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The Correlation of Sugar, Salt and Oil Consumption Patterns with Central Obesity in Government Employees at the Regional Library and Archives Service Office of Bengkulu Province

Hubungan Pola Konsumsi Gula, Garam dan Minyak Dengan Obesitas Sentral Pada Pegawai Pemerintah di Kantor Dinas Perpustakaan dan Kearsipan Daerah Provinsi Bengkulu

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ABSTRACT

Background: Central obesity manifests as the accumulation of adipose tissue in abdominal (visceral). The assessment of this condition often employs abdominal circumference (AC) as a commonly utilized metric. The increasing prevalence of central obesity is linked to dietary habits encompassing simple carbohydrates, fiber, and protein, environment, behavior, and genetic factors.

Objectives: This study aimed to determine the relationship between sugar, salt, and oil consumption patterns and central obesity in employees.

Methods: This research was an observational study with a cross-sectional design on 35 employees. Data collection included sugar, salt, and oil consumption patterns collected using a semi-quantitative food frequency questionnaire (SQ-FFQ), and central obesity was obtained by measuring abdominal circumference using measuring tape, then statistical analysis using the Chi-square test.

Results: Most respondents had unhealthy consumption patterns of sugar, salt, and oil that were 71.4%, 62.9%, and 82.9%, respectively. There was a significant relationship between consumption patterns of sugar (p=0.002), salt (p=0.033), oil (p=0.019) and the proportion of central obesity in employees at the Regional Library and Archives Office of Bengkulu Province.

Conclusions: Twenty-two employees experienced central obesity, with the majority surpassing daily sugar, salt, and oil intake recommendations as a notable risk factor. To mitigate this, Bengkulu Province Regional Library and Archives Office staff are advised to limit the consumption of sugar, salt, and oil-rich items such as salted fish, canned sardines, dried shrimp, instant chili sauce, soy sauce, instant noodles, palm oil, and coconut milk in their meals.

INTRODUCTION

Obesity is a global health concern. The rising prevalence of obesity happens both in developed and developing countries[1]. Central obesity can be caused by the accumulation of adipose tissue in the abdominal (visceral). The stomach area has more fat content than the hip region. The assessment of central obesity often relies upon the utilization of abdominal circumference (AC) as a prevalent indicator[2]. Causing factors of central obesity encompasses dietary choices of simple carbohydrates, low fiber, high fat, environment, behavior, and genetics that encourage energy expenditure, leading to obesity[3]. The dietary pattern within Indonesian society constitutes a notable factor impeding individuals' ability to regulate their food intake. Notably, excessive consumption of sugar, salt, and oil

habits contributes to the onset of central obesity from the age of 18 onward[4].

Numerous sources of simple carbohydrate contained in food such as monosaccharides, the elemental units of carbohydrate[5]. Surpassing the recommended consumption of simple carbohydrates precipitates lipid storage[6]. Overconsumption can lead to fat accumulation in visceral adipose tissue that causes impairment of subcutaneous adipose tissue to imbalance in energy changes. Abdominal accumulation causes various health problems, such as central obesity, that leads to the development of diabetes mellitus, hypertension, coronary heart disease, and hepatic and renal pathologies, alongside dyslipidemia manifestation[7].

A survey investigating the dietary habits of the Indonesian populace reveals average sugar intake based on gender, with men exhibiting a higher consumption

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compared to women. The prevalent salt consumption within Indonesian society is quantified at ≥ 5 g/day. Furthermore, an observable gender-based distinction emerges in oil intake, as men surpass women with an average consumption of ≥ 67 g/day. Guidelines delineated by the Ministry of Health of the Republic of Indonesia declare a recommended daily intake of 40 g of sugar (equivalent to 4 tablespoons), 5 g of salt (akin to 1 teaspoon), and an oil consumption of 50 g/day (equivalent to 5 tablespoons). The sugar, salt, and oil consumption are categorically high risk when exceeding the recommendation, so heightened vulnerability to health problems including degenerative disease, cardiovascular disease, type 2 diabetes mellitus, hypertension, gallstone, and dyslipidemia. This signifies 30% of the population surpassing the recommended daily consumption threshold at a health risk[8].

Central obesity rates are rising globally, for example, in the United States (57% from 1999-2014) and China (16.1%). Indonesia also faces an increasing prevalence, especially among adults. Marina's (2019) study on 39 employees at Jakarta Health Polytechnic revealed that 62% were obese by abdominal circumference measurement. Additionally, 53.9% had excessive sugar intake, while daily fat consumption (64.51 grams) was sufficient[9]. Along with that, Bengkulu Province experienced a noticeable obesity increase from 2007-2018, reaching 29.3%, with Bengkulu City is higher at 38.40%[10].

