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Original Article

Underweight and Dietary Patterns among Ethnic Minority Students in Vietnam

*Trang Tran[1,2], Duong Truong[1,2], Tam Nguyen[2], Van Tran[2], Pattara Sanchaisuriya[3]**

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** Corresponding author*
(1) Master of Public Health Student in Nutrition for Health, Faculty of Public Health, Khon Kaen University
(2) Department of Nutrition and Food Safety, Faculty of Public Health, Thai Nguyen University of Medicine and Pharmacy, Thai Nguyen, Vietnam
(3) Department of Public Health Administration Health Promotion Nutrition, Faculty of Public Health, Khon Kaen University

Abstract

In the past decades, Vietnam achieved remarkable improvements in health care. There are still, however, big gaps in the health status between different age and socio economic groups such as ethnic minorities. The aim of this study was to assess the nutrition situation and dietary patterns of ethnic minority students in Vietnam. Cross sectional data were collected from 351 ethnic minority students at Thai Nguyen University of Medicine and Pharmacy (TUMP), Vietnam. The structured interview was designed including the students' demographic-, socio-economic background, eating habits, anthropometric measurements, and the results of a 24-hour dietary recalled. It was found that prevalence of underweight students was high (25.4%), in contrast, overweight and obesity were relatively low (4.3% and 0.5%). Mostly half of the students did not exercise, more than one-third drank alcoholic beverages, but smoking was low with only 4% . Almost 40% of participants consumed two meals per day only. Energy- and some micronutrient intake did not meet two-thirds of the Vietnamese Recommended Daily Allowances, especially vitamin A, vitamin B2, B12, folate, iron, calcium and fiber. In conclusion, the underweight of ethnic minority students is worrying, particularly as far as female students are concerned. Their diet and eating habits are inappropriate. More nutritional education, promotion of a balanced diet, and improvement of physical activities are highly recommended.

***Keywords*:** *Underweight, Dietary, Ethnic Vietnamese Student*

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นิพนธ์ต้นฉบับ

ภาวะน้ำหนักน้อยและรูปแบบอาหารในนักศึกษาชนกลุ่มน้อยชาติพันธุ์ในประเทศเวียดนาม

*Trang Tran[1,2], Duong Truong[2], Tam Nguyen[2], Van Tran[2], ภัทระ แสนไชยสุริยา[3]**

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ผู้รับผิดชอบบทความ
(1) นักศึกษาหลักสูตรสาธารณสุขศาสตรมหาบัณฑิต สาขาวิชาโภชนศาสตร์เพื่อสุขภาพ คณะสาธารณสุขศาสตร์ มหาวิทยาลัยขอนแก่น
(2) Department of Nutrition and Food Safety, Faculty of Public Health, Thai Nguyen University of Medicine and Pharmacy, Thai Nguyen, Vietnam
(3) สาขาวิชาการบริหารสาธารณสุข การส่งเสริมสุขภาพ โภชนากร คณะสาธารณสุขศาสตร์ มหาวิทยาลัยขอนแก่น

