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Survey on Dietary Behaviors and Health Status of University Students and Research on Nutrition Education Intervention

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ABSTRACT

This study investigates the dietary behaviors, health status, and nutritional knowledge of university students in Sanya City, and evaluates the effectiveness of a targeted nutrition education intervention. A questionnaire survey was administered to 380 students (356 valid responses, 93.68% response rate). The study assessed general demographic information, dietary habits, lifestyle behaviors, and nutrition-related knowledge, attitudes, and practices (KAP). Anthropometric measurements (height, weight, BMI, waist circumference, hip circumference) and physical examinations (blood pressure, blood glucose, blood lipids) were also conducted. Following baseline assessment, a multi-channel nutrition education intervention was implemented using WeChat groups, lectures, and interactive Q&A sessions. Results showed that 10.41% of participants were overweight (BMI ⩾ 24) and 3.93% were obese (BMI ⩾ 28). Prevalent unhealthy behaviors included skipping breakfast (>94%), high sugar-sweetened beverage consumption (~97%), widespread alcohol use (96.8%), and high smoking rates (18.18% males, 11.83% females). Following the intervention, significant improvements were observed: the proportion maintaining regular three meals per day increased from 32.34% to 59.78%; fruit and vegetable intake (⩾5 times/week) increased from 24.02% to 39.78%; dietary health knowledge awareness rose from 23.47% to 59.89%; and regular exercise (⩾3 times/week) increased from 29.68% to 47.62%. Additionally, 57.30% of participants shared health information with family members, producing a radiation effect on surrounding populations. These findings suggest that systematic nutrition education interventions are effective in improving dietary behaviors and lifestyle habits among university students, with potential for broader community health impact.

KEYWORDS

University students; Dietary behavior; Nutrition education intervention; Health status; Lifestyle

1 Introduction

Healthy diet and lifestyle can prevent approximately 60% of chronic non-communicable diseases (NCDs). The WHO reports that nine of the top ten leading causes of death worldwide are related to NCDs and nutritional status [1]. In China, cardiovascular diseases and cancer account for 45% and 23% of total deaths, respectively [2]. NCDs not only have a significant and prolonged impact on individuals' lifespan and quality of life for both patients and their families [3], but also consume enormous social and national resources in terms of funding and medical care. Therefore, the necessity of NCD prevention is becoming increasingly prominent.

With economic development and rising living standards, the relationship between dietary behaviors and health status among university students has attracted growing attention.

Malnutrition, particularly among young people, has become a serious public health concern that may lead to obesity, nutritional deficiencies, and metabolic syndrome [4]. These health issues not only affect students' quality of life and academic performance, but also impose significant economic burdens on society, primarily manifested as increased healthcare costs and reduced productivity [5].

The student years represent a critical stage for the formation of individual dietary habits. A balanced diet is not only essential for physical health, but also directly affects learning efficiency and mental health. However, many university students face challenges related to poor dietary habits and insufficient nutritional knowledge, which may lead to obesity, malnutrition, and other health problems. The formation of dietary habits among college students is often influenced by socioeconomic factors. Research has found that students from economically disadvantaged backgrounds tend to choose low-cost foods with limited nutritional value, thereby increasing the risk of malnutrition or obesity [6]. Furthermore, academic pressure and lack of nutritional knowledge may also contribute to unhealthy dietary habits, which not only affect students' weight but may also lead to various chronic diseases [7]. Therefore, understanding college students' dietary behaviors and their influencing factors is particularly important for developing targeted health education intervention programs.

University students, as young adults, are beginning to live independently away from parental guidance, learning to adapt to collective living — a critical period for the formation and consolidation of dietary and lifestyle habits. Their nutritional knowledge and dietary behaviors both reflect patterns inherited from their families of origin and are influenced by peer groups; they are highly malleable. Moreover, at this age, individuals possess strong comprehension

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and learning abilities, along with an eagerness to acquire and absorb new knowledge. At the same time, young people represent the future of society and the nation, and their health literacy, dietary structure, eating habits, and lifestyle are hot research topics in health-related fields both domestically and internationally[8-11].

Although various methods of nutritional assessment, dietary intervention, and health education have been proposed, existing interventions still have limitations in terms of effectiveness and individual differences, indicating the need to explore new and effective interventions to improve students' dietary behaviors and overall health status [12]. Studies have shown that dietary behavior characteristics of university students — such as food choices, meal frequency, and nutritional knowledge levels — are closely related to their health status [13]. These dietary behaviors are not only influenced by students' personal lifestyles, but are also constrained by environmental and social factors, making dietary behavior intervention complex and challenging [14]. Therefore, understanding the associations among these factors is of great significance for improving students' dietary behaviors and health status [15].

