

## Association between Ethnic Minority Characteristic Diet and Cardiovascular Disease: Postprint of a Cohort Study of Indigenous Natural Populations in Southwest China's Ethnic Minority Settlements

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### Abstract

Background: Cardiovascular disease (CVD) is one of the major chronic diseases causing death and disability, representing an important public health issue in China. Currently, few studies have examined the impact of characteristic ethnic minority diets on CVD. Objective: To analyze the current prevalence of CVD among ethnic minorities in Guizhou Province and explore the relationship between characteristic ethnic diets and CVD risk. Methods: Data were obtained from the epidemiological survey database of the “Cohort Study of Indigenous Natural Populations in Ethnic Minority Settlement Areas of Southwest China.” From July 2018 to August 2019, a multistage stratified sampling method was used to conduct a baseline survey among 18,790 residents aged 30-79 years of Dong, Miao, and Bouyei ethnicities whose families had resided in the area for three generations in Qiandongnan Miao and Dong Autonomous Prefecture and Qiannan Bouyei and Miao Autonomous Prefecture of Guizhou Province. A total of 17,085 individuals were included in the final analysis. Participants were divided into two groups based on CVD status: CVD group (530 individuals) and non-CVD group (16,555 individuals). Professional interviewers conducted face-to-face interviews using a specialized electronic questionnaire developed by the project team, covering basic demographics, lifestyle habits, disease history, and dietary habits. Based on research on ethnic minority dietary culture, participants were asked to recall the frequency (times/month) of consuming 11 foods during the past year: pickled vegetables, glutinous rice and its products, pickled fish/meat, cured/smoked meat, white sour soup, red sour soup, beef/mutton “bie” dishes, “purple blood” meat, fish mint (*Houttuynia cordata*), bracken fern, and oil tea. Unconditional logistic regression models and restricted cubic spline

analysis were used to examine the relationship between characteristic ethnic diets and CVD. Results: The overall prevalence of CVD among ethnic minorities in Guizhou Province was 3.20%, with rates of 3.14% among the Dong, 3.13% among the Miao, and 3.03% among the Bouyei. The prevalence was higher in males (3.68%) than in females (2.80%). Multivariate logistic regression analysis revealed that in the total population, consuming glutinous rice and its products 1-3 times/month was a protective factor for CVD. In the Dong population, bracken fern  $\geq 1$  time/month was a risk factor for CVD; in the Miao population, glutinous rice and its products  $< 1$  time/month and oil tea  $> 1$  time/month were protective factors; in the Bouyei population, beef/mutton “bie” dishes  $\geq 1$  time/month was a risk factor. Subgroup analysis showed that: in males, glutinous rice and its products 1-3 times/month reduced CVD risk; in individuals  $< 60$  years, glutinous rice and its products 1-3 times/month and fish mint  $< 1$  time/month reduced CVD risk, while bracken fern  $> 1$  time/month increased risk; in normal-weight individuals, glutinous rice and its products  $< 1$  time/month and 1-3 times/month reduced CVD risk; in overweight individuals, “purple blood” meat  $\geq 1$  time/month reduced CVD risk; in obese individuals, red sour soup 1-3 times/month reduced CVD risk; in non-smokers, glutinous rice and its products  $< 1$  time/month and 1-3 times/month reduced CVD risk; in former smokers, bracken fern  $> 1$  time/month increased CVD risk while oil tea  $> 1$  time/month reduced risk; in non-drinkers, glutinous rice and its products 1-3 times/month and red sour soup 1-3 times/month reduced CVD risk, while cured/smoked meat 1-3 times/month increased risk. Non-linear dose-response relationships were observed between glutinous rice and its products, pickled fish/meat, and “purple blood” meat with CVD risk ( $P_{\text{overall}} < 0.05$ ,  $P_{\text{nonlinear}} < 0.05$ ). Conclusion: The prevalence of CVD is relatively low among ethnic minority populations in Guizhou Province. Glutinous rice and its products  $< 1$  time/month and 1-3 times/month, oil tea  $> 1$  time/month, fish mint  $< 1$  time/month, “purple blood” meat  $\geq 1$  time/month, and red sour soup 1-3 times/month may reduce CVD risk, while bracken fern  $\geq 1$  time/month, bracken fern  $> 1$  time/month, beef/mutton “bie” dishes  $\geq 1$  time/month, and cured/smoked meat 1-3 times/month may increase CVD risk. Public education on the consumption frequency of characteristic ethnic diets should be promoted to prevent and control CVD among ethnic minority populations in Guizhou Province through dietary intervention.

