

Prevalence and Risk Factors of Hypertension Among College Students in a University in Qujing

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Abstract: *Objective:* To understand the prevalence of hypertension and prehypertension among ethnic minority college students in a university in Qujing, compare ethnic differences, and analyze risk factors, so as to provide a basis for blood pressure intervention in young people. *Methods:* A total of 1,834 college students were selected by cluster sampling. Indicators such as blood pressure, height, weight, and abdominal circumference were measured, and statistical analysis was performed using chi-square test and multivariate Logistic regression. *Results:* Using 140/90 mmHg as the standard, the prevalence of hypertension was 3.9% and prehypertension was 26.0%; there was no statistically significant difference in the prevalence between Han and ethnic minority students ($p > 0.05$). According to the 130/80 mmHg standard, the prevalence of hypertension increased to 23.7%. Male gender and high-salt diet were risk factors, while non-abdominal obesity and non-smoking were protective factors. *Conclusion:* The detection rate of hypertension and prehypertension among college students in this university is relatively high, and the prevalence scale increases significantly after the downward adjustment of the diagnostic standard. Early screening and lifestyle intervention should be strengthened.

Keywords: Hypertension; Prehypertension; College students; Ethnic minorities; Prevalence; Risk factors

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1. Introduction

Hypertension is an important risk factor for cardiovascular and cerebrovascular diseases, which was previously more common in middle-aged and elderly people, but has shown an obvious younger trend in recent years. As a transitional stage of hypertension, prehypertension is closely related to the increased risk of long-term cardiovascular and cerebrovascular events ^[1]. The 2022 Chinese Clinical Practice Guidelines for Hypertension lowered the diagnostic threshold of hypertension from 140/90 mmHg to 130/80 mmHg, incorporating a large number of people with high normal blood pressure into the scope of hypertension management. The college student group is large in number, and conducting blood pressure screening and early intervention is of great public health significance ^[2]. Yunnan is a concentrated area of ethnic minorities. Taking a university in Qujing as an example, this study analyzes the current situation of abnormal blood pressure and risk factors among Han and ethnic minority college students, providing a basis for campus health management.

2. Materials and methods

2.1. General information

A total of 1,860 students from 20 classes of Grade 2023–2024 in our university were selected by cluster sampling. After excluding unqualified data, 1,834 valid samples were obtained, with a questionnaire response rate of 98%. This study was approved by the school ethics committee, and all subjects provided informed consent.

2.2. Research methods

Trained researchers uniformly measured blood pressure, height, weight, abdominal circumference, and pulse, guided the completion of questionnaires, and data were analyzed using SPSS 20.0.

2.3. Diagnostic standards

Hypertension was defined as systolic blood pressure ≥ 140 mmHg and/or diastolic blood pressure ≥ 90 mmHg; prehypertension was defined as an average systolic blood pressure of 120–139 mmHg and/or an average diastolic blood pressure of 80–89 mmHg measured twice consecutively; subjects rested for 30 minutes before measurement, and blood pressure was measured in a sitting position with the sphygmomanometer at the same level as the heart.

2.4. Statistical methods

SPSS 20.0 was used for statistical analysis. Count data were expressed as rates (%), and comparisons were made using chi-square test. Measurement data were expressed as $\bar{x} \pm s$. A p value < 0.05 was considered statistically significant.

3. Results

3.1. General population data

There were 1,834 valid samples with an average age of (19 ± 1) years. Among them, 1,375 were Han nationality (75.0%) and 459 were ethnic minorities (25.0%); 452 were male (24.6%) and 1,382 were female (75.4%). The proportion of students with a family history of hypertension was 18.0%, smoking history was 16.4%, overweight/obesity was 9.5%, and abdominal obesity was 7.9%. Refer **Table 1**.

Table 1. Characteristics of general population data

Item	Grouping	Number	Composition ratio (%)
Gender	Male	452	24.6
	Female	1382	75.4
Age (years)	Mean \pm Standard deviation	19 ± 1	/
Ethnicity	Han	1375	75.0
	Ethnic minorities	459	25.0
Smoking history	Yes	301	16.4
BMI (kg/m^2)	≥ 24	175	9.5
Abdominal obesity	Yes	145	7.9

Note: The diagnostic standard for abdominal obesity is abdominal circumference > 85 cm for males and > 80 cm for females.

