PREVALENCE AND FACTORS ASSOCIATED WITH OVERWEIGHT AND OBESITY AMONG ADULTS IN THAI BINH PROVINCE IN 2024

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ABSTRACT

Objective: To determine the prevalence of overweight and obesity and identify associated factors among adults in Thai Binh Province in 2024.

Subjects and Methods: A cross-sectional study was conducted on 1,330 adults across 8 districts/cities in Thai Binh Province from June to July 2024. Data were collected via anthropometric measurements, interviews, and blood tests, analyzed using logistic regression

Results: The prevalence of overweight and obesity was 49.4%, with 28.0% at risk, 19.2% overweight, and 2.2% obese. Associated factors included body fat (OR=1.14, 95% CI: 1.12-1.16), visceral fat (OR=1.92, 95% CI: 1.79-2.06), alcohol consumption (OR=1.54, 95% CI: 1.16-2.05), beer consumption (OR=1.63, 95% CI: 1.23-2.16), and fruit intake (OR=0.93, 95% CI: 0.88-0.98). Additionally, 30.5% had increased waist circumference, 33.2% had a high waist-to-hip ratio, 50.3% had high/borderline cholesterol, and 66.0% had high/very high triglycerides. *Conclusion:* Overweight and obesity affect nearly half of adults in Thai Binh, linked to body fat, visceral fat, alcohol/beer consumption, and low fruit intake, necessitating targeted interventions.

Keywords: Overweight, obesity, associated factors, Thai Binh

I. INTRODUCTION

Overweight and obesity, characterized by excessive fat accumulation, are major risk factors for cardiovascular diseases, type 2 diabetes, and metabolic syndrome. Globally, their prevalence has surged, particularly in developing nations like Vietnam, driven by urbanization, sedentary lifestyles, and dietary shifts (1). The World Health Organization (WHO) reported that worldwide obesity has nearly tripled since 1975, affecting over 1 billion people by 2022, including 650 million adults, 340 million adolescents, and 39 million children (2). On World Obesity Day 2022, WHO highlighted that this number continues to rise, projecting an additional 167 million people will face health consequences from overweight or obesity by 2025. Obesity impacts most body systems, increasing risks of noncommunicable diseases (NCDs) such as hypertension, stroke, and cancers, and tripling the likelihood of hospitalization for COVID-19 (2).

In Vietnam, the prevalence of overweight and obesity among adults escalated from 15.6% in 2015 to 26.8% in urban areas and 18.3% in rural areas by 2020, according to the Ministry of Health (3). The *World Obesity Atlas 2023* forecasts an annual increase of 6.2% for adults and 9.8% for children, among the highest globally, with an economic burden projected to reach 2.0% of national GDP by 2035 due to healthcare costs and lost productivity (4). In Thai Binh Province, a Red River Delta region undergoing rapid socioeconomic transition, these trends may be amplified, in 2019 the proportion of individuals aged 25-64 with a BMI greater than or equal to 25 was 11.8% (5). Amid this crisis, WHO's World Obesity Day 2022 call to accelerate action underscores the need for early intervention (2). This study aims to assess the current prevalence of overweight and obesity among adults in Thai Binh in 2024 and identify associated factors to inform public health strategies.

II. SUBJECTS AND METHODS

2.1. Subjects, Location, and Study Period

The study included 1,330 adults from 8 districts/cities in Thai Binh Province: Thai Binh City (De Tham, Dong My, Phu Xuan), Vu Thu (Viet Hung, Minh Lang), Dong Hung (Phong Chau, Phu Luong), Tien Hai (An Ninh, Phuong Cong), Quynh Phu (An Hiep), Thai Thuy (Hoa An), Hung Ha (Hong Minh), and Kien Xuong (Tay Son).