## Full Text

### Relationship Between Ethnic Minority Specialty Diets and Cardiovascular Disease: A Cohort Study Based on Natural Populations Living in Ethnic Minority Agglomerations in the Southwestern Region

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## Abstract

**Background** Cardiovascular disease (CVD) is one of the major chronic diseases causing death and disability, representing a significant public health challenge in China. Currently, few studies have examined the impact of ethnic minority specialty diets on CVD.

**Objective** To analyze the prevalence of CVD among ethnic minorities in Guizhou Province and explore the relationship between ethnic specialty diets and CVD risk.

**Methods** Data were obtained from the epidemiological survey database of the “Cohort Study of Natural Populations Living in Ethnic Minority Aggregation Areas in the Southwest Region.” Between July 2018 and August 2019, multi-stage stratified sampling was used to conduct a baseline survey of 18,790 Dong, Miao, and Bouyei residents aged 30-79 years who had lived in Guizhou Province’s Qian-dongnan Miao and Dong Autonomous Prefecture and Qiannan Bouyei Miao Autonomous Prefecture for three generations. A total of 17,085 participants were included in the analysis and divided into two groups based on CVD status: CVD group (530 participants) and non-CVD group (16,555 participants). Professional investigators conducted face-to-face interviews using a specialized electronic questionnaire developed by the research team, covering basic information, lifestyle habits, disease history, and dietary patterns. Based on ethnic minority dietary culture research, participants were asked to recall the frequency (times/month) of consuming 11 food items over the past year: pickled vegetables, glutinous rice and its products, pickled fish/meat, preserved/smoked meat, white sour soup, red sour soup, cow/sheep “deflated” dishes, purple-blooded meat, heartleaf houttuynia herb, fern, and oil tea. Unconditional logistic regression models and restricted cubic splines were used to analyze the relationship between ethnic diets and CVD.

**Results** The overall CVD prevalence among ethnic minorities in Guizhou was 3.20%, with specific rates of 3.14% among the Dong, 3.13% among the Miao, and 3.03% among the Bouyei. Male prevalence (3.68%) was higher than female prevalence (2.80%). Multivariate logistic regression analysis showed that in the total population, glutinous rice and its products consumed 1-3 times/month (OR=0.720, 95%CI=0.553-0.937, P=0.015) was a protective factor for CVD. In the Dong population, fern \$ \$1 time/month (OR=2.172, 95%CI=1.162-4.059, P=0.015) was a risk factor for CVD. In the Miao population, glutinous rice and its products <1 time/month (OR=0.563, 95%CI=0.340-0.933, P=0.026) and oil tea >1 time/month (OR=0.442, 95%CI=0.202-0.967, P=0.041) were protective