University cafeterias play a crucial role in students' daily lives, serving as a primary source of nutrition. Cafeterias not only provide convenient food options, but also subtly influence students' eating habits and health. Research indicates that students' dietary habits are closely related to their health. College students generally exhibit unhealthy eating habits that are closely associated with the variety and nutritional value of cafeteria foods [16]; while good dietary habits help maintain physical health and improve academic efficiency, poor dietary habits may lead to obesity, malnutrition, and other health issues [17]. A nutritionally balanced menu design can help students maintain healthy body weight and reduce the risk of obesity and related chronic diseases by providing abundant fruits, vegetables, whole grains, and high-quality proteins [18].

Nutrition labels and information transparency play an important role in influencing students' food choices. Studies have found that clear nutrition labels help consumers better understand the nutritional composition of foods, enabling them to make healthier choices [19]. Visual presentations of nutritional information and health information, such as "traffic light" labels, can help students better understand food composition and make more informed choices [20]. When menus include detailed nutritional information, students tend to choose lower-calorie, lower-sodium, and higher-nutritional-value foods, thereby improving overall dietary quality [21]. This information transparency not only enhances students' awareness of food, but also strengthens their emphasis on healthy eating. Therefore, cafeteria innovation in food presentation and visualization can effectively guide students toward healthier dietary choices and promote their overall health [22].

In order to implement the National Nutrition Plan (2017–2030) and the Hainan Province National Nutrition Plan (2018–2030) Implementation Plan, and to promote the construction of nutrition-healthy venues in food service industries and school cafeterias in Hainan Province — guiding relevant institutions in scientific meal planning and building a systematic nutritional dietary service system — the Hainan Provincial Health Commission organized and compiled [23] the officially released notification on April 8, 2025: "Notice on Printing and Distributing the 'Hainan Province Nutritional Healthy Restaurant Evaluation Standards (Trial for Food Service Operators)' and 'Hainan Province Nutritional Healthy Canteen Evaluation Standards (Trial for School Canteens)' ". This project represents an active initiative to implement relevant national calls and provincial policies.

In summary, university cafeterias play a crucial role in promoting healthy eating among students; their multiple influences are reflected not only in students' nutritional intake, but also in their mental health and academic efficiency. Factors such as food variety, nutritional balance, dining environment, and nutrition education in cafeterias will all have a significant impact on students' dietary behaviors. Therefore, the optimization of cafeteria management strategies and food choices will directly affect students' health status and quality of life.

2 Baseline Characteristics Survey of Target Population and Radiating Population

2.1 Survey of General Personal Information

This study used online questionnaires, distributing 380 questionnaires and recovering 356 valid responses, yielding an effective response rate of 93.68%. The first part of the questionnaire collected general information about respondents, including basic demographic information such as gender, age, ethnicity, and place of origin, as well as parental educational background; and social background information including living environment, economic status, and family structure (Table 1).

As shown in Table 1, the male-to-female ratio in the study population was approximately 1:1. The age range was 18–23 years, broadly consistent with the typical undergraduate education age range in China, with the majority concentrated between 18 and 22 years; those aged 23 and above accounted for only 3.37%. Undergraduate students at universities in Sanya City are predominantly Han Chinese, accounting for approximately 90%. The ratio of local Hainan students to students from other provinces was approximately 7:3.

Table 1 General Personal Information Survey Data

Item	Category	Count	Percentage
Gender	Male	187	52.53%
	Female	169	47.47%
Age	18 years	62	17.42%
	19 years	69	19.38%
	20 years	76	21.35%
	21 years	74	20.79%
	22 years	63	17.70%
	23 years and above	12	3.37%
Ethnicity	Han	314	88.20%
	Ethnic minority	42	11.80%
Place of Origin	Hainan Province	246	69.10%
	Other provinces	110	30.90%
Father's Education	Junior high school or below	32	8.99%
	High school	93	26.12%
	Associate degree	170	47.75%
	Bachelor's degree	48	13.48%
	Master's degree or above	17	4.78%
Mother's Education	Junior high school or below	46	12.92%
	High school	79	22.19%
	Associate degree	128	35.96%
	Bachelor's degree	85	23.88%
	Master's degree or above	14	3.93%
Economic Status (Monthly income per capita)	< 5,000 CNY	150	42.13%
	5,000–10,000 CNY	300	84.27%
	e > 10,000 CNY	117	32.87%
Family Structure	Nuclear family (parents + children)	251	70.51%
	Three-generation household	54	15.17%
	Single-parent family	45	12.64%
	Other	6	1.69%

Mothers' educational level was most commonly associate degree (35.96%), with approximately two-thirds holding associate degree or above; approximately 66.01% of fathers held associate degree or above qualifications.

