rates. Bonferroni test was used for pairwise comparison.  $P < 0.05$  was considered statistically significant.

Table 1. The basic information of the object

Age	Total	Gender		Areas	
		Male	Female	Urban	Rural
3.0~	802(31.17%)	418(52.12%)	384(47.88%)	428(53.37%)	374(46.63%)
4.0~	899(34.94%)	447(49.72%)	452(50.28%)	416(46.27%)	483(53.73%)
5.0~	872(33.89%)	402(46.10%)	470(53.90%)	426(48.85%)	446(51.15%)
Total	2573(100.00%)	1267(49.24%)	1306(50.76%)	1270(49.36%)	1303(50.64%)

Note:5.0~ on behalf of 5~6

**3.2 Physical Development Deviation of Preschoolers of Different Genders, Areas and Ages**

The growth retardation rate was 13.06%. There was no significant difference in growth retardation rate among different ages and genders. The growth retardation rate (4.41%) in urban areas was lower than that in rural areas (21.49%), and the difference was statistically significant ( $\chi^2=165.25, P=0.000$ ). See table II.

The underweight rate was 12.24%. The underweight rates in males (9.87%) and urban (8.03%) were lower than those of females (14.55%) and rural (16.35%), with statistically significant ( $\chi^2=13.12$  and  $41.39, P=0.000$ ). The difference of underweight rate among different ages was statistically significant ( $\chi^2=18.21, P=0.000$ ). The rate of underweight among 5 years old was higher than that among 3 years and 4 years old children, respectively. See table 2.

**3.3 Body Symmetry of Preschoolers of Different Genders, Areas and Ages**

The proportion of children who are emaciation, overweight and obese were 1.71%, 7.38% and 5.05%,

**3. Results**

**3.1 The Basic Information of The Object**

2753 children met the inclusion criteria, including 1267 males and 1306 females, with 1270 children in the urban and 1303 in the rural, see table 1.

respectively. There was no significant difference in body symmetry among different age and gender. Regional differences in body symmetry were statistically significant ( $\chi^2=48.30, P=0.000$ ). The rates of emaciation and obesity in urban children was higher than that in rural. See table 2.

**3.4 Incidence of Caries and Anemia of Preschoolers of Different Genders, Areas and Ages**

The dental caries rate was 38.09%. There was no significant difference in dental caries rate among different genders. The rate of dental caries in urban (32.20%) was lower than that in rural (43.82%), and the difference was statistically significant ( $\chi^2=36.81, P=0.000$ ). The rate of dental caries in different age groups was statistically significant ( $\chi^2=9.31, P=0.010$ ). 5 years old children dental caries rate was higher than 3 years old children. See table 2.

The anemia rate was 13.37%. There was no significant difference in anemia rate among different ages. The anemia rate in male (10.66%) and urban area (6.06%) was lower than that in female (16.00%) and rural area (20.49%), respectively, and the difference was statistically significant ( $\chi^2=15.88$  and  $115.60, P=0.000$ ). See table 2.

Table 2. comparison of physical development deviation and common disease detection in different gender, ages and areas (n, %)

Items	Groups	Sample size	Growth Retardation	Underweight	Emaciation	Overweight	Obese	Dental Caries	Anemia
Genders	male	1267(49.24%)	180(14.21%)	125(9.87%)	27(2.13%)	90(7.10%)	60(4.74%)	464(36.62%)	135(10.66%)
	female	1306(50.76%)	156(11.94%)	190(14.55%)	17(1.30%)	100(7.66%)	70(5.36%)	516(39.51%)	209(16.00%)

	<b>total</b>	2573(100.00%)	336(13.06%)	315(12.24%)	44(1.71%)	190(7.38%)	130(5.05%)	980(38.09%)	344(13.37%)
	<b><math>\chi^2</math></b>		2.90	13.12		3.36		2.28	15.88
	<b>P</b>		0.089	0.000		0.340		0.132	0.000
	<b>urban</b>	1270(49.36%)	56(4.41%)	102(8.03%)	44(3.46%)	100(7.87%)	68(5.35%)	409(32.20%)	77(6.06%)
	<b>rural</b>	1303(50.64%)	280(21.49%)	213(16.35%)	0(0.00%)	90(6.91%)	62(4.76%)	571(43.82%)	267(20.49%)
<b>Areas</b>	<b>total</b>	2573(100.00%)	336(13.06%)	315(12.24%)	44(1.71%)	190(7.38%)	130(5.05%)	980(38.09%)	344(13.37%)
	<b><math>\chi^2</math></b>		165.25	41.39		48.30		36.81	115.60
	<b>P</b>		0.000	0.000		0.000		0.000	0.000
	<b>3.0~</b>	802(31.17%)	105(13.09%)	94(11.72%)	14(1.75%)	55(6.86%)	40(4.99%)	283(35.29%)	123(15.34%)
	<b>4.0~</b>	899(34.94%)	74(8.23%)	83(9.23%)	13(1.45%)	53(5.90%)	50(5.56%)	330(36.71%)	109(12.12%)
	<b>5.0~</b>	872(33.89%)	56(6.42%)	138(15.83%)	17(1.95%)	82(9.40%)	40(4.59%)	367(40.09%)	112(12.84%)
<b>Ages</b>	<b>total</b>	2573(100.00%)	235(9.13%)	315(12.24%)	44(1.71%)	190(7.38%)	130(5.05%)	980(38.09%)	344(13.37%)
	<b><math>\chi^2</math></b>		0.45	18.21		9.84		9.31	4.09
	<b>P</b>		0.799	0.000		0.132		0.010	0.129

