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Research Article

Body composition and obesity among hospital nurses in Ho Chi Minh City, Vietnam: A cross-sectional study

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Highlights/Key Messages

- More than half of nurses had elevated body fat.
- Body composition measures detected more obesity than BMI.
- Central adiposity affected over 40% of participants.
- Male nurses showed higher obesity prevalence.
- BMI alone may underestimate adiposity-related risk.

Background
Obesity and abnormal fat distribution among nurses are increasingly recognized, particularly those exposed to shift work and occupational stress. Body mass index (BMI) may underestimate adiposity-related risk in Asian populations.

Objective
To determine the prevalence of obesity using body composition indicators and to examine demographic, occupational, and lifestyle-related factors associated with adiposity among hospital nurses at a major hospital in Vietnam.

Methods
A cross-sectional study was conducted among 154 nurses at a tertiary hospital in Ho Chi Minh City, Vietnam. Demographic, occupational, and lifestyle data were collected using structured questionnaires. Body composition was assessed using bioelectrical impedance analysis (InBody 270). Obesity was defined as BMI ⩾25 kg/m², elevated body fat percentage (BFP; >25% for men and >35% for women), and high visceral fat level (VFL ⩾10). Logistic regression analyses were performed to identify factors associated with adiposity indicators.

Results
Most (72%) of the sample were female. The prevalence of obesity was 35.7% by BMI criteria, 54.5% by elevated BFP, and 40.9% by high VFL, suggesting that BMI alone may underestimate adiposity-related risk in this population. Male nurses had significantly higher odds of BMI-defined obesity (OR = 6.77; 95% CI: 3.12–14.69) and elevated BFP (OR = 2.44; 95% CI: 1.15–5.16) compared with female nurses. Nurses aged 30–44 years had higher odds of elevated VFL than those aged <30 years (OR = 2.12; 95% CI: 1.02–4.39). Body fat percentage and trunk fat percentage differed significantly across age groups, whereas BMI did not.

Conclusion
Obesity and central adiposity were common among hospital nurses and were more frequently identified using body composition indicators than BMI alone. However, the findings should be interpreted with caution because important lifestyle- and circadian-related factors were not directly assessed. Further longitudinal studies incorporating dietary intake, sleep quality, and detailed shift-work characteristics are needed to better clarify determinants of adiposity among healthcare workers in Vietnam.

Keywords: obesity, body composition, nurses, visceral fat, Vietnam

Introduction

Obesity, characterized by excessive accumulation of body fat, is a major global public health challenge associated with increased risks of cardiometabolic diseases, including type 2 diabetes and cardiovascular disorders (Yoon et al., 2006). In recent decades, the prevalence of overweight and obesity has risen not only in the general population but also among healthcare workers, particularly nurses. International studies indicate that 30%–55% of nurses are overweight or obese, with a prevalence comparable to or exceeding that of the general population (Kyle et al., 2016; Luckhaupt et al., 2014).

Nurses represent a high-risk occupational group because of shift work, prolonged working hours, chronic occupational stress, sleep disruption, and irregular dietary patterns (Magnavita et al., 2017). Although nursing is often perceived as physically demanding, most occupational activities are low-intensity and intermittent and may be insufficient to prevent fat accumulation.

Growing evidence suggests that BMI alone is inadequate for assessing obesity-related health risks because it does not distinguish between fat mass and lean mass or capture regional fat distribution. Individuals with normal BMI may still exhibit excessive body fat or visceral adiposity, a condition known as normal-weight obesity, which is associated with increased cardiometabolic risk (Khonsari et al., 2022). Central adiposity, particularly trunk and visceral fat, has been shown to be more strongly associated with insulin resistance and metabolic syndrome than BMI alone (Snijder et al., 2004).

Most existing Vietnamese studies have relied primarily on BMI-based classification, which may underestimate adiposity-related metabolic risk in Asian populations, who tend to exhibit higher body fat percentages at lower BMI levels. Consequently, evidence regarding body composition, visceral fat distribution, and adiposity profiles among Vietnamese nurses remains limited. In particular, little is known about the demographic, occupational, and lifestyle-related factors associated with visceral adiposity in this occupational group.

