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The Prevalence and Risk Factors of Hyperuricemia in Chinese Children and Adolescents: A Meta-Analysis

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Abstract:

Objective: To explore the prevalence and risk factors of hyperuricemia in Chinese children and adolescents by meta-analysis.

Material and Methods: The China National Knowledge Infrastructure (CNKI), Wanfang Data Knowledge Service platform, VIP Periodical Chinese Journal Service platform, PubMed, Embase database, Chinese BioMedical Literature database (CBM), Cochrane Library, Web of Science, and a manual search were all included in the extensive search, which had a final search date of September 2024. The meta-analysis was conducted using RevMan 5.4 and Stata 17.0.

Results: A total of 14 pieces of literature comprising 89359 patients were included. According to our review, the common risk factors reported were gender (male), age, overweight or obesity, hypertension, impaired glucose regulation, dyslipidemia, total cholesterol, triglycerides, low-density lipoprotein, high-density lipoprotein, and urea nitrogen were the key risk factors for hyperuricemia (HUA) in Chinese children and adolescents (p-value<0.05). In contrast, HUA in children and adolescents was not linked to a diet high in animal offal, waist circumference, or town residence (p-value>0.05).

Conclusion: The high rate of hyperuricemia in Chinese children and adolescents serves as a reminder to the general public, medical professionals, and those who determine health policy to get ready for the challenges that lie ahead.

Keywords: adolescents, Chinese children, hyperuricemia, meta-analysis, risk factors

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Introduction

One of the main causes of uric acid deposition diseases is hyperuricemia (HUA). Apart from gout, hyperuricemia is also a risk factor for a number of other illnesses, including ischemic heart disease, diabetes mellitus, dyslipidemia, hypertension, stroke, and preeclampsia[1].

Due to China's social and economic advancements, improvements in living standards, and dietary changes, the prevalence of hyperuricemia has been rising in recent years[2]. Although adult HUA has received sufficient attention, awareness of it among children and adolescents is still quite limited. HUA is a serious metabolic disease in children and adolescents. Furthermore, complications, such as renal insufficiency, are more likely in children than in adults[3]. According to studies, the number of children and teenagers with hyperuricemia (serum uric acid (SUA) >420 μmol/L, girls >360 μmol/L) increased from 16.7% in 2009–2015 to 24.8% in 2016–2019[4]. This suggests that HUA is increasingly becoming more common at younger ages. Understanding the prevalence and risk factors of HUA in Chinese children and adolescents is essential to improving the situation. To find out what factors affect HUA in Chinese children and adolescents, several cross-sectional studies were conducted, both domestically and abroad. However, the results of these surveys differ significantly due to confounding factors, such as study populations, survey areas, and sample sizes. Therefore, more investigations are required.

In order to fully comprehend the state of HUA among Chinese children and teenagers in China at the moment; in order to completely understand how HUA is currently affecting Chinese children and teenagers in China; in order to provide a reference for reducing the incidence of HUA in this population, and developing the corresponding preventive and interventional countermeasures in an effort to address the increasingly serious trend of hyperuricemia at a younger age, we used the methods of a meta-analysis to examine the detection rate and influencing factors of HUA in Chinese children and adolescents since 2018 by compiling the published literature on the influencing factors of HUA in Chinese children and adolescents, both domestically and internationally, during the survey period of 2018–2022, to serve as a benchmark for lowering the prevalence of HUA in this demographic, and developing suitable management and prevention strategies in an effort to address the growingly alarming trend of hyperuricemia rejuvenation.

Material and Methods

This systematic review and meta-analysis were carried out following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA). The protocol was registered in the International Prospective Register of Systematic Reviews (CRD42024593168).

Search strategy

Up until September 2024, a thorough literature search was carried out in 7 databases, including CNKI, VIP, PubMed, Embase, CBM, the Cochrane Library, and Web of Science, without regard to language limitations. In order to locate more relevant research, a manual search of the reference lists of previously published meta-analyses or systematic reviews was also conducted. Potential studies were then located in Google Scholar. The search was conducted using the combination of keywords "Hyperuricemia" OR "uric acid" OR "urate" AND "Adolescent" OR "Adolescence" OR "Child" OR "Teen" OR "youth" OR "Teenager" OR "Student" OR "Minors" AND "Risk Factors" OR "Health Correlates" OR "Influencing Factors" OR "Relative Factors" OR "Population at Risk" OR "Risk Score" AND "China" OR "Chinese.".

Inclusion and exclusion criteria

Inclusion criteria: The study type was a cross-sectional study; (b) participants were children and adolescents aged 3 to 18 years old; (c) studies with complete data; (d) studies that included exclusively Chinese ethnic groups.

