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Nutritional Status, Eating Patterns, Physical Activity, Health and Phenotype History of Obese Young Women in Bandung City

Status Gizi, Pola Konsumsi, Aktivitas Fisik, Riwayat Kesehatan dan Fenotip Wanita Muda Obese di Kota Bandung

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ABSTRACT

Background: The incidence of obesity in Bandung City is rising. The prevalence of obesity among women surpasses that of men, with a notable rise observed in the young adult demographic.
Objectives: This study assessed the nutritional status, dietary habits, physical activity, health history, and phenotype of young obese women in Bandung City.
Methods: This mixed-method design involved 88 obese individuals (body fat percentage >35%) aged 18-25 years of Sundanese ethnicity. The research was carried out from August to November 2023. The obtained data encompassed general subject characteristics, anthropometric measurements, body composition, dietary intake and physical activity information, health history, and phenotypic data. Comprehensive interviews were performed concerning dietary habits, physical activity, phenotypic history, nutritional status, and health history.
Results: The participants' average age and body weight were 20.3 years and 81.5 kilograms, respectively. The average total fat percentage (%BF) was 38.3%. Occupation (p-value=0.033), weight (p-value=0.001), body mass index (p-value=0.001), waist circumference (p-value=0.001), hip circumference (p-value=0.001), visceral fat (p-value=0.001), resting metabolism (p-value=0.001), and energy (p-value=0.009), fat (p-value=0.043), and carbohydrate (p-value=0.021) intake were associated with total body fat. Conversely, the subject's physical activity, personal and familial history of chronic diseases, development of obesity, and parental obesity history exhibited no correlation with the subject's total body fat (p-value≥0.05).
Conclusions: The subject's occupation, body weight, body mass index, waist and hip circumference, visceral fat, resting metabolism, energy, fat, and carbohydrate intake were correlated with the subject's total body fat.

INTRODUCTION

The incidence of obesity is rising worldwide in both emerging and industrialized nations. The World Health Organization (WHO) reported that in 2014, 11% of males and 15% of women aged 18 and older were classified as obese. Obesity is associated with metabolic illnesses, such as diabetes, hypertension, and cardiovascular disease. The obesity prevalence in Indonesia is 21.8%[1,2]. Prior studies have investigated the risk factors associated with obesity in Indonesia[3,4]. Specific population groupings are recognized to possess an elevated risk of obesity at any moment. For instance, women exhibit a higher susceptibility to obesity across various age groups[5].

Data from Basic Health Research (2018) indicates that the prevalence of obesity among women over 18 years was 29.3%, compared to 14.5% in men[2]. Moreover, young adults are recognized for experiencing weight increase more rapidly than any other demographic cohort. Young adulthood may have physical morbidities that persist and exacerbate in later adulthood, including hypertension, diabetes, and others. The health ramifications of obesity in young adults are challenging to address due to often subtle symptoms and a general lack of concern for health maintenance, influenced by competing life priorities and their neurocognitive developmental stage, which complicates adherence to treatment[6–8].

The rise in individual body weight and the prevalence of obesity within populations are attributed to multiple variables that remain incompletely understood[9]. This study delineated the nutritional state, dietary habits, physical activity, health, and phenotypic history of obese young women in Bandung City. Data

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concerning the traits of obese young women is anticipated to be essential for developing intervention or weight loss programs aimed at normalizing nutritional status and mitigating illness risks. Consequently, a heightened focus would be on enhancing health outcomes among the Sundanese ethnic community. This study examines the phenotypic history of obesity in Sundanese women aged 18 to 25 years in Bandung, Indonesia.

METHODS

This study employed a mixed-methods technique. Quantitative data was collected by a comparative cross-sectional method, and qualitative data was gathered using a phenomenological technique. This study employed a purposive sampling method. The population size was initially indeterminate; the calculation by Lemeshow et al. (1997) was applied, utilizing the proportion of obese women over 18 years of age. An error margin of 10% indicates that the minimum required sample size is 88 individuals, accounting for a projected dropout rate of 10%. The eligibility criteria for this study were: 1) obese women (body fat percentage >35%); 2) of Sundanese ethnicity; 3) aged 18 to 25 years; 4) willing to participate and provide informed consent. The exclusion criteria for this study were: 1) pregnancy or breastfeeding, 2) a history of chronic illness, and 3) ongoing participation in another research project.