factors for CVD. In the Bouyei population, cow/sheep deflated dishes \$ \$1 time/month (OR=1.935, 95%CI=1.046-3.579, P=0.035) was a risk factor for CVD. Subgroup analyses revealed that in males, glutinous rice and its products 1-3 times/month (OR=0.639, 95%CI=0.427-0.957, P=0.030) reduced CVD risk. In participants <60 years, glutinous rice and its products 1-3 times/month (OR=0.656, 95%CI=0.443-0.971, P=0.035) and heartleaf houttuynia herb <1 time/month (OR=0.642, 95%CI=0.418-0.986, P=0.043) reduced CVD risk, while fern >1 time/month (OR=1.655, 95%CI=1.011-2.709, P=0.045) increased CVD risk. In participants with normal body mass, glutinous rice and its products <1 time/month (OR=0.584, 95%CI=0.393-0.868, P=0.008) and 1-3 times/month (OR=0.666, 95%CI=0.452-0.981, P=0.039) reduced CVD risk. In overweight participants, purple-blooded meat \$ \$1 time/month (OR=0.658, 95%CI=0.453-0.955, P=0.027) reduced CVD risk. In obese participants, red sour soup 1-3 times/month (OR=0.592, 95%CI=0.360-0.973, P=0.039) reduced CVD risk. In non-smokers, glutinous rice and its products <1 time/month (OR=0.716, 95%CI=0.532-0.965, P=0.028) and 1-3 times/month (OR=0.711, 95%CI=0.530-0.955, P=0.023) reduced CVD risk. In former smokers, fern >1 time/month (OR=7.507, 95%CI=1.324-42.556, P=0.023) increased CVD risk, while oil tea >1 time/month (OR=0.319, 95%CI=0.103-0.990, P=0.048) decreased CVD risk. In non-drinkers, glutinous rice and its products 1-3 times/month (OR=0.710, 95%CI=0.531-0.948, P=0.020) and red sour soup 1-3 times/month (OR=0.775, 95%CI=0.613-0.980, P=0.033) reduced CVD risk, while preserved/smoked meat 1-3 times/month (OR=1.400, 95%CI=1.040-1.884, P=0.027) increased CVD risk. Glutinous rice and its products, pickled fish/meat, and purple-blooded meat all showed non-linear dose-response relationships with CVD risk (Poverall<0.05, Pnonlinear<0.05).

**Conclusion** The prevalence of CVD is relatively low among ethnic minority populations in Guizhou Province. Glutinous rice and its products (<1 time/month, 1-3 times/month), oil tea (>1 time/month), heartleaf houttuynia herb (<1 time/month), purple-blooded meat (\$ 1time/month), and red sour soup (1 – 3times/month) may reduce CVD risk, while fern ( 1time/month, > 1time/month), cow/sheep deflated dishes (\$ 1time/month), and preserved/smoked meat (1-3 times/month) may increase CVD risk. Public education on appropriate intake frequencies of ethnic minority specialty diets should be promoted to implement dietary interventions for CVD prevention and control among ethnic minority populations in Guizhou Province.

**Keywords:** Cardiovascular diseases; Minority groups; Speciality diets; Guizhou; Logistic models; Cohort studies

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## Introduction

Cardiovascular disease (CVD) is a chronic non-communicable disease that constitutes a leading cause of death and disability worldwide [1]. Research shows

that both the prevalence and mortality of CVD in Chinese populations increased from 1990 to 2019, imposing a heavy disease burden [2]. According to the “Report on Cardiovascular Health and Diseases in China 2022” [3], it is estimated that 330 million people currently suffer from CVD in China, which remains a major public health challenge. Healthy dietary intake is essential for reducing CVD risk [4]. Guizhou Province is home to multiple ethnic groups, with the Dong, Miao, and Bouyei being the most populous after the Han Chinese. Their dietary habits differ significantly from other regions, with preferences for ethnic specialty foods such as cow/sheep “deflated” dishes, sour soup, oil tea, and purple-blooded meat [5]. An animal study demonstrated that Miao red sour soup from Guizhou has preventive effects on non-alcoholic fatty liver disease [6], while another study found that oil tea consumption is associated with reduced lipid risk [7]. Our research group previously identified associations between cow/sheep deflated dishes and white sour soup with dyslipidemia [8], and between preserved meat, pickled vegetables, oil tea, fern, and white sour soup with metabolic-associated fatty liver disease [9]. Based on these findings, we hypothesized that these dietary patterns might also affect CVD. Currently, few studies have investigated the impact of ethnic minority specialty diets on CVD. Therefore, this study analyzed the relationship between ethnic minority specialty diets and CVD in Guizhou to provide evidence for dietary prevention and control of CVD in this region.