## 4. Conclusion

The level of growth and development is one of the important indicators to measure the nutrition and health status of children. Preschool period is critical for growth and development. Balanced nutrition and healthy living habits are especially important for the growth and development of preschoolers.

### 4.1 Developmental Deviation of Preschoolers in Chongqing

Height, weight and BMI [4] are important indicators to reflect the growth, nutrition and health of children, and are also the main monitoring contents of children's health services in China. This investigation showed that the growth retardation rate was 13.06%, higher than the national nutrition and health survey in 2012 (3.2%) [5] and the underweight rate was 12.24%, higher than the mid-term statistical monitoring report of the program for the development of Chinese children (2011-2020) in 2016 (1.49%) [6]. Rates of growth retardation and underweight were also higher than that in other parts of the country [7-8]. BMI is a neutral and reliable indicator that is commonly used in the world to measure the body symmetry and health. This investigation showed that the rate of emaciation was higher than Xi'an or Taizhou and the rates of overweight and obesity were lower than Xi'an or Taizhou [4] [8]. In addition to gender differences in underweight rate, there were no gender, regional or age differences in growth retardation rate and body symmetry. Thus it can be seen that the body symmetry of preschoolers in Chongqing is moderate, but the physical development is not optimistic. Active measures should be taken to improve the nutritional status of preschoolers and promote their physical development.

### 4.2 Caries and Anemia in Preschoolers in Chongqing

The dental caries rate of preschoolers was 38.09%, which was lower than the statistical results of the 3rd national oral health epidemiology survey (64.34%), and lower than the

results of Chongqing municipal survey in 2013 (54.08%) and 2016 (51.4%), respectively [9-10]. The results of this survey were lower than those of Chongqing and the national a decade ago, which may be related to the choice of respondents. However, compared with other countries, preschoolers in Chongqing are still at a high level of caries prevalence. Like other findings, this study found no gender differences in dental caries rates. This study found that the caries rate of rural children was higher than that of urban children. The reason for the difference may be related to the level of economic development of urban and rural areas, the attention paid by parents to oral problems and children's living habits. Studies have shown that the caries rate of children aged 3-5 years in Chongqing region basically increases by 10% with each year of age [10]. The survey also shows that there is significant age difference of caries rate, and increased with age. At present, the comprehensive oral disease intervention program for preschool children in Chongqing (fluoride paint) is concentrated in three main areas (Yubei, Yuzhong, and Shapingba). It can be considered to add intervention in other areas to benefit more preschool children. Moreover, the prevention and treatment of decayed teeth from 2 years old is helpful to strengthen the early intervention of decayed teeth in preschoolers, so as to avoid the aggravation of decayed teeth with age.

The prevalence of anemia was 13.37%, higher than the result (4.79%) of the medium term monitoring and testing reported of 2016 program on the development of children in China (2011-2020) [6], and lower than that of the 2013 Chongqing survey [11]. In line with other findings [12], the difference of anemia rate between urban and rural areas is large. According to the outline for the development of children in China (2011-2020), the rate of anemia among children under the age of five should be kept below 12% by 2020. However, the prevalence of anemia in rural children is much higher than this level. The nutritional status of children under 5 years old in China has always been significantly different between urban and rural areas, and the malnutrition rate of children in rural areas is higher than that in urban areas. This is mainly due to the imbalance economic development between urban and rural areas. In addition, the survey showed gender differences in anemia rates, which may be related to differences in dietary preferences and physical development status between boys and girls.

### 4.3 summary

In summary, the physical development status of preschoolers in Chongqing was not optimistic. The rate of growth retardation, underweight and overweight is higher than the national level and some cities, and the prevalence of dental caries and anemia is slightly lower than the national level. Physical development, symmetry and common diseases all have some differences between urban and rural areas. This is mainly because physical development of preschoolers is influenced by various factors such as heredity, environment, nutrition, diseases, among which the nutrition and growth environment are especially important. In terms of nutrition, children in urban areas are superior to rural areas, so the indicators of nutritional status of children in urban are superior to children in rural. In terms of growth environment, the living environment, learning conditions and transportation modes of are quite different in urban and rural. In the final analysis, the difference of physical development between urban and rural children is caused by the imbalance of economic development between urban and rural area. Therefore, attention should be paid to development of preschoolers in the process of growth and development and targeted measures should be used to improve the physical development of children.

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