We utilized a modified, validated questionnaire for data collection. Demographic information encompassing name, age, educational background, and profession. Anthropometric and body composition metrics, encompassing body weight (BW), height, body mass index (BMI), waist circumference (WC), hip circumference (HC), waist-to-hip ratio (WHR), fat percentage (%BF), visceral fat (VF), and subcutaneous fat (SF). Consumption data was obtained through a validated semi-quantitative food frequency questionnaire (SQ-FFQ), and physical activity data was collected using the Physical Activity Level (PAL) questionnaire[10,11]. Additionally, five items concerning health and phenotypic history data were included, addressing chronic disease history and parental obesity, utilizing a questionnaire created by the researcher, which was subsequently assessed for validity ($r > 0.361$) and reliability (Cronbach $\alpha > 0.632$). Comprehensive interviews were performed with six participants utilizing 14 inquiries, including dietary practices, physical activity, health, and phenotypic history. The information is derived from the subject and her parents. The inquiries were as follows: “Which meals do you favor and which do you detest?”, “What cooking techniques do you prefer, and which do you abhor?”, “What is the primary rationale for choosing and planning food or daily meals?”, “Do you frequently consume high-calorie fast food, beverages, or snacks?”, “What is the nature of your daily physical activity?”, “What is the primary motivation for engaging in or abstaining from physical activity?”, “Have your parents ever been obese? If so, when did they become obese?”, “Have your parents ever had or are you currently facing a chronic illness? If so, what type of illness and for how long?”, “When did you begin to acquire weight?”, “Do you have a history of chronic disease?”, “Do you regularly consume special supplements or medications for particular purposes?”, “What elements do you believe exert the most significant influence on weight gain?”

BMI was categorized into Non-obese (<30 kg/m^2) and Obese (≥30 kg/m^2)[12]. WC and WHR were categorized into No Risk (<80 cm and ≤0.85) and At Risk (≥80 cm and >0.85)[13]. VF was classified into Normal (0.5-9.5), High (10-14.5), and Very High (15-30). The %BF category using WHO standard, i.e. Obese (>35%)[12]. SF was then classified into Normal (20 - <30%), High (30 – 35%), and Very High (≥35%). The categories of VF and SF used are from OMRON Healthcare. The subject’s physical activity was classified into Light (1.40-1.69), Moderate (1.70-1.99), and Heavy (2.00-2.40)[11]. Classification of Energy, Protein, Fat, PUFA, Carbohydrates, and Fiber intake were divided into severe deficit (<70%), moderate deficit (70-79%), mild deficit (80-89%), normal (90-119%), and excess (>120%)[14]. Micronutrient adequacy levels were obtained using Gibson's (2005) cut-off points, which were divided into insufficient (<77) and sufficient (≥77)[15]. Cholesterol intake was categorized into Normal (<300 mg) and Excessive (≥300 mg)[16]. Information on students' sweet beverages, high-carbohydrates, high sodium, and high-fat consumption habits in the last month is collected using a SQ-FFQ, then categorized into <7 a week, once a day, and more than once a day based on the subject’s frequency.

The instruments employed comprise the Omron Karada Scan Body Composition Monitor HBF-375, which accurately measures body weight (BB), body mass index (BMI), fat percentage, visceral fat, and subcutaneous fat with a precision of ± 400 g for weights ranging from 0 to 40.0 kg, and ± 1% for weights between 40.0 and 135.0 kg (OMRON, Japan); a stadiometer for height measurement (TB) with an accuracy of 0.1 centimetres (SAGA, Indonesia); a flexible steel metric tape for waist and hip circumference measurements with a precision of 0.5 centimetres (OneMed, Indonesia); and a calculator for determining the waist-hip ratio. This study requires no materials. The data was analyzed utilizing Google Sheets and Microsoft Excel 2019. Nutritional intake was assessed via Nutrisurvey 2007. Descriptive statistics were conducted to examine each variable's frequency distribution and percentage summary utilizing SPSS for Windows version 26.0. Narrative analysis was performed manually utilizing qualitative data. The Spearman's rho test examined the association between total body fat and another variable. This study has obtained ethical approval from the research ethics committee of Padjadjaran University (UNPAD) under No. 1068/UN6.KEP/EC/2023, dated August 18, 2023.

RESULTS AND DISCUSSIONS

Subject’s Characteristics and Nutritional Status

Table 1 displays the characteristics of the subjects. All participants were female, with a mean age of 20.3 ± 1.87 years. The subject's most recent schooling was completed in high school, and they are currently enrolled at a college in Bandung City. All participants belong to the Sundanese ethnic group. After screening to assess the nutritional status of the subjects, it was discovered that the mean ± SD of the subject's body

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weight was 81.5 ± 11.75 kg and height was 158.3 ± 5.69 cm. The Body Mass Index (BMI) is calculated by dividing body weight in kilograms by the square of height in meters. A predominant proportion of patients (72.7%) were classified as obese according to WHO criteria (≥30 kg/m^2), while the remainder consisted of normal weight (1.1%) and overweight individuals (26.2%).