Data collection occurred over a two-month period, from June to July 2024, a time frame selected to avoid seasonal variations in diet or physical activity that might occur during harvest or festive periods. Inclusion criteria required participants to be adults

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(aged 18 or older) who had lived in these areas for at least six months, ensuring familiarity with local conditions

Inclusion criteria were adults residing in these areas, while exclusion criteria included those using lipid-lowering drugs, with systolic blood pressure ≥160 mmHg, diastolic ≥95 mmHg, or fasting glucose ≥7 mmol/L.

2.2. Research Methods

A cross-sectional design was employed. The sample size was calculated using the formula:

$$n = Z^2_{(1-\alpha/2)} \frac{p(1-p)}{(\varepsilon p)^2}$$

where Z (1−α/2) = 1.96 (95% confidence),

p=0.276 (prevalence from Tran Thai Phuc's study) (6)but few studies have been sufficient enough to examine the magnitude of excess weight of Vietnamese adults. This review aimed to provide a generalized estimate of the prevalence of excess weight among Vietnamese adults.\nMETHODS: PubMed, Scopus and national database were used to identify articles published up to May 2022. The Newcastle-Ottawa Quality Assessment Scale was used to rate the study quality. The data was analyzed using RStudio software, and the combined effects were estimated using random-effects meta-analysis. The Cochran's Q-test and the I2 test were employed to examine heterogeneity, and subgroups were conducted. Egger's test and visual inspection of the symmetry in funnel plots were used to determine publication bias.\nRESULTS: 58 studies with 432,585 participants from 1998 to 2020 were suitable for inclusion in the final model after meeting the prerequisites. Over the last three decades, the combined pooled prevalence of excess weight among adults in Vietnam was 20.3% (95% CI: 15.2-26.6, ε=0.1 (relative error), and a reserve factor k=1.3 k = 1.3 k=1.3, yielding n=1330

The sample size of Blood Tests: 350

Data collection involved:

Anthropometric Measurements: Body weight was measured with a SECA electronic scale (accuracy 0.01 kg), height with a wooden ruler (calibrated in centimeters), and waist and hip circumferences with a non-elastic tape (to 0.1 cm). Body Mass Index (BMI) was calculated as weight (kg) divided by height squared (m²) and categorized using Asian-specific WHO cutoffs: <18.5 (underweight), 18.5-22.9 (normal), 23-24.9 (at risk), 25-29.9 (overweight), ≥30 (obese). These thresholds, lower than general WHO standards (e.g., ≥25 for overweight), account for Asians' increased metabolic risk at lower BMI levels [1].

Body Fat Assessment: Body fat percentage was measured via bioelectrical impedance analysis and classified per Lohman (1986) and Nagamine (1972): males (low: 5.0-9.9%, normal: 10.0-19.9%, high: 20.0-24.9%, very high: 25.0-50.0%); females (low: 5.0-19.9%, normal: 20.0-29.9%, high: 30.0-34.9%, very high: 35.0-50.0%).

Visceral Fat Indicators: Visceral fat was indirectly assessed through waist circumference (>90 cm for males, >80 cm for females) and waist-to-hip ratio (WHR; >0.9 for males, >0.8 for females), both validated proxies for abdominal fat accumulation.

Structured Interviews: Participants completed questionnaires administered by trained staff, capturing lifestyle data such as alcohol consumption (yes/no, frequency), beer consumption (yes/no, frequency), and fruit intake (servings/week). These tools were adapted from validated instruments to ensure consistency.

Blood Tests: Fasting blood samples (minimum 8 hours) were collected in the morning and analyzed at the Thai Binh Center for Disease Control using an automated biochemical analyzer. Parameters included triglycerides (<1.7 mmol/L normal, 1.7-2.2 borderline high, 2-6 high, >6 very high), total cholesterol (<5.1 mmol/L normal, 5.1-6.2 borderline high, ≥6.2 high), HDL cholesterol (≥1.3 mmol/L normal, ≤1.0 high risk), and LDL cholesterol (≤3.3 mmol/L normal, ≥4.1 high).