Families with a monthly per capita income of 5,000 – 10,000 CNY accounted for 84.27%. The predominant family structure was the nuclear family model (parents + children) at 70.51%, followed by three-generation households (15.17%) and single-parent families (12.64%).

Among respondents who were aware of their family medical history, reported chronic disease conditions in three generations (including grandparents, parents' generation, and same-generation cousins) showed that cancer and hypertension had the highest proportions, followed by cardiovascular and cerebrovascular diseases, then diabetes, overweight, and obesity (Table 2).

Table 2 Family Medical History Known by Student Respondents

Diseases	Overall proportion (n / %)	Number of people with chronic diseases among three generations of family relatives				
		1	2	3	4	5
Hypertension	156/43.82%	139/39.04%	16/4.49%	1/0.28%	-	-
Osteoporosis	10/2.81%	8/2.25%	1/0.28%	1/0.28%	-	-
Diabetes (insulin-dependent)	47/13.20%	46/12.92%	-	-	-	1/0.28%
Diabetes (non-insulin-dependent)	49/13.76%	38/10.67%	11/3.09%	-	-	-
Cancer	179/50.28%	121/33.99%	46/12.92%	8/2.25%	3/0.84%	1/0.28%
Overweight/Obesity	37/10.39%	25/7.02%	8/2.25%	1/0.28%	2/0.56%	-
Coronary heart disease	61/17.13%	47/13.20%	9/2.53%	4/1.12%	-	1/0.28%
Stroke	82/23.03%	69/19.38%	11/3.09%	2/0.56%	-	-

2.2 Dietary Survey

The vast majority of on-campus university students use the cafeteria as their primary eating venue; however, food delivery services remain their second most common eating option, with a higher proportion on weekends (approximately 84.57%). Therefore, the cafeteria dining environment, range of available foods, food variety, and meal prices are decisive

factors for on-campus students' balanced nutrition.

2.3 Dietary Behavior and Lifestyle Survey

Data on the frequency of skipping breakfast per week among the surveyed population (Figure 1) showed that the majority had a habit of skipping breakfast (94.97% of males, 97.20% of females). On weekends, students often combined breakfast and lunch into one meal. Vegetarians and picky eaters accounted for a relatively small proportion. Approximately 21.37% of female respondents reported having dieted or currently dieting. Due to class schedules and other factors, dinner was relatively the most flexible meal of the day, making it the primary meal for on-campus university students.

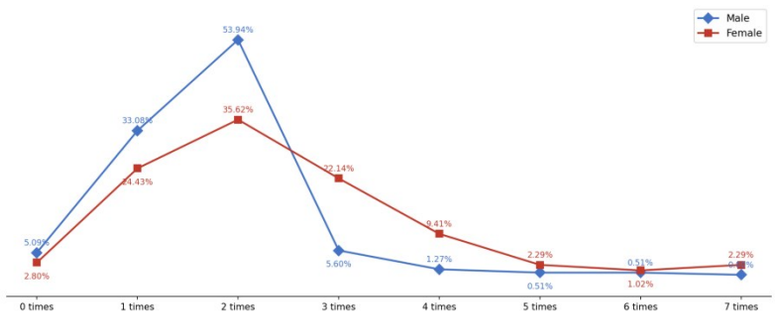


Figure 1 Frequency of Skipping Breakfast per Week Among Student Respondents

Because university students, especially males, often consume alcohol in social settings, relevant data are presented in Table 3. Only 3.20% of respondents had never consumed alcohol. The average age of first alcohol exposure was 14 years. Students with urban household registration had a higher proportion of alcohol consumption compared to those with rural registration, with a statistically significant difference ($P < 0.05$). Drinking habits showed no significant association with family income; peer socialization and group activities among peers may be the primary reason.