3.2. Prevalence of abnormal blood pressure

Using 140/90 mmHg as the standard, the prevalence of hypertension among ethnic minorities was 4.4% and prehypertension was 27.9%; the prevalence of hypertension among Han nationality was 3.8% and prehypertension was 25.3%; the overall prevalence of hypertension was 3.9% and prehypertension was 26.0%. There was no statistically significant difference between the two groups ($p > 0.05$), as shown in **Table 2**.

Table 2. Comparison of prevalence of abnormal blood pressure between han and ethnic minority students

Ethnicity	Number of examinations	Hypertension (140/90 mmHg)	Prehypertension	Hypertension (130/80 mmHg)
		Case (%)	Case (%)	Case (%)
Han	1375	52 (3.8)	348 (25.3)	321 (23.3)
Ethnic minorities	459	20 (4.4)	128 (27.9)	112 (24.4)
χ^2	–	0.31	1.19	0.21
p	–	> 0.05	> 0.05	> 0.05

3.3. Prevalence after downward adjustment of hypertension diagnostic threshold

The 2022 Chinese Clinical Practice Guidelines for Hypertension recommends lowering the diagnostic threshold of hypertension in Chinese adults from 140/90 mmHg to 130/80 mmHg. According to the 130/80 mmHg standard, the overall prevalence of hypertension increased to 23.7%, 23.3% among Han nationality and 24.4% among ethnic minorities. There was no statistically significant difference between the two groups ($p > 0.05$), as shown in **Table 2**.

3.4. Prevalence of hypertension, post-downward adjustment hypertension, and prehypertension among students of major ethnic minorities

A total of 459 students from 18 ethnic minorities were included in the survey. The detection rate of hypertension was 4.4%; according to the 130/80 mmHg diagnostic standard, the detection rate of hypertension increased to 24.4%, and the prevalence of prehypertension was 27.9%. See **Table 3**.

Table 3. Main detection results of abnormal blood pressure

Ethnicity	Number of surveys	Composition ratio (%)	Hypertension (140/90 mmHg)		Hypertension (130/80 mmHg)		Blood pressure 120–139/80–89 mmHg	
			Case	Detection rate (%)	Case	Detection rate (%)	Case	Detection rate (%)
			Bai	72	15.7	1	1.4	15
Yi	177	38.6	6	3.4	40	22.6	45	25.4
Other ethnic minorities	210	45.7	12	5.7	57	27.1	43	20.5

3.5. Multivariate logistic regression analysis of risk factors for hypertension

Logistic regression analysis was performed with blood pressure status as the dependent variable and gender, obesity, smoking, diet, family history, and drinking as independent variables, as shown in **Table 4**. Using 140/90 mmHg as the hypertension standard, non-abdominal obesity and non-smoking were protective factors, meaning the presence of these factors was associated with a reduced risk of hypertension; while a salty diet and male gender were pathogenic factors, indicating that a salty diet would increase the risk of hypertension,

and female gender was a protective factor that would reduce the risk of hypertension; family history and drinking history had no significant effect on the risk of hypertension under this threshold ($p > 0.05$).

Table 4. Logistic regression analysis of risk factors for hypertension under different blood pressure diagnostic standards

Variable	140/90 mmHg OR (95% CI)	130/80 mmHg OR (95% CI)
Male	3.448 (1.366–8.908)*	2.243 (1.278–3.934)*
Non-abdominal obesity	0.013 (0.004–0.046)*	0.462 (0.201–1.059)
Non-smoking	0.287 (0.107–0.768)*	1.444 (0.762–2.736)
Salty diet	3.463 (1.063–11.288)*	1.882 (0.906–3.913)
No family history	0.534 (0.203–1.403)	0.536 (0.321–0.895)*
Drinking history	1.726 (0.483–6.173)	0.896 (0.428–1.877)

Note: * $p < 0.05$

When using 130/80 mmHg as the hypertension threshold, male gender was still a pathogenic factor, indicating that females had a lower risk of hypertension than males under the lower blood pressure threshold; no family history became a protective factor, suggesting that people with a family history were more likely to develop hypertension under the relatively strict threshold of 130/80 mmHg; while abdominal obesity, smoking history, salty diet, and drinking history had no statistical significance on the risk of hypertension under this threshold ($p > 0.05$).