Data were processed using SPSS 16.0. Descriptive statistics (frequencies, percentages) were used to report prevalence, while multivariate logistic regression identified factors associated with OW/OB, expressed as odds ratios (OR) with 95% confidence intervals (CI). Statistical significance was set at p<0.05.

2.3. Research Ethics

The study was reviewed and endorsed by the Scientific Council of the Thai Binh Department of Science and Technology. Participants were informed of the study's purpose, risks, and benefits, and provided written consent.

III. RESULTS

3.1. Prevalence of Overweight and Obesity

Table 1. General Characteristics of Study Participants

Characteristic	Frequence	%
Gender (n=1330)		
Male	665	50.0
Female	665	50.0
Location (n=1330)		
Urban (Thai Binh City)	332	25.0
Rural (7 districts)	998	75.0
Waist Circumference (n=1330)		
Normal	924	69.5
High (>90 cm M, >80 cm F)	406	30.5
Total Cholesterol (n=350)		
Normal (<5.1 mmol/L)	174	49.7
Borderline (5.1-6.2 mmol/L)	112	32.0
High (≥6.2 mmol/L)	64	18.3
Triglycerides (n=350)		
Normal (<1.7 mmol/L)	88	25.1
Borderline (1.7-2.2 mmol/L)	31	8.9
High (2-6 mmol/L)	196	56.0
Very High (>6 mmol/L)	35	10.0

The sample was evenly split by gender (50% male, 50% female), reflecting Thai Binh's balanced demographic profile. Urban participants comprised 25%, with 75% from rural areas, consistent with the province's predominantly rural composition. Central obesity, indicated by high waist circumference, affected 30.5% of participants, with a likely higher proportion among females due to lower thresholds. Lipid profiles revealed significant abnormalities: 50.3% had high or borderline cholesterol (32.0% borderline, 18.3% high), and 66.0% had high or very high triglycerides (56.0% high, 10.0% very high), suggesting a population at elevated metabolic risk.

Table 2. BMI Distribution by Location

BMI Category	Urban (n=332)	%	Rural (n=998)	%	Total (n=1330)	%
Underweight	11	3.3	48	4.8	59	4.4
Normal weight	150	45.2	464	46.5	614	46.2
At Risk	91	27.2	282	28.3	373	28.0
Overweight	75	22.6	180	18.0	255	19.2
Obesity	5	1.5	24	2.4	29	2.2
Total	332	100	998	100	1330	100

The overall prevalence of overweight and obesity (including at-risk, overweight, and obese categories) was 49.4%, indicating a significant public health burden. Urban areas showed a slightly higher overweight rate (22.6%) than rural areas (18.0%), though obesity was more prevalent in rural settings (2.4% vs. 1.5%). The lack of significant urban-rural difference ($p>0.05$) suggests uniform lifestyle influences across the province.

3.2. Related Indicators

Table 3. Prevalence of Related Indicators

Indicator	Frequence	%
High waist circumference (n=1330)	406	30.5
High waist-to-hip ratio (n=1330)	441	33.2
High/very high body fat (n=1330)	457	34.4
High/borderline cholesterol (n=350)	176	50.3
High/very high triglycerides (n=350)	231	66.0

High waist circumference (30.5%) and waist-to-hip ratio (33.2%) reflect central obesity in nearly one-third of participants. Body fat distribution showed 34.4% with high or very high levels, with females likely contributing more to the “very high” category due to gender-specific thresholds. Lipid abnormalities were prevalent, with 50.3% exhibiting high/borderline cholesterol and 66.0% high/very high triglycerides, indicating a strong metabolic risk profile.