บทคัดย่อ

ในทศวรรษที่ผ่านมา ประเทศเวียดนามประสบความสำเร็จอย่างมากในการดูแลสุขภาพ อย่างไรก็ตาม ยังคงมีช่องว่างของสถานะสุขภาพที่แตกต่างกันระหว่างช่วงอายุ สถานภาพทางเศรษฐกิจสังคม ตัวอย่างเช่น กลุ่มชาติพันธุ์ที่เป็นชนกลุ่มน้อย การวิจัยครั้งนี้มีวัตถุประสงค์เพื่อประเมินภาวะโภชนาการและรูปแบบการบริโภคอาหารของนักศึกษาชนกลุ่มน้อยในประเทศเวียดนาม เก็บรวบรวมข้อมูลแบบภาคตัดขวางในนักศึกษากลุ่มชาติพันธุ์จำนวน 351 คน ที่มหาวิทยาลัยแพทย์และเภสัชศาสตร์ไทยเหงียน ประเทศเวียดนาม โดยใช้แบบสัมภาษณ์เชิงโครงสร้างประกอบด้วยข้อมูลประชากร เศรษฐกิจสังคม พฤติกรรมการบริโภคการ การวัดสัดส่วนร่างกาย และการบริโภคอาหาร 24 ชั่วโมงย้อนหลัง ผลการวิจัยพบว่า ความชุกของนักศึกษาที่มีน้ำหนักต่ำกว่าเกณฑ์ค่อนข้างสูง (ร้อยละ 25.4) ในทางตรงกันข้าม นักศึกษาน้ำหนักตัวเกินและอ้วนค่อนข้างต่ำ (ร้อยละ 4.3 และร้อยละ 0.5 ตามลำดับ) เกือบครึ่งหนึ่งของนักศึกษาไม่ได้ออกกำลังกาย มากกว่าหนึ่งในสามของนักศึกษาดื่มเครื่องดื่มแอลกอฮอล์ แต่มีการสูบบุหรี่อยู่ในระดับต่ำ (ร้อยละ 4) เกือบร้อยละ 40 ของนักศึกษาที่เข้าร่วมรับประทานอาหารมื้อหลักเพียงสองมื้อต่อวัน การได้รับพลังงาน และสารอาหารบางชนิดไม่เป็นไปตามข้อกำหนดการบริโภคอาหารของประเทศเวียดนามโดยเฉพาะอย่างยิ่งวิตามินเอ วิตามินบี12 โฟเลต เหล็ก แคลเซียม และเส้นใย สรุปได้ว่า ภาวะน้ำหนักน้อยในนักศึกษาชนกลุ่มน้อยในเวียดนามเป็นเรื่องน่าเป็นห่วงโดยเฉพาะในเพศหญิง ทั้งนี้ นักศึกษามีพฤติกรรมการรับประทานอาหารและพฤติกรรมการกินที่ไม่เหมาะสม จึงควรให้ความรู้เพื่อส่งเสริมการรับประทานอาหารและการออกกำลังกายที่สมดุล

คำสำคัญ: *ภาวะน้ำหนักน้อย, นักศึกษา, ชนกลุ่มน้อยชาติพันธุ์ ประเทศเวียดนาม*

Introduction

Student undergraduates, as young adults are valuable intellectual human resource for the future, especially for a developing country. When students enter the university their life changes considerably, including relationships and eating habits and adjustment to the new academic environment which differs from staying within the family and being more or less supervised by parents and other family members (Irazusta et al., 2007; Laska et al., 2009). They now have to structure their daily life by themselves and have to look into how to spend their daily allowances. Living arrangement alter their food consumption patterns in terms of times of food intake and the selection of nutrient composition. Based on substantial evidence surrounding eating habits in young population, especially university students, the food consumption patterns and nutrients intake appear to be objectionable, in that, among other pitfalls, they tend to skip meals frequently (Yildiz et al., 2011; Chhaya et al., 2012; Sun et al., 2013; Hakim et al., 2012), eat a limited variety of food (Brunt, Rhee, & Zhong, 2008; Desouky et al., 2014), habitually select unhealthy foods (Brunt, Rhee, & Zhong, 2008; El Ansari, Stock, & Mikolajczyk, 2012) and adopt unhealthy eating practices (Mokhtari, Jamaluddin, & Saad, 2015; Gunes et al., 2012). If these problems go on uncorrected, the nutritional status, and their health are significantly affected, together with diminished ability to acquire innovative ideas (Papadaki et al., 2007; Alakaam et al., 2015).

Vietnam is a middle-income country, with 54 ethnic groups. Of which the Kinh ethnic group is the largest one and accounts for the majority. Most of the ethnic minorities reside in mountainous areas, covering three-fourths of the country's territory. Each ethnic group has its own cultural identity and consumption behaviors. Cultural determinants may positively or negatively affect the care for health in particular the health of mothers and children. (Dang, 2012; Ba, Hanh, & Cuong, 2002; Hoa, 2009). Nutritional studies including a number of Vietnamese minority groups indicated that high underweight rates abides compared to the rest of the country. Furthermore, malnutrition is distributed unevenly in that. The populations living in the northern and mountainous areas have higher levels of malnutrition than other regions. Prevalence of malnutrition in rural communities is greater than urban areas, and malnutrition in ethnic minorities is higher than for the rest of the population (Tuan, Tuong, & Popkin, 2008; National Institute of Nutrition, Ministry of Health, 2012). A National Nutrition Survey showed that malnutrition of children was highest in the mountains, i.e., 35.2% in central highlands, 33.7% in northern midland and mountain areas, 31.4% in the north central area and central coastal zone (Tuan, Tuong, & Popkin, 2008). A recent study conducted among adults in a northern mountain area likewise found a high percentage of the chronic energy deficiency (CED) of 31.7% (Nguyen et al., 2014). Another study in the south of Vietnam also resulted in a similar high prevalence of 35% (Hanh et al., 2001). On the other hand, the proportion of overweight and obesity has dramatically increased in both children and adults. The rate of overweight for children under 5 year-old and adolescents accounted for 5.6% and 17.8%, respectively (National Institute of Nutrition, Ministry of Health, 2012; Do et al., 2015). Between 2002 and 2012, the percentage of overweight and obesity increased among adults, ranging from 5.2% to 20% (Tuan, Tuong, & Popkin, 2008; National Institute of Nutrition, Ministry of Health, 2012; Hanh et al., 2001; Laillou et al., 2012; Ly et al., 2013).