This outcome is noteworthy for discussion, as an analysis of nutritional status based on fat percentage reveals that all subjects (100%) were classified as obese (fat percentage >35%). Yet, an assessment using BMI indicates that only 72.7% were designated as obese (≥30). This discrepancy arises from underestimating obesity prevalence using BMI rather than body fat percentage. Smith et al.'s[17] research on the prevalence of obesity in Indonesia, utilizing several measurement methods (BMI, fat percentage, and visceral fat), indicate that the prevalence of overweight and obesity based on fat percentage is 72% in men and 63% in women. Currently, the prevalence of obesity, as determined by BMI, is 40%. Waist circumference identifies 91% of Indonesians with elevated visceral adipose tissue mass. Waist circumference measures indicated that 93.2% of participants were classified as "at risk" with a mean ± SD of 95.0 ± 9.12 cm. The average hip circumference was 113.1 ± 8.83 cm. The WHR value is calculated by dividing the waist and hip circumference. Following the Waist-to-Hip Ratio (WHR) calculation, 37 participants (42%) were classified as 'at risk'. Waist circumference is women's most effective predictive metric, indicating 91-93% of those with extra visceral adipose tissue (VAT) mass. The incidence of central obesity in women, as determined by waist circumference thresholds, is 1.5 times more than that assessed by BMI. Numerous studies indicate that BMI inadequately reflects the prevalence of obesity compared to alternative anthropometric metrics such as waist circumference, waist-hip ratio, and waist-height ratio. Consequently, employing BMI to assess the prevalence of obesity in Asian populations may not accurately represent the potential risk of chronic diseases within this demographic[17].

Table 1. Characteristics and nutritional status of Sundanese obese young women subjects in Bandung City

Variable	Unit	n	%	Mean ± SD	r	p-value
Age						
18-25	y.o	88	100.0	20.3 ± 1.87	0.032	0.769
Last education						
High School	-	75	85.2	-	0.167	0.227
Student		13	14.8			
Occupation						
Student		72	81.8			
Private sector	-	2	2.3	-	0.227	0.033*
Civil servants		3	3.4			
Other		11	12.5			
BW	kg	88	100.0	81.5 ± 11.75	0.680	0.001*
Height	cm	88	100.0	158.3 ± 5.69	-0.020	0.855
BMI						
Non-Obese (<30)	kg/m^2	24	27.3	32.5 ± 4.46	0.772	0.001*
Obese (≥30)		64	72.7			
WC						
No risk (<80)	cm	6	6.8	95.0 ± 9.12	0.672	0.001*
At risk (≥80)		82	93.2			
HC	cm	88	100.0	113.1 ± 8.83	0.689	0.001*
WHR						
No risk (≤0.85)		51	58.0	0.84 ± 0.040	0.127	0.239
At Risk (>0.85)		37	42.0			
VF						
Normal (0.5-9.5)		24	27.3			
High (10-14.5)	%	45	51.1	12.4 ± 5.02	0.757	0.001*
Very High (15-30)		19	21.6			
TBF	%	88	100.0	38.3 ± 2.68	-	-
RM	Cal	88	100.0	1560 ± 167.7	0.618	0.001*
SF						
Normal (20 - <30)		3	3.4			
High (30 - 35)	%	28	31.8	35.4 ± 3.60	0.827	0.001*
Very High (≥35)		57	64.8			

(*) Significant correlation to total body fat (TBF), analyzed using Spearman's rho test, significant if p-value<0.05. BW (Body Weight); BMI (Body Mass Index); WC (Waist Circumference); HC (Hip Circumference); WHR (Waist-Hip Ratio); VF (Visceral Fat); TBF (Total Body Fat); RM (Resting Metabolism); SF (Subcutaneous Fat); SD (Standard Deviation); y.o. (years old); cm (centimeters); Cal (Calorie); kg (kilograms); % (percent); r (coefficient correlation)

WC and WHR are two surrogate metrics employed to assess the prevalence of overall and central obesity. WC and WHR offer superior screening for persons with elevated visceral adipose tissue mass