Exclusion criteria: Literature with poor quality and no specific data records; (b) the study type was a review or conference paper; (c) the full text was not available; (d) non-English and Chinese language; (e) studies that focus on a particular group, like obesity.

Data extraction and quality assessment

All databases were comprehensively searched, and articles were screened using EndNote version x 20 software. After removal of duplicates, articles were screened by title and abstract, and then eligible studies were screened by full text. All data from the eligible studies in the analysis were extracted using standard pre-designed tables with study and participant characteristics. The information extracted from the literature included participants' sex and age, as well as the study's sample size, risk factors, OR value, upper limit of 95.0% CI, 95.0% CI lower limit, and so forth. To address multiple effect sizes from the same study, we evaluated the reported odds ratios (ORs) or risk ratios with 95% confidence intervals (CIs), or calculated them using the available data. If multiple ORs were reported, we included those representing independent outcomes or distinct illness characteristics. For overlapping data, only the primary outcome was selected. In addition, if required to ensure consistency, ORs or risk ratios and 95% CIs were computed for every study.

In order to evaluate the study quality, the Agency for Healthcare Research and Quality (AHRQ) was used to evaluate the quality of the cross-sectional studies consisting of 11 items. Each item was scored with "yes, no, unclear," and "yes," which were all assigned one point. The answers "no" and "unclear" were assigned a score of 0. A score of 0–3 indicated low-quality research, 4–7 medium-quality research, and 8–11 high-quality research. We included all medium-quality research and high-quality research. We included all medium-quality research and high-quality research. Two authors (QYW and ZZW) reviewed full-text articles to determine if they met all the inclusion criteria, and the percent agreement was 0.75; discrepancies were resolved via consensus.

Statistical analysis

Stata 17.0 and RevMan 5.4 software were used for the meta-analysis. The odds ratio (OR) was used as the effective index, and point estimates and 95.0% confidence intervals were given for each effect size. A Q test was used for the heterogeneity analysis, and I^2 was used for quantitative judgment. If p-value<0.1 or I^2>50.0%, the random effect model was selected for sensitivity analysis; otherwise, the fixed effect model was used. If the number of studies was ≥10, the funnel plot was drawn to judge the literature bias, and Egger's test was performed to describe the publication bias. A p-value of less than 0.05 was considered to indicate a statistically significant combined effect size. To visualize the regional distribution of HUA, ArcGIS 10.8 software was used to generate a geographical distribution map.

Results

Selection of studies

A total of 1,535 studies were found through the search; 378 of them were eliminated as duplicates. We excluded 1,098 studies based on title and abstract screening. After the initial title and abstract screening, a total of 59 studies were screened against the full-text eligibility criteria. Of these, 5 studies were removed because their study population did not include healthy children and adolescents, 23 studies were removed because their findings did not fit within the scope of this review, and 17 studies were removed for being non-data-based publications (e.g., commentaries, literature reviews, conference abstracts). After the full-text review, 14 studies were included in our final analysis. A summary of the source selection process is presented in Figure 1 as a PRISMA flow diagram.

Basic characteristics and quality assessment of the included literature

In our study, a total of 14 studies were included, and the characteristics of the 14 studies are summarized in Table 1. The literature was published between 2016 and 2023. There were 89,359 participants from 12 regions, and the sample sizes ranged from 87 to 54,580. In addition, the minimum recruitment age of the study participants varied from 3 to 18 years. Regarding geographic regions, 2 studies from East China, 1 from South China, 1 from Central China, 6 from North China, 1 from Northwest China, and 2 from Southwest China.

