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Research Article

Analysis Dyslipidemia and Its Risk Factors in School-Age Children Aged 6 to 17 Years in Beijing

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Abstract

To investigate the prevalence of dyslipidemia and risk factors in school-age children aged 6 to 17 years in Beijing. The data for the study were obtained from the China Nutrition and Health Surveillance of Children and Nursing Mothers. Analyzed the prevalence of dyslipidemia and related risk factors. The prevalence of dyslipidemia in school-age children aged 6-17 years in Beijing was 10.23%. The prevalence rates of hypercholesterolemia, hypertriglyceridemia, low HDL-C, and high LDL-C were 5.83%, 5.11%, 3.57%, and 3.92%, respectively. The prevalence rates of dyslipidemia, hypertriglyceridemia, low HDL-C and high LDL-C were the lowest in school-age children with normal weight. The prevalence rates of dyslipidemia, hypertriglyceridemia and low HDL-C were the highest in overweight school-age children. The prevalence rate of high LDL-C was the highest in obese school-age children. And the above differences were statistically significant (P<0.05). Among the five districts in Beijing, Changping district had the lowest detection rates of dyslipidemia, hypercholesterolemia and hypertriglyceridemia. Dongcheng District had the highest detection rates of dyslipidemia and hypercholesterolemia. Yanqing district had the highest detection rate of hypertriglyceridemia. And the above differences were statistically significant (P<0.05).The results of multivariate Logistic regression analysis showed that the prevalence of dyslipidemia in children aged 6-17 years in Dongcheng and Shunyi districts of Beijing was higher than that in Changping district, with OR values of 2.910 (95%CI: 1.283-6.600) and 2.739 (95%CI: 1.213-6.185), respectively. Compared with normal weight, the prevalence of dyslipidemia was higher in overweight and obese children aged 6-17 years, with OR values of 2.910 (95%CI: 1.283-6.600). The prevalence of dyslipidemia was high in school-age children aged 6-17 years in Beijing. Overweight and obesity were the risk factors for dyslipidemia, and there were significant regional differences, which should be paid attention to by relevant departments.

Keywords: Dyslipidemia; School-age children; Beijing

Introduction

In recent years, the prevalence and mortality of cardiovascular disease in China are still on the rise, and the mortality rate of cardiovascular disease ranks first, which has become a major public health problem. Atherosclerosis is considered to be an independent risk factor for cardiovascular disease [1-3]. Relevant studies have shown that dyslipidemia in school-age children will not only present the risk of atherosclerosis in adolescence, but also continue to develop into adulthood, which increases the risk of cardiovascular disease in adulthood, and the severity is closely related to dyslipidemia [3-6]. Therefore, this study used the data of Beijing school-age children aged 6-17 years from the China Children and Lactating Women Nutrition and Health Surveillance (2016-2017) to analyze the prevalence of dyslipidemia and its influencing factors, and to provide scientific basis for the follow-up targeted intervention.

Materials and Methods

Study Design and Samples

Data of Beijing school-age children aged 6-17 years were collected from China Child and Maternal Nutrition and Health Surveillance (2016-2017). A total of 841 students were enrolled. This study was approved by the Ethics Review Committee of Chinese Center for Disease Control and Prevention (ethical approval number: 2017-021). All the subjects and their guardians signed the informed consent, and the subjects had no recent infectious diseases.

Data Collection and Measurements

Data on demographic characteristics and related factors were collected by trained and qualified investigators from China Child and Lactating Women Nutrition and Health Surveillance 2016-2017. Body measurements (height, weight, waist circumference, blood pressure, etc.) were measured by measuring instruments (TZG height altimeter, Pelta HD-390 electronic weight scale, Omron HBP1300 electronic blood pressure monitor) designated by the national project group and repeated for 2 times. Laboratory test: 6ml fasting venous blood of the subjects was collected in the morning, placed in the dark for 30 minutes in a vacuum separation rubber tube, centrifuged at 1500×g at room temperature for 10-15 minutes, separated, transferred to a special light-proof frozen storage tube, placed in the light-proof frozen storage box, put in the frozen storage box, and stored at -70 ℃ until tested. All biochemical indicators were tested by qualified and certified laboratories which passed the quality assessment of the national Project Working group. Total cholesterol (TC), triglyceride (TG), high-density lipoprotein-cholesterol (HDL-C) were detected. High density lipoprotein-cholesterol (HDL-C), low-density lipoprotein-cholesterol (LDL-C), etc.

