Correlation Between Dietary Quality and Metabolic Syndrome in School-aged Children in Beijing

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Objective:
To explore the correlation between dietary quality and metabolic syndrome (MetS) and its components among school-aged children in Beijing, and to provide a scientific reference for the prevention and control of MetS in this population.

Methods:
Data for this study were derived from the 2019 Beijing Schoolchildren Nutrition and Health Monitoring Project. The study employed a multi-stage, stratified, cluster random sampling method, selecting 3,460 school-aged children from seven districts in Beijing, specifically those in grades 1, 3, 5, and 7, as the research subjects. Among them, 966 participated in a complete detailed dietary survey. A self-designed, expert-reviewed questionnaire was used to collect demographic information from the participants and their caregivers. Dietary data were collected through a 3-day 24-hour dietary recall and weighing method. Physical and serological indicators were collected through physical and laboratory examinations. The diagnosis of MetS and its components was determined using the diagnostic criteria for Chinese children and adolescents developed by the Pediatrics Branch of the Chinese Medical Association in 2012. Dietary quality was assessed using the Chinese Dietary Guideline Index for Children (CDGI-C). T-tests, non-parametric tests, and multivariate logistic regression models were used to analyze the correlation between dietary quality and MetS and its components among school-aged children in Beijing.

Results:
In 2019, the detection rate of MetS among school-aged children in Beijing was 3.9%. The metabolic component with the highest detection rate was central obesity (24.6%), followed by elevated blood pressure (21.0%), hyperglycemia, elevated triglycerides (TG), and low high-density lipoprotein cholesterol (HDL-C), with detection rates of 7.8%, 7.4%, and 5.3%, respectively. The average CDGI-C score for Beijing school-aged children was 59.19 ± 11.09 points. The scores for boys and girls were 58.82 and 59.56 points, respectively, showing no statistically significant difference ($P > 0.05$). Compared to children aged 6-10 years (60.45 points), children aged 10-14 years had a

lower CDGI-C score (57.79 points) ($P < 0.05$). The CDGI-C score of urban children (60.61 points) was higher than that of suburban children (58.19 points) ($P < 0.05$). Univariate analysis showed that children with MetS had lower total CDGI-C scores and lower scores for whole grains and legumes, as well as dark green vegetables ($P < 0.05$). Children with central obesity had lower total CDGI-C scores and lower scores for whole grains and legumes, dark green vegetables, and fruits ($P < 0.05$). Children with elevated blood pressure had lower scores for whole grains and legumes, as well as dark green vegetables, but higher scores for fruits and nuts ($P < 0.05$). Children with hyperglycemia had lower scores for whole grains and legumes, dark green vegetables, and nuts, but higher scores for dairy products and oils ($P < 0.05$). Children with low HDL-C had lower scores for whole grains and legumes ($P < 0.05$). After adjusting for potential confounders such as age, gender, region, primary caregiver's education level, per capita family income, and total energy intake, analysis showed that higher scores for whole grains and legumes were associated with a lower risk of MetS (OR = 0.84, 95% CI: 0.70-0.99). Higher scores for dark green vegetables were associated with a lower risk of MetS (OR = 0.76, 95% CI: 0.63-0.93) and hyperglycemia (OR = 0.76, 95% CI: 0.65-0.89). Higher scores for nuts were associated with a lower risk of hyperglycemia (OR = 0.86, 95% CI: 0.75-0.99).

Conclusion:
School-aged children in Beijing follow the "Chinese Dietary Guidelines for School-aged Children (2022)" to a certain extent, but their overall dietary quality remains relatively low. Higher dietary quality scores are associated with lower detection rates of MetS and central obesity. Increased intake of whole grains and legumes, dark green vegetables, and nuts is a protective factor against MetS or its components. Enhancing adherence to dietary guidelines may help prevent metabolic diseases in school-aged children.

Keywords:
School-aged children; Dietary quality; Metabolic syndrome