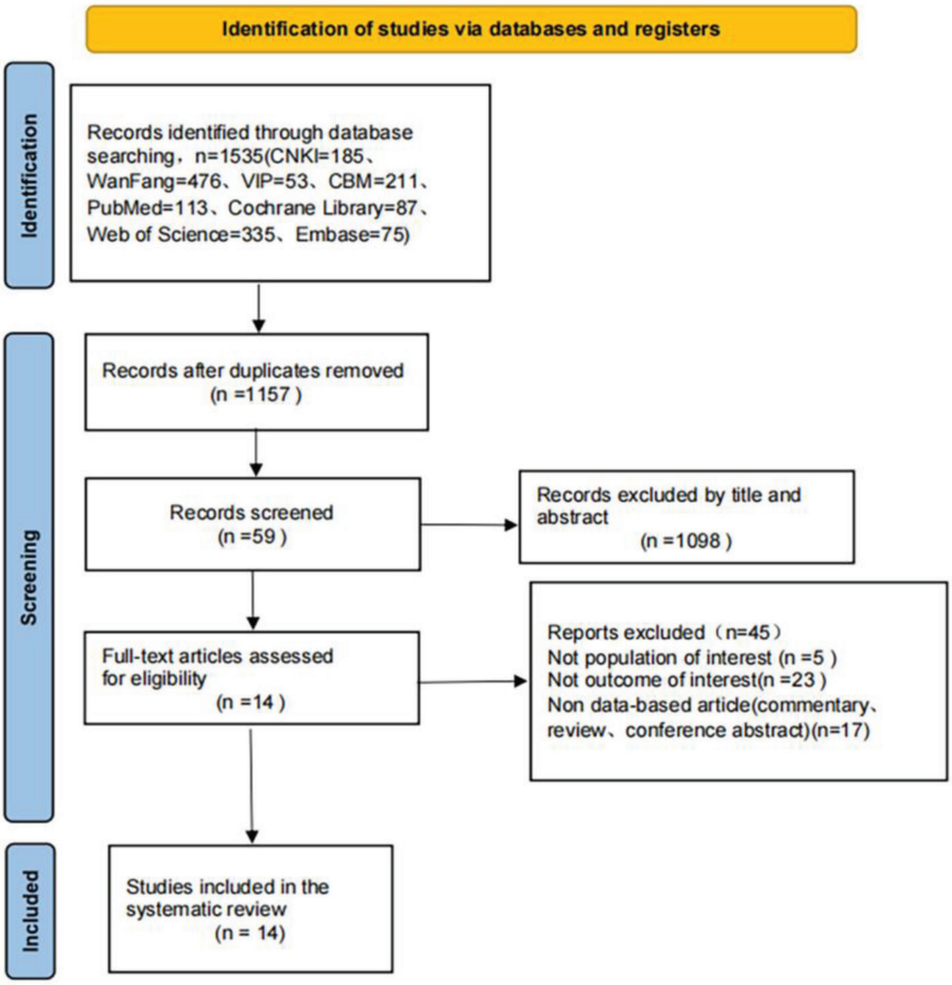

Figure 1 Flow diagram of study selection

Table 1 Basic characteristics and quality assessment of the included literature

Author (year)	Study site	Sample size	HUA Prevalence %	Study population characteristics	Time of study	Risk factors	AHRQ Quality assessment score
Li et al., 2017	Tianjin	4,073	10.10	Mean age: 5.6 Range age: 3–6 Gender Male: 2,140 (52.54%) Female: 1,933 (47.46%)	2015	a b c d f g	7
Rao et al., 2022	China	54,580	23.30	Mean age: – Range age: 3–19 Gender Male: 28,849 (52.86%) Female: 25,731 (47.14%)	2009–2019	a c	7
Guo et al., 2023	Sichuan	15,739	55.12	Mean age: 11.33 Range age: 6–17 Gender Male: 9,392 (59.67%) Female: 6,347 (40.33%)	2017–2021	a b c d f g h i j n o	7
Kong et al., 2023	Shenzhen	3,383	39.93	Mean age: 13.3 Range age: 9–17 Gender Male: 1,882 (55.63%) Female: 1,501 (44.37%)	2021	a c l	7
Liu et al., 2016	Shanxi	808	3.96	Mean age: – Range age: 10–11 Gender Male: 426 (52.72%) Female: 382 (47.28%)	2013–2014	a c d e c p	6
Hu et al., 2023	Yunnan	430	58.80	Mean age: 12.66 Range age: 10–15 Gender Male: 207 (48.14%) Female: 223 (51.86%)	2019	b m	7
Jiang et al., 2021	Beijing	1,483	14.83	Mean age: 9.49 Range age: 6–14 Gender Male: 773 (52.12%) Female: 710 (47.88%)	2017–2019	a b c f g h i m	6
Cai et al., 2022	Yinchuan	1,486	29.80	Mean age: 14.3 Range age: 10–18 Gender Male: 728 (48.99%) Female: 758 (51.01%)	2015–2018	e f h i k p	8
Zhang et al., 2021	Qingdao	1,658	12.55	Mean age: 11.53 Range age: 7–15 Gender Male: 986 (59.47%) Female: 672 (40.53%)	2016–2018	a c d f g i	7
Chen et al., 2019	Tangshan	1,000	13.50	Mean age: 8.4 Range age: 4–15 Gender Male: 560 (56.00%) Female: 440 (44.00%)	2012–2017	a b c f g	7