Therefore, this study aimed to assess obesity using multiple body composition indicators and to examine demographic, occupational, and lifestyle-related factors associated with higher BMI, body fat percentage, and visceral fat levels among hospital nurses in Ho Chi Minh City, Vietnam.

Methods

Study Design and Participants

A cross-sectional study was conducted between November and December 2025 among registered nurses working at An Binh Hospital, a tertiary hospital in Ho Chi Minh City, Vietnam. Eligible participants included nurses aged ⩾ 18 years who were actively employed in clinical, intensive care/emergency/anesthesia, laboratory, or administrative departments.

Exclusion criteria were acute or severe chronic diseases (e.g., cancer, end-stage renal disease, or heart failure), pregnancy or lactation, use of medications affecting muscle metabolism (e.g., long-term corticosteroids or antipsychotics), and the presence of implanted medical devices that could interfere with bioelectrical impedance analysis (BIA) measurements.

Sample Size and Sampling Procedure

Sample size was calculated using a single-proportion formula with a 95% confidence level, a precision of 0.08, and an expected obesity prevalence of 29.8% based on a previous Vietnamese study using body fat percentage criteria (Oanh, 2018). The minimum required sample size was 125 participants. To account for potential nonresponses, the target sample size was set at 150 nurses.

A stratified random sampling method was applied across hospital departments. The number of nurses recruited from each department was proportional to staffing levels. Within each stratum, nurses were randomly selected using a random number table. If a selected nurse declined to participate, another nurse from the same department was randomly selected as a replacement.

Data Collection and Measurements

Data were collected using structured questionnaires and direct anthropometric measurements. The questionnaire obtained information on demographic characteristics (age and sex), occupational factors (department and occupational physical activity level), and lifestyle-related variables (exercise and household physical activity). Occupational physical activity was categorized as sedentary, light, or moderate activity based on self-reported typical work-related movement and standing duration during shifts. Exercise status was classified as participation in regular exercise for ⩾150 minutes per week versus <150 minutes per week. Household physical activity refers to routine domestic chores performed at least 3 times per week. The questionnaire was pilot-tested among 15 nurses prior to formal data collection to improve clarity and consistency.

Body composition was assessed using direct segmental multi-frequency BIA with the InBody 270 device (InBody Co., Seoul, South Korea). Other measurements included body mass index (BMI), body fat percentage (BFP), skeletal muscle mass, trunk fat percentage, and visceral fat level (VFL). All measurements were performed in the morning with participants barefoot and wearing light clothing, following the manufacturer's standardized protocol. Participants were instructed to avoid vigorous physical activity, alcohol consumption, and large meals for at least 8 hours prior to assessment whenever feasible in order to minimize hydration-related variability.

The InBody 270 estimates body composition parameters using direct segmental multi-frequency bioelectrical impedance analysis (DSM-MFBIA). Previous studies have demonstrated acceptable agreement between multi-frequency BIA devices and dual-energy X-ray absorptiometry (DXA) for estimating body composition in adult populations, although differences compared with imaging-based reference methods may occur (Ling et al., 2011; Garcia et al., 2020).

Obesity was defined as BMI ⩾25 kg/m², which is recommended for Asian populations because of their higher metabolic risk at lower BMI levels compared with Western populations (World Health Organization Western Pacific Region, 2000). Elevated BFP was defined as >25% for men and >35% for women (Khonsari et al., 2022). High VFL (⩾10)

was classified according to the manufacturer's recommended categorization for the InBody system and prior studies using BIA-derived visceral adiposity estimates. Previous studies have shown that BIA-derived visceral fat estimates demonstrate moderate-to-good correlation with computed tomography, CT-derived visceral fat area, although agreement is imperfect and may vary across devices and populations (Park et al., 2016; Xu et al., 2021). Therefore, VFL in the present study should be interpreted primarily as a relative indicator of increased central adiposity rather than a definitive diagnostic criterion for visceral obesity.

Statistical Analysis

Data were analyzed using SPSS version 26.0 (IBM Corp., Armonk, NY, USA). Continuous variables were presented as means ± standard deviations, and categorical variables as frequencies and percentages. Group comparisons were conducted using independent-samples t tests or one-way analysis of variance (ANOVA) for continuous variables and chi-square tests for categorical variables.