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compared to body mass index (BMI)[17]. The International Atherosclerosis Society and the International Chair on Cardiometabolic Risk Working Group on Visceral Obesity asserted that an increase in waist circumference would likely indicate excess visceral adipose tissue mass and heightened cardiometabolic risk. Waist circumference (WC) and waist-to-hip ratio (WHR) are advised in clinical environments to indicate early health risks, cardiovascular disease, and type 2 diabetes[13,18]. The respondents' visceral fat ranged from normal to extremely high, with over half classified as 'high' (51.1%), while the rest fell into the 'very high' (21.6%) and 'normal' (27.3%) categories. The incidence of central obesity among individuals aged 15 years and older in Bandung City is 40.8%[19]. The buildup of visceral fat is a significant cardiometabolic risk factor that promotes the generation of pro-inflammatory cytokines and adipokines with cardio depressant and pro-atherosclerotic effects[20]. The resting metabolism (RM) indicated is obtained after assessing the subject's body composition with the Karada Scan HBF-375. Resting Metabolic Rate (RM), defined as the caloric requirement for sustaining minimal energy levels, varies among individuals based on age, body weight, body composition, and energy consumption. The mean ± SD resting metabolic rate of the individuals was 1560 ± 167.7 calories, irrespective of their activity level. Subcutaneous fat is located beneath the skin in regions such as the arms, hips, and thighs. A majority (64.8%) of patients had subcutaneous fat in the 'very high' category, while the rest were classified as 'high' (31.8%) and 'normal' (3.4%). The correlation between elevated subcutaneous fat mass and cardiometabolic risk is not consistently as linear as that of visceral fat mass[20]. After correlation analysis, it was found that BW, BMI, WC, HC, VF, RM, and SF had a strong positive relationship with total body fat. Meanwhile, occupation of the subject had a weak positive relationship with total body fat.

Subject's Physical Activity

The poll assessed physical activity levels, revealing that the majority of participants engaged in 'moderate' (43.2%), followed by 'mild' (37.5%) and 'heavy' (19.3%) physical activity. Due to the predominance of female students among the subjects, the majority slept less than 8 hours, utilizing that time for coursework, with assignment completion being a significant component that enhanced the subjects' physical activity. Most participants spent hours using their cell phones for entertainment rather than completing schoolwork. None of the subjects engaged in regular or scheduled sports; they primarily wandered around the campus and boarding residence. In this investigation, the subject's physical activity showed no link with total body fat (r=0.057; p-value=0.601).

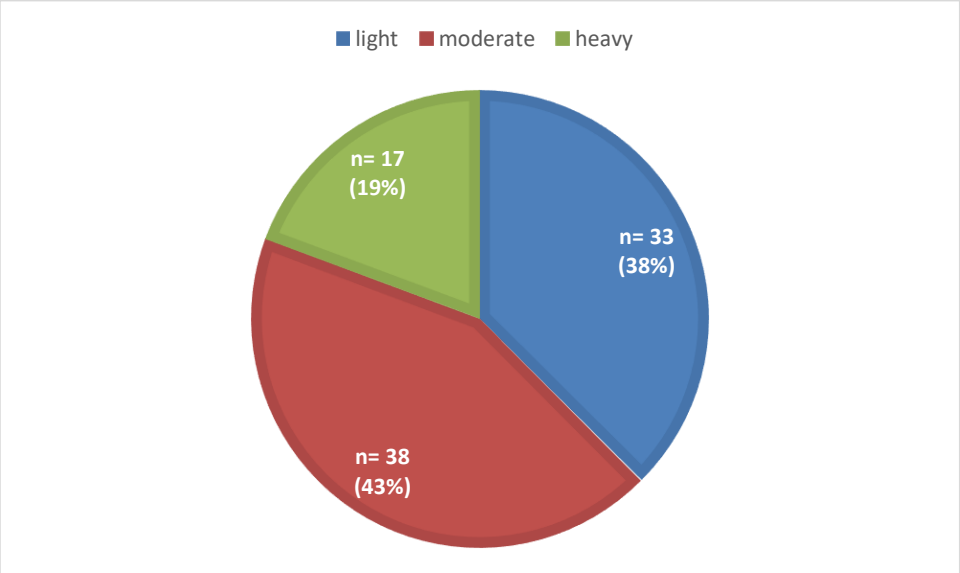

Figure 1. Distribution of physical activity of Sundanese obese young women subjects in Bandung City

In-depth interviews were performed with ten respondents and their moms concerning physical activity. Most moms do not encourage their children to engage in physical activity; however, one mother typically asks them to participate in gymnastics, cycling, or walking exercises. The child infrequently engages in physical activity due to their preoccupations. In-depth interviews with children revealed that all participants reported infrequently engaging in physical activities, including household chores or exercise. The participants abstained from exercising due to their commitments to studying or working. They perceive their physical activity as substantial due to spending the entire day engaged in learning or working, necessitating physical exertion in their occupational environment, such as lifting or relocating objects.