Table 1 Continued

Author (year)	Study site	Sample size	HUA Prevalence %	Study population characteristics	Time of study	Risk factors	AHRQ Quality assessment score
Wu et al., 2019	Jiangsu	509	36.90	Mean age: - Range age: 13-14 Gender Male: 250 (49.12%) Female: 259 (50.88%)	2018	a c l	6
Liu et al., 2023	Henan	87	8.05	Mean age: - Range age: 7-18 Gender Male: 49 (56.32%) Female: 38 (43.68%)	2021	b c f g i	7
Guo et al., 2018	Beijing	3,566	7.30	Mean age: - Range age: 5-15 Gender Male: 1,825 (51.18%) Female: 1,741 (48.82%)	2015	a b c d g i	5
Chen et al., 2018	Beijing	557	14.28	Mean age: - Range age: 6-14 Gender Male: 291 (52.24%) Female: 266 (47.76%)	2017	a b c e k l p	7

a=Gender, b=age, c=BMI body mass index, d=impaired glucose regulation, e=hypertension, f=TC total cholesterol, g=TG triglycerides, h=HDL high-density lipoprotein, i=LDL low-density lipoprotein, j=BUN urea nitrogen, k=WC waist circumferencea, l=a diet high in animal offal, m=region(town), n=serum creatinine, o=blood calcium, p=dyslipidemia

Meta-analysis of the prevalence risk factors of hyperuricemia in Chinese children and adolescents

The results showed that the overall prevalence of hyperuricemia in Chinese children and adolescents was 23.0% (95.0% CI 14.0% to 22.0%) with high heterogeneity: I^2=99.9% and p-value<0.001 (Figure 2). Random-effects models were used. Regarding publication bias: Visual inspection of the funnel plot revealed fundamental symmetry, and the Egger's test findings suggested that publication bias was not present (p-value=0.756>0.05).

Of the 16 risk factors that were extracted for the meta-analysis, the following risk factors had high heterogeneity across studies (p-value<0.1, I^2>50.0%): gender, age, 10 to <13 years, 13 to 18 years, BMI, hyperglycemia, diet based on animal offal, TC, LDL, region (town), and WC; risk factors of dyslipidemia, hypertension, TG, HDL exhibited acceptable heterogeneity across studies (p-value≥0.1, I^2≤50.0%), and a fixed-effects model was employed as well. According to the meta-analysis, risk factors for HUA in Chinese children and adolescents included age, male gender, dyslipidemia, overweight or obesity, hypertension, impaired glucose regulation, TC, TG, H-LDL, and L-HDL (p-value<0.05) (Table 2).

Publication bias

A funnel plot was employed to check for publication bias because only the factors of gender and BMI had more than 10 articles included in this investigation. The findings demonstrated that the 2 components' scatter points were nearly. Equally spaced on either side of the axis in the funnel

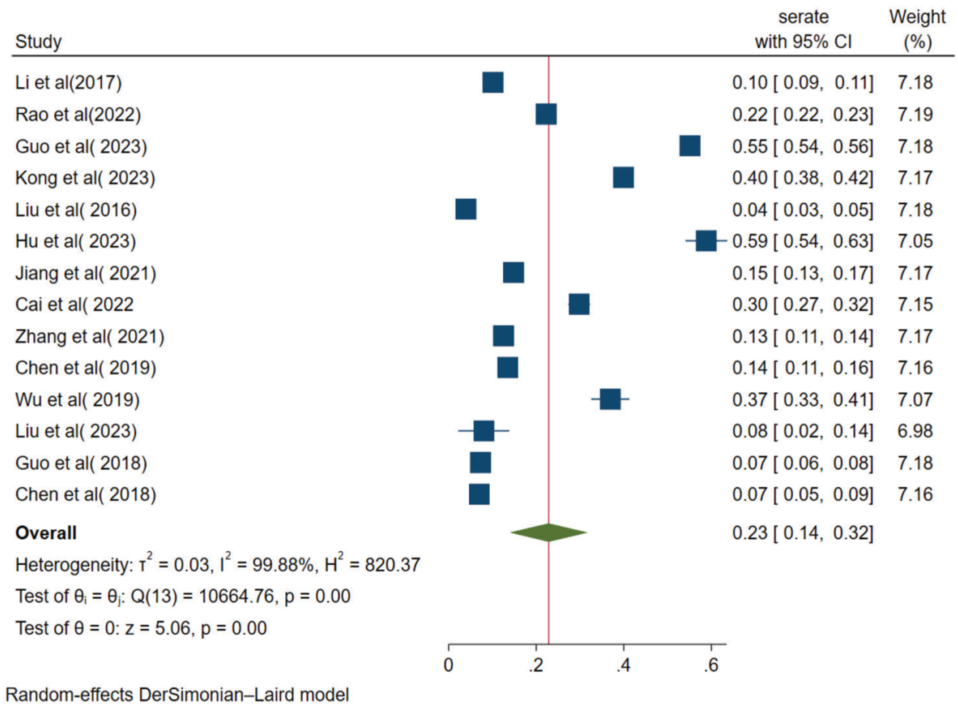

Figure 2 Forest plot of the pooled prevalence of hyperuricemia in Chinese children and adolescents