Multivariable logistic regression analyses were performed to identify factors associated with three dependent outcomes: BMI-defined obesity, elevated BFP, and elevated VFL. Independent variables included age group, sex, occupational physical activity, household physical activity, and exercise status. As a sensitivity analysis, age was additionally modeled as a continuous variable. The overall direction and statistical significance of the observed associations were materially unchanged compared with the categorical age-group models. Age-group categorization was retained in the primary presentation to facilitate interpretation across clinically and occupationally relevant age strata. Odds ratios (ORs) and 95% confidence intervals (CIs) were reported. Statistical significance was set at $p < 0.05$.

Ethical Considerations

Ethical approval was obtained from the Ethics Committee of Pham Ngoc Thach University of Medicine, Ho Chi Minh City, Vietnam (Approval No. 1442/TĐHYKPNT-HĐĐĐ). Written informed consent was obtained from all participants prior to data collection. Participant anonymity and confidentiality were strictly maintained, and all data were used exclusively for research purposes.

Results

Participant Characteristics

A total of 154 nurses participated in the study, with a mean age of 34.6 ± 9.3 years. Participants were categorized into three age groups: <30 years (36.4%), 30–44 years (48.7%), and ⩾45 years (14.9%). Most participants were female (72.1%).

As shown in Table 1, most participants reported moderate occupational physical activity (63.6%), while 35.7% engaged in regular exercise and 80.5% reported performing routine household chores. The prevalence of self-reported comorbidities was low, including hypertension (3.2%), type 2 diabetes mellitus (1.3%), and other medical conditions (4.5%). Significant sex differences were observed in department distribution, occupational activity level, and regular exercise participation ($p < 0.05$).

Table 1. Demographic and occupational characteristics of nurses in a Vietnamese hospital (n = 154)

Characteristics	Total (n = 154)	Male (n = 43)	Female (n = 111)	
Age	34.6 ± 9.3	33.0 ± 11.0	35.2 ± 8.5	
< 30	56 (36.4)	20 (46.5)	36 (32.4)	
30 – 44	75 (48.7)	16 (37.2)	59 (53.2)	p = 0.185[a]
⩾ 45	23 (14.9)	7 (16.3)	16 (14.4)	
Department/Unit				
Clinical department	87 (56.5)	20 (46.5)	67 (60.4)	
Intensive care/ Emergency/Anesthesia	35 (22.7)	6 (14.0)	29 (26.1)	**p < 0.001[a]**
Paraclinical unit	22 (14.3)	9 (20.9)	13 (11.7)	
Administrative/Management	10 (6.5)	8 (18.6)	2 (1.8)	
Existing comorbidities				
Hypertension	5 (3.2)	2 (4.6)	3 (2.7)	
Type 2 diabetes mellitus	2 (1.3)	1 (2.3)	1 (0.9)	
Others	7 (4.5)	1 (2.3)	6 (5.4)	
Occupational activity				
Sedentary	4 (2.6)	0 (0.0)	4 (3.6)	
Light activity	52 (33.8)	10 (23.3)	42 (37.8)	p = 0.078[a]
Moderate activity	98 (63.6)	33 (76.7)	65 (58.6)	
Household chores				
No	30 (19.5)	9 (20.9)	21 (18.9)	p = 0.777[a]
Yes	124 (80.5)	34 (79.1)	90 (81.1)	
Exercise				
No	99 (64.3)	13 (30.2)	86 (77.5)	**p < 0.001[a]**
Yes	55 (35.7)	30 (69.8)	25 (22.5)	

Note. Values are presented as n (%). [a] Chi-square test or Fisher's exact test, as appropriate. A p-value < 0.05 was considered statistically significant.

Anthropometric and Body Composition Measures by Age Group

As shown in Table 2, BFP ($p = 0.027$) but not BMI ($p = 0.319$) differed significantly by age group. Trunk fat percentage also differed significantly across age groups ($p = 0.049$) but not other BIA-derived measurements.