In a study by Suryadinata et al. (2020)[21], obese adults exhibit moderate (54.5%) to low (41.5%) levels of physical activity. Females, older individuals, and those unemployed are more predisposed to low physical activity levels. Low physical activity was more prevalent among persons residing in metropolitan areas, belonging to the 'rich' economic quintile, and possessing higher education levels. Reduced physical activity correlates with an increased prevalence of overweight, obesity, hypertension, diabetes, and cardiovascular disease risk.

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Insufficient physical exercise correlates with negative health consequences and significant expenses for the healthcare system and society. Expediting the execution of public health programs aimed at diminishing physical inactivity will probably yield significant health and economic advantages for society[22].

Subject's Eating Patterns

The SQ-FFQ values were gathered, followed by the nutritional intake and adequacy percentage calculation. Percent adequacy is the ratio of consumption to the Recommended Dietary Allowances (RDA)[23], adjusted for the individual's ideal body weight. Upon determining the percent adequacy of energy and nutrients, they are classified according to the Ministry of Health (1996) for energy and macronutrient categories, Gibson (2005) for micronutrients, and Xu et al. for cholesterol[16].

The calculation findings indicate that the mean ± SD of the subjects' energy intake was 1523 ± 620 Cal, with an average percent adequacy of merely 72.4% (moderate-level shortfall). Among the participants analyzed, 47 (53.4%) exhibited a high-level energy intake deficit, 14 (15.9%) demonstrated a moderate-level deficit, eight (9.1%) had a low-level deficit, 12 (13.6%) were classified as normal, and seven (8.0%) were categorized as excessive. A comparable trend was observed in the consumption of proteins and carbohydrates. The mean ± standard deviation of protein and carbohydrate intake were 47.2 ± 35.9 g and 179.0 ± 73.2 g, respectively. The mean sufficiency percentage for protein and carbs was 81.3% (moderate shortfall) and 54.1% (severe deficit), respectively. Regarding protein consumption, 45 subjects (51.1%) exhibited a high degree of deficiency, 7 subjects (8.0%) demonstrated a moderate level of deficiency, 8 subjects (8.0%) were classified as having a high level of deficiency, 17 subjects (19.3%) were within the normal range, and 12 subjects (13.6%) had excessive intake. Subsequently, regarding carbohydrate consumption, 74 participants (84.1%) fell into the high-level deficit category, 3 subjects (3.4%) exhibited a moderate-level deficit, 2 subjects (2.3%) had a low-level deficit, 8 subjects (9.1%) maintained normal intake, and 1 subject (1.1%) had excessive intake.

The mean ± SD of the subjects' fat intake was 70.0 ± 33.35 g, with a mean percentage of fat adequacy at 111.9% (normal/almost excessive). Among the 30 patients, 34.1% exhibited excessive fat consumption, 27.3% were classified as normal, 21.6% showed a high deficit, 9.1% had a moderate deficit, and 8% experienced a mild deficit. Should the under-reporting assumption be applied, the subject's fat consumption may exceed the reported levels, categorizing it as excessive (>120% adequacy).

The average ± standard deviation of PUFA intake was 9.9 ± 9.26 g, with a mean percentage of PUFA adequacy at 81.6% (normal/almost excessive). Among the subjects, the majority, comprising 55 individuals (62.5%), exhibited a high-level deficit; 18 individuals (20.5%) demonstrated excessive intake of category PUFA; 8 subjects (9.1%) were classified as normal; 5 subjects (5.7%) presented a mild-level deficit; and 2 subjects (2.3%) exhibited a moderate-level deficit. The mean ± SD fiber intake was 7.4 ± 3.16 g, with a mean percentage of sufficiency of 24.7% (indicating a significant shortfall). According to the subject's dietary data, it signifies insufficient fruit intake, particularly vegetables.