Table 3 Alcohol-Related Information (n=356)

Item	% / Value	P value
Ever consumed alcohol	96.80%	
Age of first alcohol exposure (mean ± SD, years)	14.2 ± 1.9	
Age of first alcohol attempt (mean ± SD, years)	7.4 ± 2.8	
Urban household registration	97.51%	
Rural household registration	55.12%	0.034
Higher-income families	97.32%	
Middle-income families	98.54%	
Lower-income families	96.42%	0.36
Ever engaged in binge drinking as defined by WHO (>40g pure alcohol/day for males, >20g/day for females)	96.49%	

Sugar-sweetened beverages (SSBs) were the most commonly chosen drinks among the surveyed students (Figure 2). Only 3.56% of respondents reported choosing sugar-free beverages (plain water, mineral water, purified water, or others) as their daily drink. Approximately 28.24% chose one SSB per day, 38.68% chose two, and approximately one-fifth of respondents consumed three SSBs per day. Among SSBs, cola (e.g., Coca-Cola, Pepsi) was the most preferred, followed by Sprite and various tea-based beverages (Figure 3).

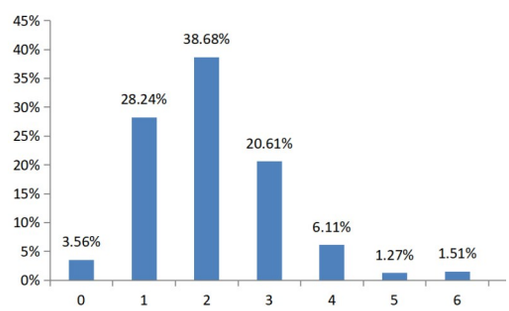


Figure 2 Daily Sugar-Sweetened Beverage Consumption Frequency

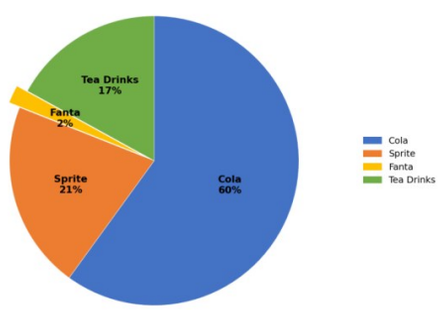
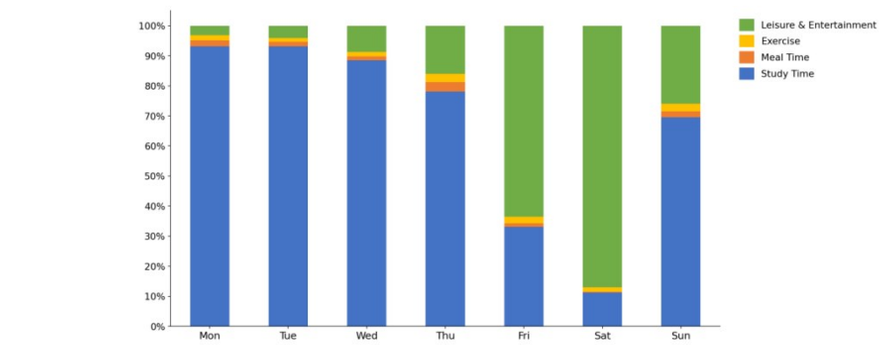


Figure 3 Types of Sugar-Sweetened Beverages Consumed Daily

Approximately 18.18% of male respondents (34 persons) and 11.83% of female respondents (20 persons) identified

themselves as smokers, among whom 11 males had previously attempted to quit, while none of the female smokers had attempted cessation. The main reasons for smoking included "cool image," "wanting to fit in," and "lack of self-control." The heaviest smokers consumed 15–25 cigarettes per day.

29.68% of respondents reported engaging in regular physical exercise, with running, ball sports, and swimming as the primary forms. The proportion of non-sleep time spent on various activities is shown in Figure 4. The majority of respondents' time was occupied by classes or studying, indicating that on weekdays, students engaged in prolonged sedentary behavior consistent with academic demands. On Fridays and weekends, students had more discretionary time; electronic devices for leisure (video games, mobile phones, tablets, etc.) occupied approximately 70.23% of this free time.



	Mon	Tue	Wed	Thu	Fri	Sat	Sun
Leisure & Entertainment	3.1%	4.1%	8.7%	16.0%	63.6%	87.0%	26.0%
Exercise	1.8%	1.3%	1.5%	2.8%	2.2%	1.5%	2.5%
Meal Time	2.0%	1.5%	1.3%	3.1%	1.1%	0.3%	2.0%
Study Time	93.1%	93.1%	88.5%	78.1%	33.1%	11.2%	69.5%

Figure 4 Proportion of Non-Sleep Time Allocation

2.4 Nutrition and Related Knowledge, Attitudes, and Practices (KAP) Survey

The level of nutritional knowledge was closely related to students' majors. Students in medical or health-related programs, such as nursing and health service management, had significantly greater nutritional knowledge than students in arts or foreign language programs ($P < 0.05$), and were more attentive to healthy behaviors and lifestyles.