4. Discussion

4.1. Analysis of prevalence of abnormal blood pressure and impact of downward adjustment of diagnostic standard

In this study, using 140/90 mmHg as the diagnostic standard, the prevalence of hypertension was 3.9% and prehypertension was 26.0%, which is similar to the results of studies on college students in other universities in China, and falls within the fluctuation range of 0.84–10.59% for the prevalence of hypertension among college students in China, indicating that the data are representative and comparable [3–5]. Both the 2017 ACC/AHA Guidelines and the 2022 Chinese Clinical Practice Guidelines for Hypertension lowered the diagnostic threshold of hypertension to 130/80 mmHg [6]. According to the new standard, the prevalence of hypertension among the subjects in this study increased significantly to 23.7%, suggesting that the detection rate of abnormal blood pressure in young people increases significantly after the downward adjustment of the diagnostic standard, further highlighting the urgency of early blood pressure screening and intervention in the college student group.

4.2. Impact of ethnic differences on blood pressure levels

The results of this study show that regardless of whether the 140/90 mmHg or 130/80 mmHg diagnostic standard is adopted, there is no statistically significant difference in the prevalence of hypertension and prehypertension between Han and ethnic minority students ($p > 0.05$), which is not completely consistent with the conclusions of some ethnic-specific hypertension studies [7–10]. The possible reasons are as follows:

- (1) The subjects are young college students with strong body compensation ability, and the blood pressure differences related to ethnic genetic background have not yet fully manifested;

- (2) The sample covers 18 ethnic minorities with uneven distribution of the number of people in each ethnic group, making it difficult to carry out detailed stratified analysis of a single ethnic group;
- (3) The subjects are all college students with relatively unified living environments and work and rest rules, which weakens the impact of ethnic-related factors such as region and eating habits on blood pressure.

4.3. Analysis of risk factors for increased blood pressure among college students

Multivariate Logistic regression analysis shows that the risk factors for abnormal blood pressure vary with different diagnostic standards: using 140/90 mmHg as the standard, male gender and salty diet are risk factors for hypertension; non-abdominal obesity and non-smoking are protective factors, and family history and drinking history have no significant effect on blood pressure; using 130/80 mmHg as the standard, male gender is still a risk factor, and no family history of hypertension becomes a protective factor, while the effects of abdominal obesity, smoking, high-salt diet, and drinking are not statistically significant. The above results suggest that gender, obesity, smoking, and high-salt diet are key controllable factors under the traditional blood pressure threshold; while under the lower diagnostic threshold, the role of family genetic background is more prominent, further confirming that hypertension is a disease caused by the combined effect of genetic and environmental factors. Some studies suggest that college students need to establish a healthy lifestyle and reduce exposure to high-risk factors to prevent the occurrence of hypertension^[11]. In this study, the smoking rate is 16.4%, the overweight/obesity rate is 9.5%, and the abdominal obesity rate is 7.9%, providing clear targets for campus health intervention.

4.4. Practical significance and intervention suggestions for blood pressure management of college students

The younger trend of hypertension has become an important challenge for the prevention and control of cardiovascular and cerebrovascular diseases in China. As a key group of prehypertension and youth hypertension, early intervention for college students can significantly reduce the risk of long-term complications such as coronary heart disease, stroke, and renal impairment^[12,13]. Colleges and universities should include blood pressure monitoring in routine physical examinations, establish health records and conduct key follow-up of prehypertensive groups; carry out targeted health education such as low-salt diet, smoking cessation, and exercise for high-risk individuals such as males, those with family history, and obese individuals; at the same time, optimize the campus diet and exercise environment, reduce the risk of abnormal blood pressure in young people from both behavioral and environmental aspects, and move forward the prevention and control of cardiovascular and cerebrovascular diseases^[14,15].

4.5. Research limitations

This study is a single-center cross-sectional survey covering only one university in Qujing, and the sample representativeness is limited; stratified and detailed analysis of factors such as altitude, eating habits, and ethnic genetic background is not conducted; long-term follow-up data are lacking, making it impossible to judge blood pressure outcome and intervention effect. In the future, multi-center and prospective cohort studies can be carried out to further clarify the blood pressure change rules and intervention strategies of ethnic minority college students in southwest China.

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Disclosure statement

The authors declare no conflict of interest.

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