Table 2. Energy and nutrient intake of Sundanese obese young women subjects in Bandung City

Nutrients	Unit	Mean	SD	% Adequacy	Category	p-value
Energy	Cal	1523.15	619.84	72.4	Moderate-Level Deficit	0.009*
Proteins	g	47.24	35.94	81.3	Mild-Level Deficit	0.054
Fat	g	70.05	33.35	111.9	Normal	0.043*
PUFA	g	9.91	9.26	81.6	Mild-Level Deficit	0.063
Carbohydrate	g	179.00	73.15	54.1	Severe-Level Deficit	0.021*
Fiber	g	7.43	5.16	24.7	Severe-Level Deficit	0.088
Vitamin A	RE	1736.64	935.52	304.8	Sufficient	0.818
Vitamin D	mg	1.18	2.05	8.3	Insufficient	0.569
Vitamin E (eq.)	mg	3.70	2.60	25.9	Insufficient	0.469
Vitamin K	mg	7.88	11.36	14.9	Insufficient	0.689
Vitamin B1	mg	0.42	0.30	40.2	Insufficient	0.232
Vitamin B2	mg	0.56	0.38	54.2	Insufficient	0.370
Niacin (eq.)	mg	0.70	2.80	5.3	Insufficient	0.849
Pantothenate	mg	2.66	1.28	56.3	Insufficient	0.311
Vitamin B6	mg	0.70	0.44	61.7	Insufficient	0.215
Total folic acid	µg	97.42	100.42	25.3	Insufficient	0.519
Vitamin B12	µg	2.06	2.55	54.4	Insufficient	0.823
Biotin	µg	0.86	1.49	3.1	Insufficient	0.467
Vitamin C	mg	47.47	55.53	65.6	Insufficient	0.871
Calcium	mg	215.30	228.87	22.1	Insufficient	0.468
Phosphor	mg	518.24	403.09	72.6	Insufficient	0.173
Magnesium	mg	148.56	106.96	50.5	Insufficient	0.355
Iron	mg	5.80	6.75	34.5	Insufficient	0.160
Iodine	µg	1.28	3.06	0.9	Insufficient	0.179
Zinc	mg	4.38	2.97	56.8	Insufficient	0.111
Manganese	mg	3.66	7.65	221.4	Sufficient	0.210

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Nutrients	Unit	Mean	SD	% Adequacy	Category	p-value
Fluorine	µg	11.06	29.14	397.4	Sufficient	0.723
Potassium	mg	1067.58	1161.29	23.6	Insufficient	0.561
Sodium	mg	284.64	244.84	19.9	Insufficient	0.148
Chlorine	mg	61.42	134.33	3.0	Insufficient	0.957
Copper	mg	0.70	0.70	81.0	Sufficient	0.427
Cholesterol	mg	167.39	131.92	59.1	Normal	0.451

(*) Significant correlation with total body fat was found using Spearman's rho test, significant at p-value<0.05. SD (Standard Deviation); PUFA (Poly Unsaturated Fatty Acid)

Under-reporting of food intake is a primary impediment to the precise collection of data regarding regular dietary consumption. Underreporting in extensive nutrition surveys varies from 18% to 54% of the total sample, with specific subgroups experiencing rates as high as 70%. Data from 16,190 participants in the 2004 Canadian Community Health Survey indicate that the average under-reporting of energy intake is estimated at 10%[24].

Underreporting is more pronounced among those who are overweight and/or obese, physically active individuals, adults relative to adolescents, and women in comparison to men. Foods perceived negatively for health (e.g. cakes, sweets, confectionery) are often underreported, whereas those viewed positively (e.g. fruits and vegetables) are frequently overreported. This indicates that fat consumption is usually underestimated. This issue poses a challenge for nutritionists and necessitates a multidisciplinary approach, incorporating psychology, sociology, and physiology, to enhance comprehension of under-reporting in dietary intake research[25,26].

Vitamins A, D, E, and K are classified as fat-soluble vitamins. Regarding the sufficient proportion of fat-soluble vitamins, it is established that vitamin A intake falls within the adequate group. Conversely, vitamins D, E, and K were lacking. Vitamins B and C are hydrosoluble vitamins. The B vitamins comprise thiamine, riboflavin, niacin, pantothenic acid, pyridoxine, folic acid, cobalamin, and biotin. It is acknowledged that the levels of all water-soluble vitamins were categorized as inadequate.

Macro minerals are essential minerals the organism requires in quantities over 100 mg daily, encompassing sodium, chloride, potassium, calcium, phosphorus, and magnesium. The intake of each macromineral indicates that the sufficiency of all macrominerals falls under the insufficient group. Microminerals needed are below 100 mg per day, encompassing zinc, iodine, iron, manganese, copper, and fluorine. Only the minerals fluorine, manganese, and copper were classified as sufficient, while the others were deemed deficient.