Definition and judgment criteria

According to the "Consensus on Prevention and treatment of Dyslipidemia in children and Adolescents" [7], hypercholesterolemia: TC≥5.18mmol/L; Hypertriglyceridemia: TG≥1.70mmol/L; Low HDL-C: HDL-C≤1.04 mmol/L; High LDL-C: LDL-C≥3.37mmol/L. Any of these conditions was defined as "dyslipidemia. Overweight and obesity: The overweight and obesity status of children aged 12-17 years was determined according to the screening criteria for overweight and obesity of school-age children and adolescents (Health industry standard of the People's Republic of China WS/ T586-2018) [8].

Quality Assurance

From 2016 to 2017, the nutrition and health surveillance of children and lactating women in China was carried out in all monitoring points, including unified training, unified methods, unified standards, unified equipment, unified data entry and cleaning. Quality control groups were established at national, provincial and monitoring points, and their responsibilities and tasks were specified to be responsible for on-site inspection and supervision.

Statistical Analysis

Data cleaning and analysis were performed using SAS 9.4 software (SAS Institute Inc., Cary, NC, USA). Chi-square test was used to test the differences of dyslipidemia among different population characteristics. Logistic regression analysis was used to analyze the influencing factors. The test level α=0.05.

Results

Sample size description

A total of 841 school-age children aged 6-17 years were included in this study, including 423 boys (50.3%) and 418 girls (49.7%). The average age of school-age children was 14.16±1.75 years.

Dyslipidemia in school children aged 6-17 years in Beijing

The prevalence of dyslipidemia among children aged 6-17 years in Beijing was 10.23%. The prevalence of hypercholesterolemia, hypertriglyceridemia, low HDL-C and high LDL-C was 5.83%, 5.11%, 3.57% and 3.92%, respectively. The detection rates of dyslipidemia, hyper TC, low HDL-C and high LDL-C in boys were higher than those in girls, and the detection rates of high TG in boys were lower than those in girls, with no statistical significance (P>0.05). The detection rates of dyslipidemia, hyper TC, hyper TG, low HDL-C and high LDL-C were the lowest in school-age children with normal weight, and the detection rates of dyslipidemia, high TG, and low HDL-C were the highest in school-age children with overweight. The detection rates of hyper TC and high LDL-C in obese school-age children were the highest, and the above differences (except hyper TC)

were statistically significant (P<0.05). From different regions, changping district of school-age children abnormal blood fat, hyper TC, high TG levels, and low HDL - C concentration and high LDL - C disease detection rates were the lowest, the characteristics of the dongcheng district of abnormal blood fat and hyper TC detection rate is highest, yanqing spatial TG levels, the highest detection rate, and the difference had statistical significance (P < 0.05); The detection rate of low HDL-C in Shunyi district was the highest, and the detection rate of high LDL-C in Dongcheng District was the highest, and the above differences were not statistically significant (P>0.05), as shown in Table 1.