## Methods

**1.1 Study Participants** Data were derived from the epidemiological survey database of the “Cohort Study of Natural Populations Living in Ethnic Minority Aggregation Areas in the Southwest Region.” Between July 2018 and August 2019, multi-stage stratified sampling was employed to conduct a baseline survey of 18,790 Dong, Miao, and Bouyei residents aged 30-79 years who had resided for three generations in Qiangdongnan Miao and Dong Autonomous Prefecture and Qiannan Bouyei Miao Autonomous Prefecture of Guizhou Province. Detailed information about the cohort has been previously reported [10]. Inclusion criteria comprised all individuals who completed the baseline survey. Exclusion criteria included incomplete questionnaire data, lack of covariate information, and presence of malignant tumors or mental/psychological disorders. A total of 17,085 participants were included in the final analysis and divided into two groups based on CVD status: CVD group (530 participants) and non-CVD group (16,555 participants). All participants provided informed consent voluntarily. The study was approved by the Medical Ethics Review Committee of Sichuan University (K2016038) and the Medical Ethics Committee of Guizhou Medical University Affiliated Hospital (2018[094]).

**1.2 Survey Methods** Professional investigators conducted face-to-face interviews using a specialized electronic questionnaire developed by the research team, covering basic information, lifestyle habits, disease history, and dietary patterns. Based on ethnic minority dietary culture research, participants were

asked to recall the frequency (times/month) of consuming 11 food items over the past year: pickled vegetables, glutinous rice and its products, pickled fish/meat, preserved/smoked meat, white sour soup, red sour soup, cow/sheep deflated dishes, purple-blooded meat, heartleaf houttuynia herb, fern, and oil tea.

**1.3 Laboratory Examination Indicators** Fasting venous blood samples were collected from participants. Total cholesterol (TC), triglycerides (TG), high-density lipoprotein cholesterol (HDL-C), low-density lipoprotein cholesterol (LDL-C), and fasting blood glucose were measured using an automatic biochemical analyzer (HITACHI 7180, Tokyo, Japan).

**1.4 Variable Definitions** **1.4.1 Basic Characteristics:** (1) Education level was categorized as junior high school and below, senior high school (including technical secondary school), and college and above. (2) Annual household income was divided into <20,000 yuan, 20,000-59,999 yuan, and  $\geq 60,000$  yuan. (3) BMI was defined as  $\text{weight}/\text{height}^2$  (kg/m<sup>2</sup>) and classified according to standards as normal (BMI < 24 kg/m<sup>2</sup>), overweight (24 < BMI < 28 kg/m<sup>2</sup>), and obese (BMI  $\geq 28$  kg/m<sup>2</sup>) [11].

**1.4.2 Lifestyle Habits:** (1) Smoking status was categorized as never smoked, current smoker ( $\geq 100$  cigarettes smoked to date), and former smoker. (2) Alcohol consumption was divided into non-drinker and drinker (consuming alcohol at least once weekly in the past six months).

**1.4.3 Disease History:** (1) Participants self-reported hypertension and diabetes status. (2) CVD history was defined as self-report of being diagnosed by a doctor at a township/district-level or higher hospital with coronary heart disease, stroke, or arrhythmia [12]. (3) Family history of CVD was defined as self-report of parents or siblings diagnosed with CVD by a doctor at a township/district-level or higher hospital.

**1.4.4 Dietary Assessment:** Total energy intake was calculated based on food consumption data from Guizhou Province, the Chinese Food Exchange Tables [12], and the Chinese Food Composition Tables (2018 Edition) [12]. Energy content per food category and intake amounts were obtained and summed via matrix multiplication to derive each participant's daily total energy intake (kcal/d).

**1.5 Quality Control** Professional investigators underwent rigorous standardized training and assessment before the survey. All instruments and equipment were calibrated during the survey period, and operations followed national standard procedures. Audio recordings from questionnaire interviews were checked daily through random sampling. After data collection, a self-developed computer system was used for electronic storage and management. Data were verified and validated to ensure accuracy, with the entire correction process recorded in the computer system.

**1.6 Statistical Analysis** IBM SPSS 25.0 and R 4.3.2 were used for statistical analysis. Measurement data, which were not normally distributed, were described as M(P25, P75) and compared between groups using Mann-Whitney U tests. Count data were described as n(%) and compared using  $\chi^2$  tests. Unconditional multivariate logistic regression models were used to analyze the relationship between ethnic specialty diets and CVD, with subgroup analyses performed. The rms package in R 4.3.2 was used for restricted cubic spline (RCS) analysis to examine dose-response relationships between specialty diets and CVD risk among Guizhou ethnic minorities, with 3 knot points set at median values. The significance level was  $\alpha=0.05$ , with  $P<0.05$  considered statistically significant.