An Australian study indicated that overweight and obese women exhibited reduced serum levels of vitamin D, folate, magnesium, and potassium compared to women of normal weight[27]. A further study identified a correlation between deficits in antioxidants, vitamin A, vitamin D, vitamin B complex, calcium, iron, and zinc and obesity across diverse global populations. Researchers observe that micronutrient shortages might impact several physiological processes, such as appetite regulation, energy metabolism, and immune function, potentially contributing to the onset and persistence of obesity[28]. Additional study is required to enhance the understanding of the correlation between micronutrient deficits and obesity in women.

This study also calculated cholesterol intake, as it is recognized to be linked to cardiovascular disease[29,30]. The recommended daily cholesterol consumption should not exceed 300 mg[16]. The mean ± SD of the subjects' cholesterol consumption was 167.4 ± 131.9, with an average percent adequacy of 59.1% of 88 subjects, 26 (29.5%) exceeded the recommended cholesterol consumption. This figure may exceed calculations due to under-reporting and underestimation.

The under-reporting assumption can elucidate this issue, similar to macronutrients. A further deficiency attributable to the interviewer's underestimation may explain why the food items on the SQ-FFQ form remain restricted, potentially resulting in inadequate exploration of consumed foods or inaccurate estimations of food weight (g), despite the presence of analogous perceptions, enumerator training, support through photographic aids of food ingredients, and lists of substitute food items. Additionally, many dishes, foods, and snacks ingested by the individuals were omitted from the Nutrisurvey list; researchers incorporated nutrients from the Indonesian Food Composition Table and the fatsecret.com website. Regrettably, fatsecret.com exclusively provides total calories and a limited selection of nutrients, including protein, total fat (saturated and unsaturated), carbs, salt, and potassium. Certain minerals, such as Selenium and Chromium, are absent from the table as most meals in Nutrisurvey lack these nutrients.

Comprehensive interviews with moms and children concerning dietary preferences revealed that most preferred fried meals over sautéed or boiled options. The determinants of a mother's daily home cooking include several aspects, such as the accessibility and affordability of ingredients, the mother's individual preferences, and the family's tastes. The majority of women and children prefer fast meals and high-calorie beverages. Family dinners significantly influence the development of children's eating habits, as they provide crucial opportunities for control and interaction between parents and their offspring. Parental behavior in child feeding warrants more focus in the study as a modifiable risk factor, potentially aiding the development of future nutritional therapies and policies to prevent diet-related disorders[31]. The researcher recommends that the subsequent nutritional intake be evaluated with the SQ-FFQ instrument in conjunction with a dual 24-hour meal recall, followed by applying a nutrient calculation tool from a contemporary and comprehensive database.

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Table 3. Consumption of sweet beverages, high carbohydrates, high sodium, and high-fat foods in Sundanese obese young women subjects in Bandung City

Eating habits	Frequency						p-value
	<7x a week		Once a day		>1x a day		
	n	%	n	%	n	%	
Consumption of sweet drinks	59	67.0	14	16.0	15	17.0	0.741
Consumption of foods high in carbohydrates	35	39.8	20	22.7	33	37.5	0.122
Consumption of foods high in sodium	79	89.8	8	9.1	1	1.1	0.810
Consumption of foods high in fat	63	71.6	7	8.0	18	20.5	0.805

According to the SQ-FFQ results, research participants frequently consumed sugary beverages such as coffee and tea. Researchers categorized the frequency of chronic sugary beverage use into three groups: several times a week, once daily, and many times daily. The findings indicated that most participants (67%) ingested sugary beverages multiple times weekly, approximately 3-5 times per week. 17% of participants consumed sugary beverages more than once daily, whereas 16% consumed them daily (Table 3). Women's average consumption of sugary and fatty primary foods (such as cakes, biscuits, candy, and pudding) was 14.9%. The consumption of sweet, fatty meals exhibits a positive correlation with fiber intake, a negative correlation with vegetable intake, and no correlation with the percentage of energy derived from fat[24].

According to the SQ-FFQ results, participants frequently ingested high-carbohydrate foods and snacks, including biscuits, bread, cakes, and wheat flour or tapioca products. The findings indicated that most participants (39.8%) ingested high-carbohydrate foods/snacks multiple times per week, predominantly 3-5 times weekly. Approximately 37.5% of participants ingested high-carbohydrate foods/snacks more than once daily, while the remaining 22.7% had them once daily (Table 3). Obesity presents multiple signs of chronic disease, one of which results from overconsumption of energy-dense carbohydrate source[7]. Consuming bread is a risk factor linked to obesity in adults aged 25 to 65 years. Individuals who regularly consume bread once daily or more had a 1.19-fold increased risk of obesity (95% CI: 1.13-1.26) compared to those who infrequently eat bread. Overconsumption of wheat, processed foods (such as bread), and staple foods can result in an excessive intake of carbohydrates and fats in the body[4].