However, to date, limited studies have determined nutritional status among university students in Vietnam, especially medical students as well as separate groups of ethnic minorities. Hence, the better understanding of nutritional status among ethnic minority students and dietary patterns are required. Therefore, this study was conducted with the aim to evaluate the nutrition situation and dietary patterns of students originated from ethnic minorities in Vietnam. This study is believed to be the first survey in the nutritional status of ethnic minority students in the northern mountainous area in Vietnam.

Methodology

- **Participants**

This cross-sectional survey included participants who were full-time of 351 students with ethnic minority at TUMP, age range 17-29 years old were selected by a systematic random sampling. They obviously, did not suffer from chronic illness or physical abnormalities. They all participated voluntarily and signed the required consent form according to the regulations of the ethic committee of Khon Kaen University.

- **Data collection and analysis**

A semi-structured pre-designed questionnaire was used for directly interviewing students to gather information about their socio-economic background, dietary intake, and anthropometric data as given below. The questionnaire was prepared in English by the researcher, and after that translated into Vietnamese language for data collection. The structured questionnaire was standardized by pre-testing it. The first part was dedicated to the participant's socio-demographic characteristics. The questions assessed gender, birth date, the year of the medical course in which student was enrolled, ethnicity, living arrangements, and health status. The second section included information about eating habits. A 24-hour dietary recall was added as a third part. The survey questionnaire was pre-tested with approximately thirty students to determine readability, clarity, suitability and time necessary to complete the questionnaire.

Based on the recommended nutritional requirements by age, the age range was divided into two groups: 17 to <20 years old and ≥20 years old.

- **Anthropometric measurements**

Weight of students were assessed by a TANITA digital scale made in Japan (Tanita body fat monitor, BC 571, Tanita Corporation, Japan) with precision of 0.1 kg. Height was measured by Microtoise Ruler made in France with precision of 0.1 cm. BMI was calculated using the ratio of weight in kilograms to height in meters squared, according to WHO (2000) to classify subjects' underweight, healthy weight, overweight, or obesity. Underweight or CED is defined as BMI under 18.5 kg per m^2. Adult overweight is defined as BMI at or above 25 kg/m^2 and obesity is defined as BMI equal or more than 30 kg/m^2.

- **Assessment of dietary data**

Before conducting the survey, investigators distributed questionnaires and trained the manner of survey in a 24-hour dietary recall method. The questionnaire was developed and validated by Khon Kaen University, Thailand (Sinaga, Chakma, & Herkutanto, 1995).

The information about the dietary recall collected the number of meals per day, and the food items that were eaten the day before, including beverages. Item, food amount consumed by students was written clearly.

However, meals consumed at a special occasion such as funerals, weddings, festivals were not investigated. Students' meals every day

were divided into six different meals to help students to recall what they had eaten and to avoid omission of sub-meals. During the interview additional information, if necessary, were always asked to check the accuracy of the information.

1) Breakfast (meal 1): from the moment of waking up to breakfast finished.

2) Morning snack (meal 2): after breakfast and before lunch.

3) Lunch (meal 3): main meal at midday.

4) Afternoon snack (meal 4): after lunch and before dinner.

5) Dinner (meal 5): the main meal in the evening.

6) Midnight snack (meal 6): after dinner and before waking up the next day

An "Album of the popular dishes" and a number of measuring instruments with different sizes including cups, bowls, spoons, etc. were used as supporting tools for recalling the dietary intake and in order to convert the amounts given by the students into ordinary units such as grams.