Variables	N	Hypercholesteremia	Hypertriglyceridemia	Low HDL-C	High LDL-C	Dyslipidemia
Sex						
Male	423	28(6.62)	19(4.49)	17(4.02)	20(4.73)	45(10.64)
Female	418	21(5.02)	24(5.74)	13(3.11)	13(3.11)	41(9.81)
c^2		0.98	0.68	0.50	1.46	0.16
P-value		0.32	0.41	0.48	0.23	0.69
BMI						
Obesity	16	2(12.50)	2(12.50)	1(6.25)	3(18.75)	3(18.75)
Over weight	49	2(4.08)	10(20.41)	7(14.29)	4(8.16)	11(22.45)
Normal	776	45(5.80)	31(3.99)	22(2.84)	26(3.35)	72(9.28)
c^2		1.57	27.43	17.91	12.34	10.00
P-value		0.46	<0.01	0.01	0.01	0.01
District						
Changping	182	5(2.75)	5(2.75)	5(2.75)	5(2.75)	9(4.95)
Chaoyang	167	11(6.59)	6(3.59)	6(3.59)	7(4.19)	16(9.58)
Dongcheng	159	17(10.69)	6(3.77)	2(1.26)	8(5.03)	21(13.21)
Shunyi	167	10(5.99)	13(7.78)	10(5.99)	7(4.19)	22(13.17)
Yanqing	166	6(3.61)	13(7.83)	7(4.22)	6(3.61)	18(10.84)
c^2		11.67	8.47	5.87	1.29	8.79
P-value		0.02	0.08	0.21	0.86	0.07
Total	841	49(5.83)	43(5.11)	30(3.57)	33(3.92)	86(10.2)

Table 1: Comparison of dyslipidemia in school children aged 6-17 years in Beijing[n(%)]

Univariate Logistic regression analysis of dyslipidemia in school-aged children aged 6-17 years in Beijing

Children aged 6-17 years were determined by whether they had abnormal blood lipids (not abnormal =0; abnormal =1) was the dependent variable, and gender (girl =0; boy =1), region (Changping =0; Chaoyang = 1; Dongcheng = 2; Shunyi = 3; Yanqing =4), overweight or obese (no =0; yes =1), physical exercise (<30(min/d)=0; ≥30(min/d)=1), whether eating out (no =0; yes =1), snack times per week (<3=0; ≥3=1), whether you are allergic to food (no =0; yes =1), whether you live on campus (no =0; yes =1) were independent variables, univariate Logistic regression analysis was performed. The results showed that region, overweight and obesity, physical exercise <30 min/d and snack times per week were risk factors for dyslipidemia in school-age children aged 6-17 years in Beijing (P<0.05) are shown in table 2.

Variables	Comparable group	Reference group	B	S.E.	Waldχ^2	*P*-value	*OR*	95%*CI*
Sex	Male	Female	0.090	0.228	0.158	0.691	1.095	0.700~1.711
District	Chaoyang	Changping	0.711	0.431	2.720	0.099	2.036	0.875~4.742
	Dongcheng		1.073	0.414	6.706	0.010	2.925	1.298~6.589
	Shunyi		1.070	0.411	6.768	0.009	2.916	1.302~6.531
	Yanqing		0.849	0.423	4.023	0.045	2.337	1.020~5.359
Overweight or obese	Yes	No	0.988	0.326	9.172	0.003	2.685	1.417~5.087
Physical exercise status (min/d)	≥30	<30	-0.466	0.232	4.020	0.045	0.628	0.398~0.990
Eating out	Yes	No	-0.076	0.319	0.056	0.813	0.927	0.497~1.731
Snack times per week	≥3	<3	-0.459	0.230	3.990	0.046	0.632	0.403~0.991
Food allergies	Yes	No	-0.325	0.612	0.283	0.595	0.722	0.218~2.396
Living on school	Yes	No	0.426	0.348	1.502	0.220	1.531	0.775~3.026

Table 2: Univariate Logistic regression analysis of dyslipidemia in school-aged children aged 6-17 years in Beijing (n=841).

Children aged 6-17 years were determined by whether they had abnormal blood lipids (not abnormal =0; Abnormal =1) was the dependent variable, and factors with statistical significance in univariate analysis were used as independent variables for multivariate Logistic regression analysis. The results showed that the detec-tion rates of dyslipidemia in school children aged 6-17 years in Dongcheng District and Shunyi district were higher than those in Changping District, with OR values of 2.910 (95%CI: 1.283-6.600) and 2.739 (95%CI: 1.213-6.185), respectively. With normal weight as reference, the detection rate of dyslipidemia was higher in overweight and obese children aged 6-17 years (OR = 2.910, 95%CI: 1.283-6.600) , as shown in Table 3.