According to the SQ-FFQ data, research participants also ingested sodium-rich foods and snacks, including fast snacks and instant noodles. The findings indicated that most participants (89.8%) ingested high-carbohydrate foods or snacks multiple times per week, predominantly 3 to 5 times weekly. Approximately 9.1% of participants had high-carbohydrate foods/snacks daily, while the remaining 1.1% consumed them multiple times daily (Table 3).

According to the SQ-FFQ results, research participants frequently ingested high-fat foods and snacks, including fried items. The findings indicated that most participants (71.6%) ingested high-fat foods or snacks multiple times per week, predominantly 3 to 5 times weekly. Approximately 20.5% of participants ingested high-carbohydrate foods/snacks more than once daily, while the remaining 8% consumed them daily (Table 3).

Foods rich in sugar and fat are prioritized for avoidance due to their high palatability and energy density, and reducing their consumption is not believed to affect nutrient intake adversely. Extrinsic sugars transport dietary fats, and ingesting sweet fatty foods enhances fat intake by improving palatability[24]. Women engaging in light physical activity, consuming sweet foods and beverages exceeding 10% of the Recommended Dietary Allowance (RDA) for energy, and ingesting carbs beyond 55% of the RDA are at a risk of obesity that is around 1.2 times more than that of the comparison group, respectively. Eating vegetables, fruits, fiber, protein, fat, and sufficient energy does not constitute risk factors for obesity[3].

Subject's Health and Phenotype History

Health history in the study concerning chronic diseases encountered by the patient and the subject's parents and grandparents. Although not a communicable illness, chronic sickness can be transmitted to progeny as a risk factor[32,33]. The phenotypic traits inquired about the initial experience of being overweight and the familial history of paternal and maternal obesity.

Following computations, 2 participants (2.3%) have encountered chronic conditions, specifically hypertension and kidney disease. Concerning family history of chronic diseases, nearly half of the participants (47.7%) reported a familial prevalence of conditions including type 2 diabetes mellitus, hypertension, cancer, pulmonary disease, hyperlipidemia, cardiovascular disease, renal failure, hepatic failure, and gout.

Most participants had been overweight since childhood (27.3%) or before elementary school. Subsequently, with advancing age, the subject's body weight similarly escalates. A total of 35 individuals (39.8%) had fathers who were obese, with the majority exhibiting central obesity upon further inquiry. Simultaneously, 41 patients (46.6%) had mothers who were or are presently classified as obese. In-depth interviews with the subject's parents, aged 45-50 and with a history of chronic illness, revealed that they were diagnosed with a chronic disease three months ago. Numerous moms contacted in comprehensive discussions exhibited an obese nutritional state, with the majority remaining obese post-partum. When inquired about the determinants that most significantly impact maternal weight increase, the responses included dietary habits, including nocturnal eating, fast food consumption, regular fried foods, meatball noodles, and various snacks. Upon analyzing the correlation test, it was

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determined that the subject's and family's chronic disease history, the development of obesity, and parental obesity history had no association with the subject's total body fat in this study (p-value≥0.05).

A weakness of this research is the small sample size compared to previous relevant studies. Subsequent research should encompass a larger sample size to enhance the findings' statistical power and generalizability. Notwithstanding this restriction, the findings of this study can still provide a solid foundation for subsequent intervention programs aimed at obese people or groups, particularly within the Sundanese ethnicity.

CONCLUSIONS

A study examining obesity among young women in Bandung City reveals that BMI underestimates obesity prevalence compared to body fat percentage. Participants showed moderate physical activity, with calorie intake falling within a deficit range, and insufficient consumption of vitamins and minerals. Fat intake exceeded 100%, while carbohydrate and fiber intake was low. Diets were characterized by high fat, high carbohydrate, high sodium foods, and sugary beverages. Nearly 50% had a family history of chronic diseases and early childhood obesity. Key factors such as profession, body weight, and diet correlated with body fat percentage, suggesting the need for targeted interventions.

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CONFLICT OF INTEREST AND FUNDING DISCLOSURE

All authors have no conflict of interest regarding this article and did not receive any external financial support for the work.

AUTHOR CONTRIBUTIONS

RR, HH, HR: conceptualization, investigation, methodology, data curation, supervision, visualization, validation, editing. PN: conceptualization, data curation, formal analysis, methodology, project administration, resources, software, validation, visualization, writing-original draft & editing.

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