Table 2 Summary of meta-analysis for the risk factors of HUA

Risk factors	Number of studies	Heterogeneity		Effects models	Meta analysis	
		I^2 %	p-value		Prevalence (95%CI)	p-value
Gender (Male)	11	76	<0.00001	Random	1.46 (1.25, 1.70)	<0.00001
Age	8	81	<0.00001	Random	1.30 (1.07, 1.57)	0.007
<10 Years	4	0	0.6	Fixed	1.73 (1.24, 2.40)	0.001
10~<13 Years	3	74	0.02	Random	3.61 (1.72, 7.56)	0.0007
13~18 Years	4	98	<0.00001	Random	0.86 (0.20, 3.70)	0.84
Dyslipidemia	3	41	0.18	Fixed	1.62 (1.27, 2.08)	0.0001
BMI	12	91	<0.00001	Random	1.72 (1.17, 2.52)	0.005
Hypertension	3	0	0.45	Fixed	1.74 (1.30, 2.33)	0.0002
Impaired glucose regulation	5	88	<0.00001	Random	1.73 (1.09, 2.75)	0.02
A diet high in animal offal	4	88	<0.0001	Random	3.31 (0.99,11.11)	0.05
TC	7	98	<0.00001	Random	1.56 (1.32, 1.84)	<0.00001
TG	7	25	0.24	Fixed	1.40 (1.24, 1.59)	<0.00001
LDL	6	99	<0.00001	Random	1.84 (1.39, 2.45)	<0.0001
HDL	3	38	0.20	Fixed	2.52 (2.50, 2.55)	<0.00001
Region (Town)	2	99	<0.00001	Random	1.38 (0.37, 5.14)	0.63
WC	2	99	<0.00001	Random	1.70 (0.63, 4.56)	0.30

BMI=body mass index, CI=confidence interval, HDL=high-density lipoprotein, LDL=low-density lipoprotein, TC=total cholesterol, TG=triglycerides, WC=waist circumference plots (Figure 3). There was no discernible publication bias, as indicated by the Egger's test results for the p-value> ltl indicators, which were 0.582 and 0.129, respectively (p-value>0.05).

Sensitivity and subgroup analyses

Using RevMan 5.4, a sensitivity analysis of the statistically significant risk factors found in the literature was conducted. Sensitivity analyses were conducted using a fixed-effects model and a random-effects model transformation. The results of this study showed good stability, as there was no significant difference between the total combined value and the combined effect value after each study was removed. Sensitivity analyses were also conducted for risk factors with high heterogeneity between studies, and the source of the heterogeneity between studies was investigated using the removal of single studies method[5] were found to be a source of heterogeneity for impaired glucose regulation. Results showed: acceptable heterogeneity within the group after exclusion (p-value=0.15, I^2=44.0%).

To explore the sources of heterogeneity, we performed subgroup analyses based on region. There are notable variations in the prevalence of HUA in various geographic areas because of the size of China. Reducing the prevalence of HUA and enhancing preventative and control strategies for HUA in children and youth across various regions is made possible by understanding the regional distribution of HUA in these populations. The results are displayed in Figure 4. The prevalence in Southwest China was 45.0%, much higher than the pooled prevalence, followed by South (39.9%), Northwest (29.8%), East (25.0%), and North (9.0%).

Discussion

It is important to note that the prevalence of HUA is on the rise, particularly in younger populations, even though this study focuses on the prevalence and risk factors of HUA among Chinese children and adolescents[6]. According to the NHANES cycle data, the prevalence of teenage hyperuricemia similarly increased, rising from 34.6% in 1999–2002 to 35.5% in 2007–2010, before slightly declining