Variables	Comparable group	Reference group	B	S.E.	Waldχ2	P-value	OR	95%CI
District	Chaoyang	Changping	0.549	0.440	1.551	0.213	1.731	0.730~4.103
	Dongcheng		1.068	0.418	6.538	0.011	2.910	1.283~6.600
	Shunyi		1.008	0.416	5.880	0.015	2.739	1.213~6.185
	Yanqing		0.567	0.441	1.654	0.198	1.763	0.743~4.180
Overweight or obese	Yes	No	0.938	0.331	8.028	0.005	2.555	1.335~4.888
Physical exercise status (min/d)	≥30	<30	-0.435	0.244	3.165	0.075	0.647	0.401~1.045
Snack times per week	≥3	<3	-0.451	0.241	3.485	0.062	0.637	0.397~1.023

Table 3: Multivariate Logistic regression analysis of dyslipidemia in school-aged children aged 6-17 years in Beijing.

Discussion

The results of this study showed that the detection rate of dyslipidemia in school-age children aged 6-17 years in Beijing was 10.23%, which was lower than the results of Xiao Pei's study on dyslipidemia in children and adolescents in seven cities of China (16.7%) [9]. It was lower than the study results of children and adolescents in 11 provinces and municipalities in western China (excluding Tibet Autonomous Region) from 2016 to 2017 (21.12%) [10]. These results may be related to since 2014, the school as the core base in Beijing, widely throughout the city to carry out the "camp" in health promotion action on campus, with many departments, each year through "5.20 students YingYangRi" series of theme activities, home school nutrition education and related practice class methods such as [11] sustained nutritional health promotion activities.

The results of this study showed that the detection rate of dyslipidemia in school-age children aged 6-17 years in Beijing (10.23%) was slightly higher than the results of Zhu Ying et al. 's study on dyslipidemia in children and adolescents aged 6-18 years in Beijing in 2004 (9.61%) [12]. This was lower than the results of dyslipidemia (20.3%) in Baseline characteristics of Cardiovascular and Bone Health Promotion Program for Children and Adolescents carried out by Hou Dongqing et al in four districts of Beijing in 2016 [13]. The reason for the big difference with the results of Hou Dongqing et al., may be related to the inconsistency of age range and regional distribution of the research objects. The age of the object of this research is uniformly distributed in 6 - 17 years old and in Beijing dongcheng, chaoyang, changping and shunyi and yanqing dis-trict, and studies such as Hou Dongqing select only part of that age students elementary school, junior high school grade 1 - 4 grade and high school grade one students as the research object and in Beijing dongcheng district of, well, miyun and carried out.

The results of this study showed that there were significant differences in the detection rate of dyslipidemia among school-age children aged 6-17 in different areas of Beijing. Taking Changping District (suburb) as reference, the detection rate of dyslipidemia in school-age children aged 6-17 in Dongcheng district (urban area) was 2.91 times that of Changping District, and the detection rate in Shunyi District (suburb) was 2.74 times that of Changping District. However, there was no statistically significant difference between the detection rate in Chaoyang District (urban area) and Yanqing District (suburb) and Changping District (suburb) respectively. The possible reasons are related to the different location, socioeconomic and cultural level, dietary structure, dietary habits and lifestyle of each district in Beijing.

The results of this study showed that overweight and obese school-age children had a 2.55 times higher risk of dyslipidemia than those with normal weight, indicating that overweight and obesity are risk factors for dyslipidemia in children and adolescents, which is consistent with the results of related studies [9, 10, 12-15]. In the past 20 years, the obesity rate of children and adolescents in China has shown a rapid increase. A series of metabolic abnormalities and chronic inflammation caused by childhood obesity can have negative effects on multiple organs and systems of the body, including cardiovascular metabolic diseases such as hypertension, hyperglycemia and dyslipidemia. Therefore, the current government, schools and families should pay attention to the overweight and obesity of school-age children, and rationally balance diet and eating activity according to the Dietary Guidelines for School-age Children in China (2022), so as to avoid the occurrence of obesity and reduce the risk of cardiovascular and metabolic diseases such as dyslipidemia.