## Results

**2.1 General Characteristics** Among the 17,085 participants, 5,836 (34.16%) were male and 11,249 (65.84%) were female, with a median age of 51.84 years. The overall CVD prevalence was 3.20% (530/17,085), with rates of 3.14% (207/6,599) among the Dong, 3.13% (158/5,043) among the Miao, and 3.03% (165/5,443) among the Bouyei. Male prevalence (3.68%, 215/5,836) was higher than female prevalence (2.80%, 315/11,249). No statistically significant differences were observed between groups in ethnicity distribution, education level, household income, TC and LDL-C levels, or weekly vegetable oil and salt intake ( $P>0.05$ ). However, significant differences were found in age, gender, smoking status, alcohol consumption, BMI, prevalence of hypertension, diabetes, and family history of CVD, as well as TG, HDL-C, fasting blood glucose levels, and weekly animal oil and total energy intake ( $P<0.05$ ).

**2.2 Specialty Dietary Patterns** No significant differences were observed between groups in the consumption frequency of preserved/smoked meat, white sour soup, fern, or oil tea ( $P>0.05$ ). However, significant differences were found in the consumption frequency of pickled vegetables, glutinous rice and its products, pickled fish/meat, red sour soup, cow/sheep deflated dishes, purple-blooded meat, and heartleaf houttuynia herb ( $P<0.05$ ).

**2.3 Logistic Regression Analysis** Using CVD occurrence (yes=1, no=0) as the dependent variable and the 11 specialty foods as independent variables (coded as: never=0, <1 time/month=1, 1-3 times/month=2, >3 times/month=3; or never=0, \$ \$1 time/month=1, >1 time/month=2), multivariate logistic regression analysis after adjusting for confounders showed that in the total population, glutinous rice and its products consumed 1-3 times/month (OR=0.720, 95%CI=0.553-0.937,  $P=0.015$ ) was a protective factor for CVD. In the Dong population, fern \$ \$1 time/month (OR=2.172, 95%CI=1.162-4.059,  $P=0.015$ ) was a risk factor for CVD. In the Miao population, glutinous rice and its products <1 time/month (OR=0.563, 95%CI=0.340-0.933,  $P=0.026$ ) and oil tea >1 time/month (OR=0.442, 95%CI=0.202-0.967,  $P=0.041$ ) were protective factors for CVD. In the Bouyei population, cow/sheep deflated

dishes \$ \$1 time/month (OR=1.935, 95%CI=1.046-3.579, P=0.035) was a risk factor for CVD .

**2.4 Subgroup Analysis** Subgroup analyses were performed using CVD occurrence (yes=1, no=0) as the dependent variable and different specialty foods as independent variables (coded as above), with confounding factors adjusted.

**2.4.1 Gender Subgroup:** In males, glutinous rice and its products consumed 1-3 times/month (OR=0.639, 95%CI=0.427-0.957, P=0.030) reduced CVD risk .

**2.4.2 Age Subgroup:** In participants <60 years, glutinous rice and its products 1-3 times/month (OR=0.656, 95%CI=0.443-0.971, P=0.035) and heartleaf houttuynia herb <1 time/month (OR=0.642, 95%CI=0.418-0.986, P=0.043) reduced CVD risk, while fern >1 time/month (OR=1.655, 95%CI=1.011-2.709, P=0.045) increased CVD risk .

**2.4.3 BMI Subgroup:** In participants with normal body mass, glutinous rice and its products <1 time/month (OR=0.584, 95%CI=0.393-0.868, P=0.008) and 1-3 times/month (OR=0.666, 95%CI=0.452-0.981, P=0.039) reduced CVD risk. In overweight participants, purple-blooded meat \$ \$1 time/month (OR=0.658, 95%CI=0.453-0.955, P=0.027) reduced CVD risk. In obese participants, red sour soup 1-3 times/month (OR=0.592, 95%CI=0.360-0.973, P=0.039) reduced CVD risk .