The 24-hour dietary recall was analyzed for energy, protein, fat, carbohydrate, vitamins, minerals, and dietary fiber intake based on the Vietnamese Food Composition Database (Ministry of Public Health, Vietnam, 2000). Energy and nutrients intake were compared with the Recommended Daily Allowances (RDA) for Vietnameses adult people to assess the dietary inake status of the participants (National Institute of Nutrition, Vietnam, 2016).

- **Data analysis**

Nutrients were analyzed using 24-hours Word Access 2003 software of the Vietnam Nutrition Institute. Statistical analysis was performed using Microsoft Office Excel 2013 (Microsoft, USA), STATA software version 12.0 (STATA Corp, TX, USA), and the level of significance was set at $p<0.05$. Descriptive characteristics of the study population were presented in frequencies, percentages, means, standard deviations, medians and interquartile ranges.

- **Ethical consideration**

The research was submitted and approved by the Ethics Committee, Khon Kaen University (HE602137) and by the Ethics Council at TUMP before data collection. The study participants were informed about the purpose of the study and the research objectives and were asked for a written consent. Confidentiality of the information provided by the students was guarantee for research purposes.

Results

Socio-demographic variables are given in Table 1. Among 351 subjects 35.6% were males and 64,6% females. Their age was evenly distributed from 17 to 29 years. Most of students were 20 years old or more (83%). The majority of the participants (42.5%) originated from the Tay minority, followed by the Muong (18.2%) and the Nung group (14.3%). More than three quarters of the students (80.3%) lived outside the campus.

The eating habit of ethnic minority students is displayed in Table 2. A considerably high proportion of students consumed only one (34.2%) or two (41.6%) meals a day. On weekdays 65.5% had breakfast, 51.3% during the weekend, while most of the students (96%) got lunch and dinner regularly. Males were more prone to skip breakfast than females. As far as the consumption of alcohol is concerned more than one in three of participants drank alcohol and beer. Females with an astonishing 20% also drank alcohol but this was three times lower than that of males. Only 4% of students smoked but the majority of smokers were males (10.4%) versus 0.4% for females.

The nutritional status of ethnic minority

students by gender. Regarding the BMI cut-off values recommended by WHO, the prevalence of underweight students accounted for about one in four of the 351 participants enrolled in the study. Only a small percentage of students were overweight and obese (4.3% and 0.5%, respectively). Besides, while the proportion of underweight females tended to be higher than in males (by about 20%), the opposite was true for the figure of overweight males. As illustrated in Table 3.

Table 4 presents the nutrient intake data. The nutrient intake was adequate and more than that especially for protein and lipids, as compared to the Vietnamese Recommended Daily Allowances by gender and age. Daily energy intake of males and females did not meet 100% the energy of Vietnamese RDA. Carbohydrate intake in both sexes averaged below 70% of RDA. Some minerals were not sufficient for requirements including iron, calcium, and folate. In addition, the average folate, iron and vitamin A consumption of females was lower than of males, the reverse was true for vitamin C. The amount of fiber and vitamin D consumed daily was too low as compared to RDA, ranging from 10 to 20% of the RDA for fiber and less than 1% for vitamin D.

Discussions

The results of this study showed that the proportion of underweight among young adults was relatively high (25.4%), in particularly female students. Two thirds of respondents (69.8%) had a healthy weight, nearly five percent of students were overweight, and only 0.5% of the entire samples were obese (Table 3). Generally, the prevalence of CED in this study population was higher than that of the results from the national study in 2010 which reported that 17.2% of Vietnamese adults nationwide aged over 19 years old were underweight. In addition, the overweight rate in this study group was equivalent to the figure of adults over 20 years old (National Institute of Nutrition, Ministry of Health, 2012). This rate of underweight students was also in agreement with recent studies on university students in the Asia region (Pengpid & Peltzer, 2015; Ren et al., 2014; Huda & Ahmad, 2010). However, it was significantly lower than that of the previous study done in Vietnam which reported that 45.3% of respondents were underweight and at the same time lower than the CED rate of Pakistan students by around 16% (Ko et al., 2015; Memon et al., 2012). On the other hand, the prevalence of overweight in this study was relatively low, even negligible with the prevalence of obesity. Besides, the rate of underweight ethnic minority students in our study (25.4%) tended to be higher when compared with that of Kinh population in the National Nutrition Survey (17.6%) (National Institute of Nutrition, Ministry of Health, 2012). Findings from a previous study in the northern mountain of Vietnam also reported that the prevalence of underweight among ethnic minorities (21%) was higher than that of the Kinh (19.9%) but the difference was not significant (Linh & Liêm, 2013). By contrast, the percentage of overweight among non-Kinh ethnics in our survey (4.3%) was lower than the rate of the Kinh people in the national study (5.9%) (National Institute of Nutrition, Ministry of Health, 2012). This shows that ethnic minorities is still a vulnerable population and more interventions should be implemented for this ethnic minority population.