3 Anthropometric Measurements, Physical Examination, and Nutrition-Related Disease Assessment of Target Population

Respondents underwent measurements of anthropometric indicators, primarily including: height, weight, BMI, waist circumference, and hip circumference.

Table 4 Anthropometric Indicators

Category	Threshold			Respondent group		
	BMI (kg/m^2)	Waist Circumference (cm)	WHR	BMI %	WC %	WHR %
Underweight	15–18.4	—	⩽ 0.4	0.90%	0	0.30%
Normal	18.5–23.9	Male < 85, Female < 80	0.4 – 0.49	85.39%	72.48%	73.03%
Overweight	24–27.9	—	0.5 – 0.59	10.41%	16.85%	20.79%
Obese	⩾ 28	—	⩾ 0.6	3.93%	10.67%	6.18%

Results showed that 38 participants were overweight (BMI ⩾ 24), accounting for 10.41%, and 14 were obese (BMI ⩾ 28), accounting for 3.93%. Based on waist circumference and waist-hip ratio, BMI alone does not fully reflect the degree of obesity. The sedentary lifestyle and low physical activity of this group may result in central obesity even when BMI falls within the normal range.

Physical examination data from the past year were collected, including heart rate, blood pressure, blood glucose, and blood lipids. Results showed that 7 participants had hypertension, 15 had impaired glucose tolerance, and 18 had mild hyperlipidemia, all accounting for small proportions. Three students with hypertension who also had a history of smoking and alcohol use and a family history of chronic disease underwent medical imaging examination, revealing one case of ischemic encephalopathy.

4 Health Education Intervention

This study primarily employed the following methods for health education intervention: establishing an instant communication platform — using WeChat group messages, telephone, and voice communication as modern communication tools to regularly communicate with participants, understand recent lifestyle and behavioral changes and difficulties encountered, and provide answers and guidance; disseminating nutritional health information — through lectures, interactive Q&A sessions, and regular releases of health information, dietary guidelines, and exercise recommendations, with the aim of enhancing college students' awareness of healthy diet and lifestyle, and promoting positive behavioral change.

Table 5 Health Education Intervention Results

Indicator	Pre-intervention	Post-intervention
Proportion maintaining regular three meals per day	32.34%	59.78%
Fruit and vegetable intake ⩾ 5 times/week	24.02%	39.78%
Reduction in high-calorie food intake frequency	—	27.89%
Dietary health knowledge awareness rate	23.47%	59.89%
Exercise ⩾ 3 times/week	29.68%	47.62%
Average daily sleep duration (⩾ 7 hours)	42.89%	69.83%
Reduction in smoking and alcohol use	—	25.00%

Summary of dietary improvement outcomes (Table 5): The proportion of students maintaining regular three meals per day increased significantly after intervention, demonstrating that dietary health education has a positive effect on promoting regular meal patterns. Fruit and vegetable intake increased substantially, contributing to improved nutritional balance and overall health. The reduction in high-calorie food consumption indicates that students made healthier food choices, which is beneficial for weight management and chronic disease prevention. The significant increase in dietary health knowledge awareness demonstrates that the intervention effectively improved students' health literacy, laying the foundation for healthy dietary habits.

Lifestyle improvement outcomes: The proportion of students exercising three or more times per week increased significantly, indicating that physical activity planning and implementation had a notable effect on promoting exercise habits. The increase in average daily sleep duration contributed to improved sleep quality and reduced health problems caused by sleep deprivation. The reduction in unhealthy behaviors such as smoking and alcohol use indicates that the intervention had a positive effect on promoting healthy lifestyles.

57.30% of respondents had discussed balanced diet and healthy lifestyle topics with family members and shared the health promotion knowledge they received; among these, 43.63% reported that their family members' lifestyles had improved. Therefore, this study demonstrated a certain health education radiating effect on surrounding populations.

5 Conclusions and Recommendations

Through a systematic baseline survey, health education intervention, and effectiveness evaluation, this study assessed the nutritional and health status of university students in Sanya City. Results indicate that health education intervention effectively improved the target population's nutritional knowledge, enhanced dietary structure and lifestyle habits, and had a positive effect on the prevention of nutrition-related diseases. At the same time, the intervention produced a certain radiating effect, positively influencing the nutritional and health status of surrounding populations and family members. It is recommended that future efforts continue to deepen health education work, expand the scope of intervention, and adopt more diverse health promotion methods to further enhance public nutritional health levels.

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