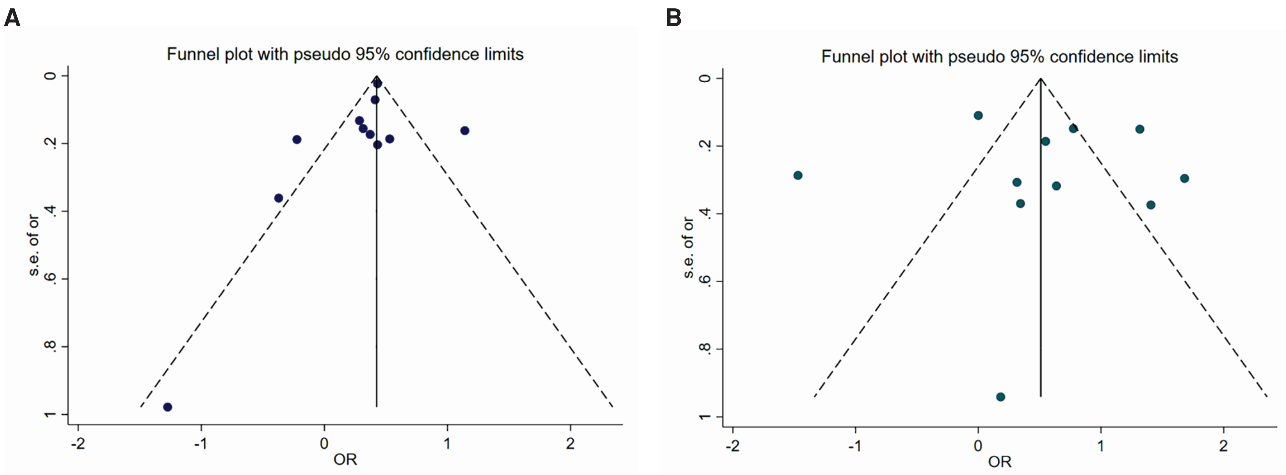

Figure 3 Funnel plot with pseudo 95% confidence limits (A) Gender (B) body mass index (BMI)

to 32.8% in 2015–2018[7]. These trends underscore the urgency of addressing HUA to prevent long-term health issues and inform policymakers in developing effective strategies. In this study, 15 epidemiological surveys from 12 provinces in mainland China were examined. The cross-sectional nature of all of the studies, which methodically examined the prevalence of hyperuricemia in a population of children and adolescents in mainland China, is a significant strength of this research. The prevalence of HUA in this community was 21.0% according to the current meta-analysis, which is consistent with the global incidence of 2.6% to 36.0% in various populations[8]. Additionally, it exceeded Zhang's 2018-2019 estimate of the prevalence of hyperuricemia in Chinese adults, which was 14.0%[9]. It was then the research by it was lower than the research by Nagahama[10] in Japan. but higher than the study by Chuang[11] in Taiwan and Lohsoonthorn[12] in Thailand. Different countries, people, lifestyles, and survey years could all be contributing factors to this discrepancy. Still, the information we now have shows that children and adolescents are more likely than adults to have hyperuricemia; thus, we should focus more on this issue in order to reduce the prevalence of HUA in this group as soon as possible through intervention.

Geographic disparities

Significant regional differences in HUA prevalence are depicted in Figure 4, where South China (G) and Southwest China (D) have the greatest rates, surpassing 40%. These variations could result from local purine-rich food customs, cultural customs, and lifestyle choices. Purine intake may be increased in Southwest China, for example, due to the region's hot and meat-heavy cuisine. According to the findings of WANG's study[13] on HUA in the elderly in 7 Chinese cities, the prevalence of HUA in children and adolescents is much higher in the south than in the north. This could be because of the stark differences

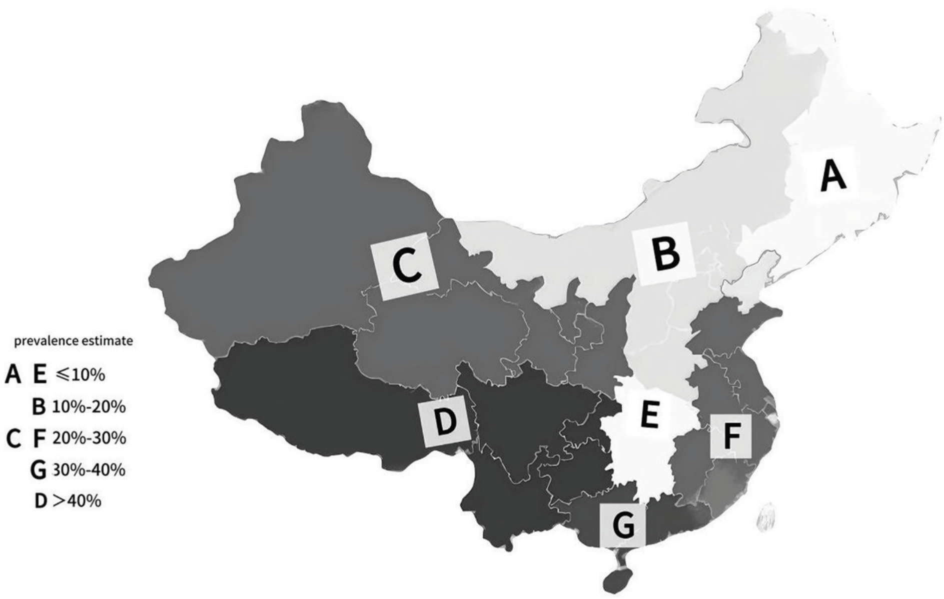

Figure 4 Regional distribution of pooled prevalence of gout in China. A=Northeast China, B=North China, C=Northwest China, D=Southwest China, E=Central China, F=East China, G=South China