Concerning eating habits, the number of students consuming only two meals per day was relatively high (Table 2). 34.2% of students reported eating two meals on weekdays, whereas

on weekends, this percentage was higher, i.e., at 41.6%. A very small proportion (1.4%) of students ate only one meal at weekends; however, the figure was not reported on weekdays. When evaluating the details of each meal, lunch and dinner consumption were estimated at almost the absolute rate; in contrast, skipping of breakfast on weekdays and weekends was common. In particular, the proportion of meal omission on weekends was higher than that on weekdays, mainly breakfast missing, and skipping breakfast tended to occur more frequently for men than women ($p<0.05$). Our data are comparable with previous studies which noted that a considerable number of young adults regularly skip breakfast (Sun et al., 2013; Hakim et al., 2012). Our research results also show that having regular breakfast (30.5%) was higher than that in the USA (23.8%) (Thiagarajah & Torabi, 2009); however, it was lower than that in Malaysia (41.5%) (Hakim et al., 2012). As found in some other studies of other age groups, the highest significant belonged to breakfast skipping when compared to lunch missing and dinner omission (Lee, Templeton, & Wang, 1996; Savige et al., 2007). The prevalence of irregular breakfast and lunch consumption were higher on weekends than on weekdays. It is difficult to identify the reasons for these differences. It might be due to changes in daily patterns such as students' not attending class on the weekend, students' not having to get up early, having longer time in bed and sleeping time to compensate for insomnia during the week (Buboltz, Brown, & Soper, 2001). Therefore, the weekend breakfast tended to occur later in the morning, leading to lunch or breakfast skipping to incorporate with lunch. In addition, there are a number of reasons why breakfast omitting is common among students, including lack of hunger in the morning, inadequate time to eat, lack of appetite or oversleeping (Thiagarajah & Torabi, 2009).

Fewer women tend to consume less alcohol and beer than men ($p<0.001$). However, up to two-thirds of men in this study drank alcohol and beer, and more strikingly, approximately 20% of women consumed alcohol as well. Nearly thirty-five percent of those investigated drank alcoholic beverages, which coincides with similar proportions of 32.9% to 40% in other studies among the same population (Brunt, Rhee, & Zhong, 2008; D'Alessio, Baiocco, & Laghi, 2006). However, our data was significantly lower than that of alcohol use among Singaporean undergraduate students by around 25% (Isralowitz & Hong, 1988). Another research study in Vietnamese medical students also presented a high rate of alcohol users, i.e. 65.5%; simultaneously, there were the greater percentages of drinker males than that of the rest, at 84.8% and 47.3%, respectively (Pham et al., 2010).

A nutritionally adequate diet should meet both macronutrient and micronutrient requirements. This study found that this is not the case for those being investigated (Table 4). The daily energy intake by each gender group was less than eighty percent of Vietnamese Recommended Daily Allowances. This should link to relatively high proportion of underweight in particularly female students. The average energy level of students in our study was below the average of Vietnamese women of reproductive age (2196 kcal/ day) as well as the national average (1925.4 kcal/day) (National Institute of Nutrition, Ministry of Health, 2012; Nguyen et al., 2013). Our results showed adequate mean intakes for protein, lipid; whilst the rest of the other entire nutrients showed deficient intakes for the adults when compared to Vietnamese RDA. In some cases, the high intake was equally common in