**2.4.4 Lifestyle Subgroup:** In non-smokers, glutinous rice and its products <1 time/month (OR=0.716, 95%CI=0.532-0.965, P=0.028) and 1-3 times/month (OR=0.711, 95%CI=0.530-0.955, P=0.023) reduced CVD risk. In former smokers, fern >1 time/month (OR=7.507, 95%CI=1.324-42.556, P=0.023) increased CVD risk, while oil tea >1 time/month (OR=0.319, 95%CI=0.103-0.990, P=0.048) decreased CVD risk. In non-drinkers, glutinous rice and its products 1-3 times/month (OR=0.710, 95%CI=0.531-0.948, P=0.020) and red sour soup 1-3 times/month (OR=0.775, 95%CI=0.613-0.980, P=0.033) reduced CVD risk, while preserved/smoked meat 1-3 times/month (OR=1.400, 95%CI=1.040-1.884, P=0.027) increased CVD risk .

**2.5 Dose-Response Analysis** When the 11 specialty foods were entered as continuous variables into the RCS model, glutinous rice and its products, pickled fish/meat, and purple-blooded meat showed dose-response relationships with CVD risk (Poverall<0.05), all exhibiting non-linear relationships (Pnonlinear<0.05) [Figure 1: see original paper].

## Discussion

CVD is a primary cause of premature death and rising healthcare costs. In 2020, the proportion of deaths due to CVD among Chinese residents was higher than in 2019 [3]. Previous studies have shown that healthy diets can effectively reduce blood pressure in Chinese adults with hypertension [13]. Few studies have

explored the association between ethnic specialty diets and CVD; therefore, investigating this relationship can provide valuable references for CVD prevention and treatment.

### 3.1 CVD Prevalence Status Among Ethnic Minorities in Guizhou

The overall CVD prevalence among ethnic minorities aged 30-79 years in Guizhou was 3.20%, with rates of 3.14% among the Dong, 3.13% among the Miao, and 3.03% among the Bouyei—all lower than global (6.73%) and national (8.46%) CVD prevalence rates. Male prevalence (3.68%) was higher than female prevalence (2.80%), which differs from previous research. Yang et al. [2] found that standardized prevalence was higher in females than males. This discrepancy may be related to differences in ethnicity, region, environment, lifestyle, dietary habits, and inadequate control of CVD risk factors (overweight, obesity, hypertension, diabetes, dyslipidemia) [14].

### 3.2 Impact of Ethnic Specialty Diets on CVD in Guizhou

Glutinous rice has high nutritional value, containing abundant essential nutrients. Glutinous rice wine has warming and spleen-nourishing effects [15]. This study found that glutinous rice and its products <1 time/month was a protective factor against CVD in the Miao population and reduced CVD risk in participants with normal body weight and non-smokers. Glutinous rice and its products 1-3 times/month was a protective factor in the total population and reduced CVD risk in males, participants <60 years, those with normal body weight, non-smokers, and non-drinkers. Additionally, monthly consumption frequency of glutinous rice showed a non-linear dose-response relationship with CVD risk. Kim et al. [16] found that fermented glutinous rice can reduce inflammatory responses. A Korean study demonstrated that glutinous rice has antioxidant, lipid-lowering, and cardioprotective effects [17]. Appropriate consumption of glutinous rice may prevent or improve the development of CVD risk factors, thereby reducing CVD occurrence, though further research is needed to confirm these mechanisms.

Fern is believed to have blood pressure-, glucose-, and lipid-lowering effects in daily consumption [18]. However, research also indicates that fern contains ptaquiloside-type glycosides that can cause cancer and other toxic effects in animals, potentially posing health risks to humans [19]. These conflicting findings may be due to anatomical and physiological differences between humans and experimental animals, as well as the controlled conditions under which experimental animals are kept, which differ from complex human living environments. This study found that fern \$ \$1 time/month was a risk factor for CVD in the Dong population, while fern >1 time/month increased CVD risk in participants <60 years and former smokers.