in living conditions and dietary practices between the 2 regions. Meat consumption, seafood consumption, and consumption of sugary drinks are linked to HUA[14]. In contrast to northern regions, southern regions favor foods strong in purines, like red meat and shellfish, and sweet drinks with a higher fructose content, which can raise uric acid levels. Furthermore, HUA is associated with high temperatures and humidity[15]. The climate in southern China is hot and humid, and significant water loss will cause the kidneys to excrete less uric acid[16]. As a result, the prevalence of HUA is higher in southern China than in northern China. It is essential to comprehend these differences in order to create focused interventions.

Male, age, obese or overweight

Our stratified analysis by age revealed distinct susceptibilities to HUA among children and adolescents. The 10–13 year age group, coinciding with early puberty, exhibited a notably higher HUA incidence (OR=3.61, 95% CI: 1.72-7.56). The substantial heterogeneity within this group (I^2=74%), as shown in Table 2, suggests considerable variability across studies. This may be attributed to the rapid growth, developmental changes, and fluctuating hormone levels characteristic of adolescence[16]. Children under 10 also showed a higher HUA risk (OR=1.73, 95% CI: 1.24-2.40), while those aged 13–18 had a lower risk (OR=0.86, 95% CI: 0.20-3.70). These results are consistent with those of Dai[17], who noted a steady increase in blood uric acid levels from infancy to puberty, with gender differences emerging post-puberty. Boys have higher levels of serum uric acid (SUA) during puberty because androgens, particularly testosterone, increase in the body during this time. Uric acid metabolism is more reliant on renal function development in childhood (3–12 years), whereas hormonal shifts and accelerated metabolism during adolescence (13–18 years) could influence uric acid levels. Such differences may lead to varying risk factor impacts[18].

The observed 1.49 times higher risk in males compared to females underscores the role of pubertal hormones. These insights underscore the importance of considering developmental stages when evaluating HUA risk factors in young individuals[19]. Our results stress the need for targeted interventions and monitoring during pivotal developmental phases, which are crucial for clinical practice. A Japanese study[20] found that testosterone stimulates the enzyme purine oxidase, which raises circulating levels of SUA and promotes elevated uric acid. Additionally, the detection rate of HUA is higher in boys than in girls, which is thought to be related to the fact that, in addition to hormones, boys and girls have different dietary habits. For example, boys tend to eat more meat, purines, fried food, etc., while girls focus more on maintaining a healthy body during puberty and paying more attention to diet balance. This implies that the adolescent male population could be the focus of HUA preventive and control efforts in children and adolescents in order to achieve early detection and early intervention to lower the incidence of HUA.

Consistent with previous findings, our study also found a significant difference in the prevalence of hyperuricemia between children who were normal weight and those who were obese and overweight. SUA and obesity have also been found to be positively correlated in other investigations, with some of these studies speculating that obesity is the primary cause of elevated serum uric acid levels in the general population[21,22]. A study conducted on Danish youngsters revealed a substantial drop in SUA in those who lost weight and a significant increase in SUA in those who gained weight, as well as a strong link between obesity and serum uric acid levels (p-value=0.02)[23]. Additionally, childhood obesity is a predictor of higher blood uric acid in adults, according to longitudinal data from the Bogalusa[24] Heart Study. Viazzi[25] reported similar results, showing a favorable relationship between children's weight development and SUA. Using baseline SUA levels, Niu demonstrated a positive correlation between SUA and weight loss in obese children and adolescents[26]. Therefore, to lower the incidence of hyperuricemia, healthy living, moderate exercise, and the prevention and control of childhood overweight and obesity should be reinforced.

Dyslipidemia, higher TC and TG, L-HDL, and H-LDL

The results of the study showed that dyslipidemia is a risk factor for HUA, and that HUA was positively correlated with LDL, triglycerides, and total cholesterol levels. HUA was negatively correlated with HDL levels. According to research by Lurbe[27], low HDL and high TG also increased when SUA levels rose, which aligns with the current study's findings. A cross-sectional study on the relationship between blood uric acid levels and lipids in children and adolescents found that children with hyperuricemia had significantly lower HDL levels and significantly higher triglycerides than children with normal SUA levels[28].