males and females; however, in the case of several nutrients, we found an increased intake level more often in men. The levels of calcium and vitamin D intakes in both genders were significantly below the adequacy level. These findings were consistent with a study conducted by researchers at the French National Research Institute for Sustainable Development and Nutrition Institute of Hanoi amongst women and children. Their investigation illustrated that the women and children in the sample consumed only 1% of the RDA of vitamin D and just over 40% of the RDA of calcium. This national study also showed that approximately 57% of Vietnamese women had a vitamin D deficiency or insufficiency, with similar rates among children. Concerning calcium, 14% of women recorded a moderate insufficiency, and nearly all participants in the study, children in particular, suffered from slight calcium insufficiency. Such high prevalence, comparable to some other countries in the sub-region, was seen in both urban and rural areas, across all ages, regardless of socio-economic status (Laillou et al., 2013). These deficiencies have consequences for bone development in young children and can cause rickets. In adults, they are factors in chronic diseases such as osteoporosis and cardiovascular diseases. The explanation for this phenomenon is the same as in Asian countries. Vietnamese people take radical measures to avoid any sun exposure, which helps to synthesize a large part of required vitamin D. On the other hand, surveys of food habits conducted in parallel to blood analyses showed that people had too little diversity in their diets, in particular low levels of fish oil. They consumed only 1% of the daily allowance of vitamin D recommended by the WHO. A similar deficiency relates to calcium. The study showed that the quantity consumed was less than half of the daily requirement (Laillou et al., 2013). Besides, in our findings, most of the students, female students in particular, presented an inadequate folate, vitamin A, and iron intake. One important reason for this phenomenon could be poor dietary pattern. In Vietnam, similar to most South East Asian countries, rice, vegetables, and legumes are the main food in the meal. The best source of minerals (such as zinc, folate, iron) is seen in a variety of animal foods which have increased over the years; however, it still contributes only a small part to total daily food intake (Nguyen et al., 2014; Pasricha et al., 2008; Ta et al., 2003).

In order to encourage students having breakfast and a nutritionally adequate diet, activities promoting health outside the classroom should be carried out regularly and extensively, the cafeteria should provide a variety of healthy dishes and eliminate marketing of unhealthy foods. Ensuring healthy foods should be available at breakfast or meals time. Besides, nutrition clubs in students should be established. By learning, relaxing and sharing together, these clubs might help students develop awareness and make students active participants in the process of changing their behavior.

Conclusions

Underweight status in ethnic minority students is still high, particularly among females. Based on the results, it seems that food patterns of the students are fine in terms of quality; but in terms of quantity, they eat less than stipulated by the Vietnamese RDA. Therefore, more nutrition education, focusing on selective nutrient sources and the benefits of healthy eating habit should be provided to ensure good health in their adult life. Further research should focus on in-depth interviews on knowledge, attitudes and nutritional practices of students.

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Table 1 General characteristics of study population (N=351)

Variables	Frequency	Percentage
Age (years)[a]		
17- <20 years	60	17
20–29 years	291	83
Gender		
Male	125	35.6
Female	226	64.4
Academic year		
First-year	44	12.5
Second-year	37	10.5
Third-year	65	18.5
Fourth-year	39	11.1
Fifth-year	68	19.4
Six-year	98	27.9
Ethnic group		
Tay	149	42.5
Muong	64	18.2
Nung	50	14.3
Othersb	88	25.0
Residential status		
At home	14	4
Outside the campus	282	80.3
University dormitory	55	15.7

a: Classified according to the Vietnamese recommended dietary allowances by age.

b: Other ethnic groups include San Diu, Dao, Thai, Mong, Cao Lan, Day, Giay, Han, Hoa, Lao, Pu Peo, San Chi and Tho.

Table 2 Eating habits among ethnic minority students

Variables	Total n (%)	Male n (%)	Female n (%)	p-value
Number of meals per weekday				
2	120 (34.2)	51 (40.8)	69 (30.5)	0.052
≥3	231 (65.8)	74 (59.2)	157 (69.5)	

Table 2 Eating habits among ethnic minority students (cont.)

Variables	Total n (%)	Male n (%)	Female n (%)	p-value
Number of meals per weekend				
1	5 (1.4)	1 (0.8)	4 (1.8)	0.109
2	146 (41.6)	61 (48.8)	85 (37.6)	
≥3	200 (57)	63 (50.4)	137 (60.6)	
The meal usually taken in weekday				
Breakfast	230 (65.5)	72 (57.6)	158 (69.9)	0.020
Lunch	350 (99.7)	125 (100)	225 (99.6)	0.456
Dinner	344 (98.0)	123 (98.4)	221 (97.8)	0.694
The meal usually taken in weekend				
Breakfast	180 (51.3)	55 (44.0)	125 (55.3)	0.042
Lunch	339 (96.6)	124 (99.2)	215 (95.1)	0.045
Dinner	338 (96.3)	120 (96.0)	218 (96.5)	0.827
Drinking alcohol	119 (33.9)	77 (61.6)	42 (18.6)	<0.001
Drinking beer	129 (36.8)	83 (66.4)	46 (20.4)	<0.001
Smoking	14 (4.0)	13 (10.4)	1 (0.4)	<0.001