Oil tea >1 time/month was a protective factor against CVD in the Miao population and reduced CVD risk in former smokers. Oil tea is prepared by frying sticky rice and tea leaves in camellia oil, adding water to make a tea soup, then

adding puffed rice, fried peanuts, and pork offal. Animal studies have found that camellia seed oil, composed of excellent fatty acids and rich bioactive components, plays an important role in lipid reduction in rats [20]. Tang et al. [21] demonstrated that oil tea inhibits blood lipid elevation in high-fat diet rats.

Cow/sheep deflated dishes are prepared from the undigested food contents extracted from the stomach or small intestine of cattle or sheep, used as a sauce ingredient for hot pot [22], with heat-clearing and detoxifying effects. This study found that cow/sheep deflated dishes \$ \$1 time/month was a risk factor for CVD in the Bouyei population, with a 1.935-fold higher risk compared to non-consumers. This may be because consumption of cow/sheep deflated hot pot is often accompanied by increased intake of red meat and offal, which may elevate CVD risk [23].

Heartleaf houttuynia herb is a plant with both edible and medicinal value, popular in Guizhou. Subgroup analysis showed that heartleaf houttuynia herb <1 time/month reduced CVD risk in participants <60 years. It exerts anti-atherosclerotic effects through lipid-lowering [24] and demonstrates anti-inflammatory activity by suppressing inflammatory markers IL-6 and nitric oxide production while increasing anti-inflammatory factor IL-10 concentrations, thereby improving cardiac function [25].

Purple-blooded meat, also called “blood red,” is prepared by stir-frying pork lean meat and offal, then adding fresh pig blood and seasonings [5]. This study found that in overweight participants, purple-blooded meat \$ \$1 time/month reduced CVD risk by 34.2%, with a non-linear dose-response relationship between monthly consumption frequency and CVD risk. Heme iron accounts for approximately 40% of iron in meat, and studies show that heme iron intake and non-heme iron intake can reduce CVD risk by 32.1% and 63.8%, respectively [26].

Red sour soup 1-3 times/month reduced CVD risk in obese and non-drinking participants. Red sour soup is a condiment made from tomatoes, chili peppers, and glutinous rice through natural fermentation by microorganisms such as *Lactobacillus* and yeast. It is a high-potassium, low-sodium healthy and nutritious food with average calcium, phosphorus, and iron contents higher than other types of sour soup [27]. Studies indicate that appropriate dietary iron intake can prevent non-fatal CVD [28], and higher total iron intake reduces CVD incidence [29].

Preserved and smoked meat are popular in southwestern China. This study found that preserved/smoked meat 1-3 times/month increased CVD risk in non-drinkers. Large amounts of salt are added during preserved meat production to prevent spoilage and extend shelf life. Research shows that excessive sodium intake increases stroke risk [30]. Dong pickled fish is naturally fermented, producing beneficial bioactive substances during fermentation [31] that may have cardiovascular benefits.

This study has several limitations. First, as a cross-sectional survey, it cannot

establish temporal relationships between exposure and outcome or infer reverse causality. Second, self-reported dietary data are subject to recall bias. Finally, no laboratory testing of specialty foods was conducted. Future studies should follow up this cohort and further explore the mechanisms through which specialty diets affect CVD to provide more scientific and comprehensive research clues for CVD development and progression.

In conclusion, CVD prevalence is relatively low among ethnic minority populations in Guizhou Province. Glutinous rice and its products (<1 time/month, 1-3 times/month), oil tea (>1 time/month), heartleaf houttuynia herb (<1 time/month), purple-blooded meat (1 time/month), and red sour soup (1-3 times/month) may reduce CVD risk, while fern (1 time/month, > 1 time/month), cow/sheep defatted dishes (1 time/month), and preserved/smoked meat (1-3 times/month) may increase CVD risk. Additionally, glutinous rice and its products, pickled fish/meat, and purple-blooded meat showed non-linear dose-response relationships with CVD risk. These findings provide reference for appropriate consumption frequencies and amounts of ethnic specialty diets, helping to prevent or reduce CVD occurrence through dietary interventions.

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