Conclusions

In conclusion, the prevalence of dyslipidemia is high in school-age children aged 6-17 years in Beijing, and overweight and obesity are the risk factors for dyslipidemia, and the regional differences are obvious. Relevant departments should pay great attention to it and actively carry out effective intervention measures.

Author Contributions: L.H., X.W. drafted the manuscript and carried out statistical analyses. Y.S. supervised the study process. B.Y.investigated and collected information; Y.Y., R.T., Y.Z. carried out the critical review of the manuscript. All authors have read and agreed to the published version of the manuscript.

Institutional Review Board Statement: The study was conducted according to the guidelines of the Declara-tion of Helsinki, and approved by the Ethics Committee of Chinese Center for Disease Control and Prevention (protocol code 2017-021).

Informed Consent Statement: Informed consent was obtained from all subjects involved in the study.

Data Availability Statement: The data presented in this study are non-public.

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Conflicts of Interest: The authors declare no conflict of interest.

References

1. Runlin G, Zheng W, Lisheng L, Manlu Z, Wen W, et al. (2018) Summary of China Cardiovascular Disease Report 2017. Chinese Circulation Journal 33: 1-8.
2. Runlin G, Zheng W, Lisheng L, Manlu Z, Wen W, et al. (2019) Summary of the Chinese Cardiovascular Disease Report 2018. Chinese Circulation Journal 34: 209-20.
3. Berenson GS, Srinivasan SR, Bao W, Newman WP, Tracy et al. (1998) Association between multiple cardiovascular risk factors and atherosclerosis in children and young adults. The Bogalusa Heart Study. The New England journal of medicine 338: 1650-6.
4. Lauer RM, Clarke WR (1990) Use of cholesterol measurements in childhood for the prediction of adult hypercholesterolemia. JAMA 264:3034-8.
5. Liang L, Junfen F, Junbao D (2012) Exploration and significance of the definition of metabolic syndrome in Chinese children and adolescents. Chinese Journal of Pediatrics 06: 401-4.
6. Graham I, Atar D, Borch-Johnsen K, Boysen G, BURELL G, et al. (2007) Fourth Joint Task Force of the European Society of Cardiology and other Societies on Cardiovascular Disease Prevention in Clinical Practice (constituted by representatives of nine societies and by invited experts). Eur J Cardiovasc Prev Rehabil 14: S1-S.
7. Xiang W, Junbao D (2009) Expert consensus on prevention and treatment of dyslipidemia in children and adolescents. Chinese Journal of Pediatrics 47: 426-8.

8. Ji C, Ma G, Zhang L (2018) Screening for overweight and obesity in school-age children and adolescents :WS/T 586-2018 [M]. Beijing; China Standards Press.

9. Xiao P (2020) Epidemiological characteristics and appropriate diagnostic cut-off points of dyslipidemia in children and adolescents in seven cities of China. Peking Union Medical College.

10. Li Y, Shanshan j, Liu b (2021) Prevalence of dyslipidemia in children aged 12-17 years in western China from 2016 to 2017. Chinese Journal of Public Health 37: 1508-13.

11. Commission B M H (2014) "Camp" in the campus - Balanced diet in Beijing campus health promotion action.

12. Liu Y, Mi L, Du J (2007) Prevalence of dyslipidemia in children aged 6-18 years in Beijing. Chin J Pract Pediatr 2: 101-2.

13. Hou D, Gao A, Zhu Z, Yu ZC, Lin NX, et al (2018) Baseline characteristics of cardiovascular and bone health promotion programs in children and adolescents [J]. Chinese Journal of Preventive Medicine 52: 1117-23.

14. zhu J, Li L, Fu J (2012) Current status of lipid levels in primary and middle school students aged 7-16 years in 6 cities of China. Chin J Epidemiol 10: 1005-9.

15. Wang Z, Zhiyong Z, Yang Y (2018) Prevalence and related factors of dyslipidemia in children and adolescents aged 6-17 years in seven provinces of China in 2012. Chinese Journal of Preventive Medicine 52: 798-801.

16. Nutrition C S o (2022) Dietary Guidelines for School-age Children in China (2022). Beijing; People's Medical Publishing House.