3.3. Associated Factors

Table 4. Multivariate Logistic Regression Analysis

Factor	OR	95% CI	pBody
pBody	1.14	1.12-1.16	<0.05
fatVisceral fat	1.92	1.79-2.06	<0.05
Alcohol consumption	1.54	1.16-2.05	<0.05
Beer consumption	1.63	1.23-2.16	<0.05
Fruit intake	0.93	0.88-0.98	<0.05

Body fat and visceral fat were significant predictors, with visceral fat showing a stronger association (OR=1.92) than total body fat (OR=1.14), highlighting its role in obesity-related risks. Alcohol (OR=1.54) and beer consumption (OR=1.63) increased the odds of overweight/obesity, while fruit intake offered a protective effect (OR=0.93), suggesting dietary modification potential. All associations were statistically significant ($p<0.05$).

IV. DISCUSSION

The general characteristics (Table 1) provide further context. The gender balance (50% male, 50% female) ensures representativeness, but the 30.5% high waist circumference suggests central obesity is widespread, potentially more so among females due to the lower threshold (80 cm vs. 90 cm for males).

In this study, lipid profiles revealed that 50.3% of participants had high or borderline cholesterol (32.0% borderline, 18.3% high) and 66.0% had high or very high triglycerides (56.0% high, 10.0% very high), surpassing the national dyslipidemia prevalence of 49% (7). This difference may stem from our focus on testing only participants with a BMI > 23 kg/m², consistent with Asia-Pacific overweight criteria.

In Thai Binh, the prevalence of overweight and obesity reached 49.4% (19.2% overweight, 2.2% obesity), significantly higher than figures from other studies, likely due to our focus on participants with a BMI > 23 kg/m², consistent with Asia-Pacific overweight criteria, targeting a group at greater risk. This rate exceeds that of the Hai Phong study, which reported a lower prevalence of 18.4% among 2,100 adults in a community-based cross-sectional design (8). Similarly, the national meta-analysis of excess weight in Vietnam, pooling 58 studies with 432,585 participants from 1998 to 2020, found an average prevalence of 20.3%, with a rising trend over time (9). In contrast, the Northern China study, involving 1,787 healthy adults from 2016 to 2021, reported 24.3% overweight and 3.8% obesity (10) The notably higher prevalence in Thai Binh may also reflect improving economic conditions and living standards in the region, which often lead to shifts in dietary patterns—such as increased consumption of energy-dense foods—and reduced physical activity, further driving the rise in overweight and obesity rates compared to these other studies.

Visceral fat’s strong association with overweight and obesity (OR=1.92) aligns with the Northern China study (2016-2021), which reported a high

prevalence of visceral obesity linked to metabolic risk, even among those with normal BMI, emphasizing visceral fat's critical role (10). Body fat's weaker effect (OR=1.14) is consistent with the Hai Phong study's focus on anthropometric measures, where abdominal obesity was significant but secondary to visceral distribution, reflecting a broader fat accumulation pattern noted in the national meta-analysis of excess weight in Vietnam (8,9). Alcohol (OR=1.54) and beer (OR=1.63) as risk factors corroborate Hai Phong's findings, where alcohol addiction was tied to central obesity in females, and the study itself, which identified alcohol as a key contributor, likely due to its caloric content and metabolic disruption (8). The protective effect of fruit intake (OR=0.93) mirrors the national meta-analysis's implication of dietary shifts, suggesting that higher fiber intake mitigates obesity risk by enhancing satiety (9).

Strengths of this study include its large, representative sample and multi-method data collection. However, limitations include the use of bioelectrical impedance to estimate visceral fat, less precise than CT scans, potential recall bias in self-reported lifestyle data. Future research should address these with longitudinal designs and direct imaging.

V. CONCLUSION

Overweight and obesity affect 49.4% of adults in Thai Binh in 2024, with 34.4% exhibiting high or very high body fat, driven by visceral fat, body fat, alcohol and beer consumption, and low fruit intake. These findings, supported by high lipid abnormalities (50.3% cholesterol, 66.0% triglycerides), align with WHO's urgent call for action and necessitate targeted interventions focusing on fat reduction, alcohol moderation, and dietary improvement to mitigate the escalating health and economic burdens in Thai Binh.

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