Table 2. Anthropometric and body composition measurements by age group

Variable	Age group			p
	< 30 (n = 56)	30 – 44 (n = 75)	⩾ 45 (n = 23)	
BMI (kg/m²)	23.4 ± 4.1	24.3 ± 3.2	23.9 ± 3.8	p = 0.319
Body fat (%)	31.0 ± 7.0	34.1 ± 5.5	32.5 ± 6.9	**p = 0.027**
Arm fat (%)	13.6 ± 1.6	13.7 ± 1.3	13.8 ± 1.7	p = 0.837
Leg fat (%)	32.8 ± 2.6	32.0 ± 2.2	32.4 ± 2.9	p = 0.224
Trunk fat (%)	47.6 ± 3.6	49.0 ± 2.6	47.9 ± 4.7	**p = 0.049**
Trunk/Leg ratio	1.5 ± 0.2	1.5 ± 0.2	1.5 ± 0.2	p = 0.131

Note. Values are presented as mean ± standard deviation.
Group comparisons were performed using one-way analysis of variance (ANOVA).

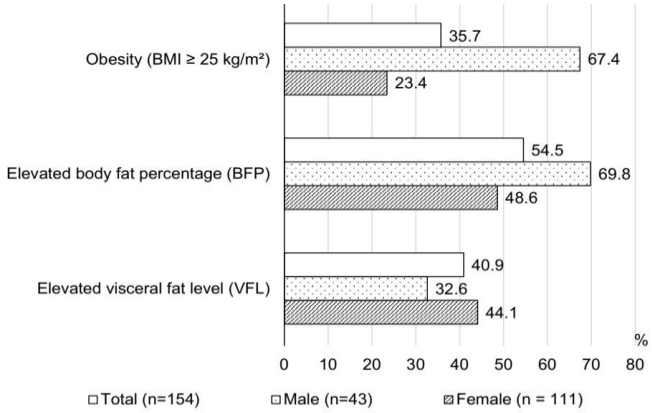


Figure 1. Prevalence (%) of participants with increased body mass index (BMI), body fat percentage (BFP), and visceral fat level (VFL) by sex (n = 154)

Prevalence of Obesity According to Different Indicators

As illustrated in Figure 1, 35.7% of participants were classified as obese according to BMI criteria. The prevalence of BMI-defined obesity was significantly higher among male nurses than female nurses (67.4% vs. 23.4%, p < 0.001). Similarly, elevated BFP was more common in men than women (69.8% vs. 48.6%, p < 0.05). No significant sex difference was observed for elevated VFL.

Factors Associated with Adiposity Indicators

Table 3 summarizes logistic regression analyses of factors associated with adiposity indicators among the nurses in our sample. Male sex was significantly associated with BMI-defined obesity and elevated body fat percentage. Nurses aged 30–44 years had higher odds of elevated VFL compared with those aged <30 years.

Table 3. Multivariable logistic regression of determinants of adiposity among nurses

Variable	Obesity (BMI ⩾ 25 kg/m²)		Elevated body fat percentage		Elevated visceral fat level	
	OR (95% CI)	p	OR (95% CI)	p	OR (95% CI)	p
Age group						
< 30	1.00	–	1.00	–	1.00	–
30–44	0.77 (0.38–1.59)	0.483	1.97 (0.97–3.97)	0.059	2.12 (1.02–4.39)	**0.043**
⩾ 45	0.82 (0.30–2.27)	0.708	1.61 (0.61–4.29)	0.339	1.77 (0.65–4.81)	0.267
Gender						
Female	1.00	–	1.00	–	1.00	–
Male	**6.77 (3.12–14.69)**	**p < 0.001**	**2.44 (1.15–5.16)**	**0.020**	1.64 (0.78–3.43)	0.192
Occupational activity						
Sedentary	1.00	–	1.00	–	1.00	–
Light activity	Not estimated[a]	–	0.46 (0.04–4.67)	0.507	0.73 (0.10–5.62)	0.765
Moderate activity	Not estimated[a]	–	0.36 (0.04–3.60)	0.386	0.66 (0.09–4.89)	0.685
Household chores						
No	1.00	–	1.00	–	1.00	–
Yes	1.14 (0.49–2.65)	0.762	0.90 (0.40–2.01)	0.795	0.88 (0.40–1.98)	0.764
Exercise						
No	1.00	–	1.00	–	1.00	–
Yes	2.45 (1.23–4.86)	**0.011**	1.00 (0.52–1.94)	1.00	0.74 (0.38–1.47)	0.393

Note. Values are odds ratios (ORs) with 95% confidence intervals (CIs). Bold values indicate statistical significance (p < 0.05). [a]Estimates were not reported because of sparse data and unstable regression estimates in the sedentary category.