Office workers, especially those in government, are at a higher risk of central obesity due to limited physical activity and widespread internet use that makes everything easier and minimizes fat burning. It is also prompted by dietary habits at work and home to experience central obesity. Investigating these factors is crucial for both health and occupational productivity[11]. On the other hand, the observed populace of Bengkulu generally consumes oil and coconut milk in daily dietary practices. This study aimed to analyze the relationship between sugar, salt, and oil consumption patterns with the incidence of central obesity within the confines of the Regional Library and Archives Service office of Bengkulu Province.

METHODS

This research was conducted at the Regional Library and Archives Service Office of Bengkulu Province. This research was conducted from March 3rd to March 15th, 2023. The study employed a quantitative analytical approach with a cross-sectional design involving 35 employees who met specified criteria: individuals aged 18 to 50 years, physically healthy, and willing to participate as respondents throughout the entirety of the research. The determination of the sample size was carried out using Lemeshow formula, taking into account an obese proportion of 37.4%, a population size of 91 individuals, and a precision value of 10%.

Research on sugar, salt, and oil consumption was collected using direct employee interviews and a semi-quantitative food frequency questionnaire (SQ-FFQ). The SQ-FFQ, organized into three sections, detailed sources of sugar, salt, and oil. Data on food lists were gathered from the survey around Bengkulu Province Regional Library and Archives Office area. The food photo book was provided to describe the quantitative dietary questioning easily. Sugar intake was categorized as good at or below 40 g/day, salt at or below 5 g/day, while optimal oil consumption not exceeding 50 g/day. After collecting data, the SQ-FFQ was computed using Nutrisurvey software. Obesity was assessed by measuring abdominal circumference using a measuring tape; values over 81 cm (female) and 91 cm (male) indicated obesity. Univariate analysis provided a detailed overview, followed by bivariate analysis using Chi-square test[12] to identify the association of variables. Ethical clearance for this research was granted by the Bengkulu Ministry of Health Polytechnic Ethics Commission under the approval number KEPK/077/03/2023.

RESULTS AND DISCUSSION

The study comprised a sample size of 35 individuals, divided by two distinguishing features: age and gender. As delineated in Table 1, the female samples consist of 23 individuals (65.71%). The age range of 30–49 showed the highest sample representation, comprising 19 individuals (54.2%).

Table 1. Overview of respondent characteristics

Characteristics	n	%
Age (year)		
19-29	6	17.1
30-49	19	54.2
50-64	10	28.5
Sex		
Male	12	34.28
Female	23	65.71

Univariate analysis explores sugar, salt, and oil consumption patterns, along with central obesity prevalence among government employees in Bengkulu Province's Regional Library and Archives Service Office. Table 2 discloses that a majority had an excessive intake of sugar (71.4%), salt (62.9%), and oil (82.9%). Noteworthy is the number of central obesities was 22 individuals (62.9%).

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Table 2. Overview of sugar, salt, oil consumption, and central obesity trends among government workers in the Regional Library and Archives Office of Bengkulu Province in 2023

Variable	n	%
Sugar consumption		
Excessive (>40 g/day)	25	71.4
Good (≤ 40 g/day)	10	28.6
Salt consumption		
Excessive (> 5 gr/day)	22	62.9
Good (≤5 g/day)	13	37.1
Oil consumption		
Excessive (>50 g/day)	29	82.9
Good (≤50 g/day)	6	17.1
Obesity (abdominal circumference)		
Central obesity: Abdominal circumference (M ≥ 90 cm, F ≥ 80 cm)	22	62.9
Non-central obesity: (M < 90 cm, F < 80 cm)	13	37.1

The study reveals that a majority of employees consumed excessive sugar consumption, it was evidently in their regular intake of various sugary items such as tea, coffee, ice cream, *martabak*, sweet snack, and instant beverages like sprite, fanta, coca cola, and chocolate, consumed 2-3 times per week. A common sugar source is granulated sugar, used 1-3 times daily in cooking and drinks like tea, coffee, and juice. The average daily sugar intake is 55.26 grams, ranging from 20.16 to 87.55 grams. Notably, 25 individuals are in the excessive category, while 10 persons are in the favorable category. Employees also obtain sugar from instant foods and drinks like instant coffee, chocolate, syrup, sweet snacks, and soft drinks. In line with Vasiljevic (2017), these dietary habits suggest an unhealthy pattern marked by increased energy consumption[13].