The studies stated above suggest that abnormalities in lipid metabolism may have an impact on the pathogenesis of HUA. The conclusion that an increase in free fatty acids elevates the body's levels of ketoacids, which are competitively released with uric acid in the renal proximal tubules, leads to a decrease in uric acid excretion and an increase in blood uric acid levels[29]. This suggests that childhood and teenage dyslipidemia should be given priority since it is associated with an increased risk of HUA. Additionally, it suggests that dyslipidemia could be used as a predictor of HUA, thereby reducing the prevalence of HUA in children and adolescents. Furthermore, Villegas[30] discovered that a diet high in purines and nucleic acid proteins raises uric acid levels and the incidence of HUA in children and adolescents, and that nutrition plays a significant role in the development of gout and hyperuricemia. Even while this study's analysis showed that the relationship between animal offal and HUA was not confirmed, it is possible that the 2 variables are positively correlated, which is consistent with the results of Reis[31]. The small amount of literature examined in this study necessitates additional research to substantiate the relationship between diets based on animal offal and HUA.

Hypertension and impaired glucose regulation

Children and teenagers with poor glucose regulation, high BUN, and hypertension are particularly vulnerable to HUA. HUA was also linked to higher blood pressure, according to 2 cross-sectional investigations done by REIS[31] on 2335 pupils in a southern Brazilian school, ages 7 to 17. After controlling for a number of variables, Fang[32] demonstrated that the probability of hyperuricemia increased by 0.8% and 0.9%, respectively, for every unit rise in systolic or diastolic blood pressure (p-value <0.05). In an 8-year follow-up research study of 6424 participants from Tianjin General Hospital in China, Zhang[33], it was discovered that individuals with hypertension were much more likely to acquire HUA. A substantial correlation between hyperuricemia and hypertension was also discovered by another sizable prospective cohort study that used data from the National Health and Nutrition Examination Survey conducted between 2001 and 2018[34]. Numerous processes, including tissue ischemia, increased renal vascular resistance, oxidative stress, and decreased glomerular filtration rate, can cause hypertension to result in high uric acid levels[35]. In the early stages, the majority of children with hyperuricemia do not exhibit any particular clinical symptoms. Therefore, a pressing clinical issue with significant social and economic implications is how to detect hyperuricemia in children early on and provide tailored therapies that successfully control hypertension. According to the study's findings, BUN increases the risk of HUA in kids and teenagers. This aligns with the findings of other investigations[36,37]. When renal function is impaired, SUA metabolism is impacted. SUA levels rise when renal function declines because less urate is excreted in the urine. A number of adolescent renal illnesses have been linked to SUA, a weak organic acid[38]. BUN problems in childhood and adolescence can cause long-term damage to renal arterioles, which can culminate in organic pathology and HUA if they are not treated promptly. A focus on BUN and HUA testing could be beneficial for preventing kidney injury early on. The findings of Jia[39], who found that the mean fasting blood glucose in the hyperuricemia group was considerably greater than that in the normovolemic group, are in line with the results of this investigation, which demonstrated that disturbed glucose regulation is a risk factor for HUA. Thus, more research on the connection between blood glucose and uric acid in children and adolescents should be conducted in order to prevent linked diseases early.

There is an urgent need for solutions to effectively address the growing prevalence of HUA among children and adolescents. A comprehensive strategy is needed to address HUA, including public health initiatives to raise awareness of the dangers and encourage better eating practices, especially cutting back on sugary and high-purine beverages[40]. By educating students and promoting regular physical activity, schools may play a critical role in promoting healthy lifestyles that reduce the risk of HUA and help people control their weight. For at-risk pediatric populations, early screening and intervention by the healthcare system are essential for prompt management. Policymakers should also encourage physical activity and a healthy diet in communities and schools. These tactics will be informed and improved by ongoing research and routine surveillance of HUA prevalence, guaranteeing their continued efficacy in the face of this condition's changing terrain. By putting these integrated solutions into practice, HUA's long-term health effects on young people can be lessened, as well as its prevalence.

Conclusion

Among Chinese children and adolescents, risk factors for HUA include the male gender, age, dyslipidemia, overweight or obesity, hypertension, impaired glucose regulation, TC, TG, LDL, and HDL. These findings can serve as a foundation for future research on the health of children and teenagers.

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Conflict of interest

The authors declare that they have no conflicts of interest.

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