No significant associations were observed between household chores and adiposity indicators. Occupational physical activity was not significantly associated with obesity outcomes; however, estimates should be interpreted with caution, given the small number of participants in the sedentary category. In this cross-sectional analysis, exercise participation was associated with BMI-defined obesity but not with elevated body fat percentage or visceral fat level. Sensitivity analyses modeling age as a continuous variable yielded materially unchanged findings.

Discussion

This study provides evidence of substantial adiposity and unfavorable body fat distribution among hospital nurses in a major hospital in Vietnam when assessed using body

composition indicators in addition to BMI. Although approximately one-third of participants met the Asia–Pacific BMI criteria for obesity, more than half had elevated body fat percentage (BFP), and over 40% demonstrated high visceral fat levels (VFL). These findings suggest that, even with an adjusted cut-off point, BMI alone may underestimate adiposity-related metabolic risk in this occupational group. Asian populations are characterized by higher body fat accumulation at lower BMI thresholds compared with Western populations (World Health Organization Western Pacific Region, 2000; Yoon et al., 2006)

BMI versus body composition indicators

The higher prevalence of elevated BFP compared with BMI-defined obesity observed in this study is consistent with previous evidence regarding "normal-weight obesity," a condition characterized by excessive body fat despite normal BMI. BMI cannot distinguish fat mass from lean mass and provides no information regarding regional fat distribution, especially visceral adiposity, which is more strongly associated with cardiometabolic risk than total body weight alone (Després, 2012; Snijder et al., 2004). Previous studies in Asian populations have similarly shown that substantial proportions of adults with non-obese BMI values may still exhibit elevated body fat and metabolic abnormalities (Yoon et al., 2006).

Shift work, sleep disruption, irregular meal timing, and occupational stress have been associated with adverse metabolic outcomes among healthcare workers in previous studies (Cao et al., 2024). However, these factors were not directly assessed in the present study. Therefore, the observed associations between demographic or occupational characteristics and adiposity indicators should be interpreted with caution, as residual confounding from unmeasured lifestyle and circadian factors remains possible.

Age-related adiposity patterns

Although BMI did not differ significantly across age groups, BFP and trunk fat percentage did. Nurses aged 30–44 in our sample demonstrated the highest mean body fat and trunk fat percentages, suggesting that age-related adiposity changes in nurses may primarily involve redistribution of fat toward central compartments rather than overall increases in body weight.

This pattern is biologically plausible because aging is associated with progressive reductions in skeletal muscle mass and preferential visceral fat accumulation, even in the absence of marked weight gain (Després, 2012). Central fat accumulation is clinically important because visceral adipose tissue is metabolically active and contributes to insulin resistance, systemic inflammation, and cardiovascular risk (Snijder et al., 2004). Notably, these changes were observed despite the relatively young mean age of the study population, suggesting that adverse changes in body composition may begin early in nurses' professional careers.

Sex differences in adiposity

Male nurses demonstrated significantly higher odds of BMI-defined obesity and elevated BFP than female nurses. These findings are generally consistent with evidence that men tend to accumulate more visceral and abdominal fat, whereas premenopausal women preferentially accumulate subcutaneous fat (Després, 2012). Behavioral and occupational factors may also contribute to this disparity. In the present study, male nurses reported higher participation in regular exercise but also showed substantially higher obesity prevalence, suggesting that other unmeasured factors such as dietary habits, alcohol intake, sleep patterns, or work-related stress may influence adiposity among male staff.

Interestingly, no statistically significant sex difference in elevated VFL was observed after adjustment. This may partly reflect the relatively small number of male participants and limited statistical power for subgroup comparisons.

Occupational and lifestyle factors

No significant associations were observed between occupational physical activity or household chores and adiposity indicators. These findings should be interpreted cautiously because occupational activity was self-reported, and the sedentary category included only a small number of participants, which may have reduced estimate stability. Moreover, occupational movement during nursing work may not reach the intensity or duration required to substantially reduce visceral adiposity.