Table 3 Nutritional status according to gender

Variables	Total		Male		Female		p-value
	N	%	n	%	n	%	
Underweight	89	25.4	14	11.2	75	33.2	<0.001
Normal weight	245	69.8	98	78.4	147	65	
Overweight	15	4.3	12	9.6	3	1.3	
Obesity	2	0.5	1	0.8	1	0.5	

Table 4 Average nutrients intake and percentage of Vietnamese Recommended Dietary Allowances (RDA) among students by gender

Nutrients	Male (n=125)			Female (n=226)		
	RDA	Median (Q1-Q3)	% of RDA	RDA	Median (Q1-Q3)	% of RDA
Energy (kcal)						
15-19 years	2820	1795.9 (1596.8-2635.7)	63.7	2380	1685.5 (1465.6-2072.6)	70.8
20-29 years	2570	2114.2 (1642.6-2528.2)	82.3	2050	1710.5 (1361.9-2060.7)	83.4
Protein (g)						
15-19 years	74	72.8 (60.7-100.9)	98.4	63	67.5 (54.3-92.1)	107.1
20-29 years	69	89.9 (68.9-107.7)	130.3	60	72.7 (54.1-86.8)	121.1
Lipid (g)						
15-19 years	63-94	56.6 (34.4-81.4)	89.8	53-79	58.6 (45.4-81.3)	110.6
20-29 years	57-71	65.8 (60.0-89.8)	115.4	46-57	52.6 (36.4-74.5)	114.3
Carbohydrate (g)						
15-19 years	400-440	283.2 (230.5-362.1)	70.8	330-370	224.6 (201.1-294.6)	68.1
20-29 years	370-400	282.5 (215.2-356.4)	76.4	320-360	234.4 (175.6-274.9)	73.2
Dietary fiber (mg)						
15-19 years	38	4.9 (3.3-7.3)	12.9	26	5.2 (4.0-8.0)	20
20-29 years	38	5.9 (4.2-8.0)	15.5	25	6.0 (4.1-9.1)	24

Table 4 Average nutrients intake and percentage of Vietnamese Recommended Dietary Allowances (RDA) among students by gender (cont.)

Nutrients	Male (n=125)			Female (n=226)		
	RDA	Median (Q1-Q3)	% of RDA	RDA	Median (Q1-Q3)	% of RDA
Vitamin A (μg)						
15-19 years	850	569.4 (218.2-838.2)	70.2	650	493.5 (240.9-829.9)	75.9
20-29 years	850	464.4 (255.5-778.6)	54.6	650	449.2 (254.0-733.9)	69.1
Vitamin C (mg)						
15-19 years	100	80 (32.6-146.6)	80	100	95.6 (55.5-163.4)	95.6
20-29 years	100	90 (50.8-154.5)	90	100	94.2 (50.7-191.3)	94.2
Vitamin D (μg)						
15-19 years	15	0.1 (0.0-0.5)	0.67	15	0 (0.0-0.1)	0
20-29 years	15	0 (0.0-0.4)	0	15	0 (0.0-0.3)	0
Folate (μg)						
15-19 years	300	175.6 (124.9-386.5)	58.5	400	212.2 (93.9-424.7)	53
20-29 years	400	245.3 (139.1-460.1)	61.3	400	216.0 (98.7-366.1)	54
Calcium (mg)						
15-19 years	1000	463.7 (308.1-572.5)	46.4	1000	411.9 (315.3-620.8)	41.2
20-29 years	800	419.3 (318.6-532.9)	52.4	800	420.8 (291.9-582.4)	52.6
Iron (mg)						
15-19 years	17.5	13.6 (9.7-16.4)	77.7	29.7	12.6 (10.2-15.3)	42.4
20-29 years	11.9	15.1 (11.7-18.0)	126.9	29.6	12.1 (9.6-15.2)	40.9

Q1–Q3: The first quartile and the third quartile