Participants who reported regular exercise had higher odds of BMI-defined obesity, whereas no significant associations were observed for elevated BFP or VFL. This apparently paradoxical finding may reflect reverse causality inherent to cross-sectional studies, whereby individuals with overweight or obesity are more likely to initiate exercise in response to weight concerns or medical advice. Or the fact that BMI measures increased muscle mass as equal to increased fat. Similar findings have been reported in cross-sectional studies evaluating obesity-related behaviors, particularly when physical activity is assessed using self-reported measurements rather than objective monitoring methods (Guo et al., 2019).

Additionally, the metabolic benefits of exercise may be attenuated by shift work, circadian disruption, and inadequate sleep among nurses. Emerging evidence suggests that night-shift work independently contributes to obesity and metabolic dysregulation through hormonal and circadian mechanisms (Cao et al., 2024).

Strengths and limitations

A major strength of this study is the use of body composition assessment to evaluate multiple adiposity indicators in a relatively under-investigated occupational population in Vietnam. The inclusion of visceral fat measures and regional fat distribution parameters provides more comprehensive insights than BMI alone.

However, several limitations should be considered. First, the cross-sectional design precludes causal inference.

Second, lifestyle-related variables were self-reported and may be subject to recall and reporting bias. Third, dietary intake, sleep quality, shift-work intensity, and circadian disruption were not assessed. These factors are important determinants of metabolic health and body composition among healthcare workers and may substantially confound or mediate the observed associations between demographic or occupational characteristics and adiposity indicators. Finally, the relatively small numbers of male nurses and sedentary workers may have limited the statistical power of some subgroup analyses.

The interpretation of visceral fat findings should also be considered with caution. Although previous studies have demonstrated moderate correlations between BIA-derived visceral fat estimates and CT-measured visceral fat area, imaging methods such as CT and MRI (magnetic resonance imaging) remain the reference standards for assessing visceral adiposity. In addition, widely accepted, standardized clinical thresholds for InBody-derived visceral fat levels across different ethnic populations have not yet been established. Nevertheless, BIA-based assessment remains widely used in epidemiological and occupational health research because of its feasibility, noninvasive nature, portability, and practicality for large-scale screening.

Future longitudinal studies incorporating detailed dietary assessment, objective measures of physical activity, and shift-work characteristics are needed to better clarify the determinants of adiposity and visceral fat accumulation among healthcare workers.

Implication for Nursing Practice

The findings of this study have several implications for occupational health practice in hospital settings. First, routine health screening programs for nurses should consider incorporating body composition assessment alongside BMI, particularly measures of BFP and central adiposity. Early detection of excess adiposity may facilitate timely preventive interventions before overt cardiometabolic disease develops.

Second, workplace health promotion strategies should address the unique occupational context of nursing, including shift schedules, irregular eating patterns, and chronic exposure to stress. Programs targeting structured physical activity, access to healthy meals during shifts, sleep hygiene, and stress management may be more effective than conventional weight-focused interventions alone.

Finally, improving awareness regarding the limitations of BMI and the importance of body composition assessment may help nurses better recognize obesity-related health risks in both themselves and their patients.

Author Contributions

MCP conceptualized the study, performed data analysis, and drafted the manuscript. PAN and TLTB contributed to data collection and interpretation. GMT and TBTN assisted in data management and manuscript revision. All authors read and approved the final manuscript and its submission and have given consent for publication.

Declaration of Generative AI and AI-Assisted Technologies in Scientific Writing

ChatGPT (OpenAI) was used only for grammar and spelling checks. All scientific content remains the responsibility of the authors.

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Institutional Review Board Statement

The study was conducted according to the guidelines of the Declaration of Helsinki and approved by the Ethics Committee of Pham Ngoc Thach University of Medicine, Ho Chi Minh City, Vietnam (Approval No. 1442/TĐHYKPNT-HĐĐĐ; date of approval: 28/10/2025).

Data Availability Statement

The datasets generated and/or analyzed during the current study are available from the corresponding author upon reasonable request.

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Conflict of Interest

The authors declare that there is no conflict of interest regarding the publication of this paper. The funders had no role in the design of the study; in the collection, analyses, or interpretation of data; in the writing of the manuscript; or in the decision to publish the results.

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