The mean daily salt intake among employees is 8.16 grams, with a range from a minimum of 1.10 grams to a maximum of 29.68 grams. This indicates that 62.9% of individuals are at a high risk of unfavorable salt consumption, compared to 37.1% others. Table salt is commonly used up to twice daily, primarily in cooking, with quantities ranging from 2-3 teaspoons per use. To enhance the savory profile, salt is added to dishes such as soup, broth, and sauce at a rate of 0.5-1 teaspoon per liter, while meat and seafood may receive up to 1 teaspoon per pound (453 grams) for coarse salt, meanwhile for table salt, the recommended dosage is reduced to 0.5-0.75 teaspoon per pound[12]. Salt intake source is not only table salt, but various foods like salted egg, salted fish, dried shrimp (ebi), anchovy, soy sauce, chili sauce, and instant sauce, with a frequency of 2-3 times monthly.

Interview results reveal a food habit among employees involving diverse oil consumption, notably through fried foods, averaging 2-4 pieces per serving, consumed 3-4 times weekly both within and outside the office. Daily cooking involves the use of 2-7 tablespoons of oil for sautéing and frying, contributing to elevated overall oil consumption among employees.

The mean daily oil consumption stands at 64.80 grams, ranging from 13.90 to 83.13 grams, with only 6 individuals falling within the optimal category. Examination of FFQ data shows a diverse oil source, including palm oil in daily cooking, 3-4 pieces of fried food, and occasional use of sesame oil, coconut oil, and olive oil. This aligns with Jusuf's (2020) research on 187 respondents, establishing a correlation between oil consumption patterns and central obesity due to high energy content in oil-rich foods[14]. This practice is linked to fat accumulation in the visceral abdominal area [2], potentially increasing insulin resistance and influencing lipid and lipoprotein lipase (LPL) metabolism[15]. This study found an average abdominal circumference of 91.26 cm, ranging from 63 cm to 128 cm. Wa Ode's 2018 study on 90 employees revealed that the majority (75%) experienced central obesity[16].

This research further investigated the association between independent variables (sugar, salt, and oil consumption patterns) and central obesity using the Chi-square test, yielding p-values of 0.002, 0.033, and 0.019, respectively. Sugar, a simple carbohydrate, undergoes conversion into energy upon absorption. Its entry into the body regulates metabolism and impacts insulin. Insulin released by pancreatic beta cells initiates the conversion of sugar into energy. Increased processed sugar intake necessitates elevated insulin production, marking the inception of various diseases.[17].

The current rising consumption of diverse sugar sources, including simple sugar like glucose and fructose, is commonly added as supplementary ingredients in sweetened foods and beverages. Fructose is prevalent in processed sweet items, while glucose can be found in granulated sugar and various sugar types[18]. Various instant or homemade sweet food and beverages like juices, known for their high sugar content, are frequently consumed by employees, up to three times weekly[19]. This aligns with Wong's (2020) finding, indicating that the global prevalence of sweetened food and drink consumption poses a significant concern, as sugar sources contribute to increased calorie intake that potentially leading to central obesity issues[20].

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Table 3. The correlation of sugar, salt, and oil consumption patterns and central obesity among government employees in the Regional Library and Archives Office of Bengkulu Province

Variable	Central Obesity Condition				Total		*p-value
	Central Obesity		Non-Central Obesity				
	n	%	n	%	n	%	
Sugar consumption							
Excessive	20	80.0	5	20.0	25	100.0	
Good	2	20.0	8	80.0	10	100.0	0.002
Total	22	62.9	13	37.1	35	100.0	
Salt consumption							
Excessive	17	77.3	5	22.7	22	100.0	
Good	5	38.5	8	61.5	13	100.0	0.033
Total	22	62.9	13	37.1	35	100.0	
Oil consumption							
Excessive	21	72.4	8	27.6	29	100.0	
Good	1	16.7	5	83.3	6	100.0	0.019
Total	22	2.9	13	37.1	35	100.0	

* *Chi-square* test

The findings of this research reveal a discernible association between salt consumption patterns and central obesity (p=0.033) among employees at the Regional Library and Archives Service of Bengkulu Province in 2023. Commonly consumed salt sources include salted fish, canned sardines, dried shrimp (ebi), instant chili sauce, soy sauce, and instant noodles. This aligns with Lee's (2018) research, affirming that excessive salt-added foods contribute to increasing extracellular water volume, thereby inducing central obesity and heightened body weight[21].

Salt is a ubiquitous added material for enhancing taste in everyday cooking. Iodine salt intake is crucial in synthesizing thyroid hormone, regulating metabolism, and enhancing cognitive function[17]. High salt consumption can influence metabolic disorders, notably obesity, and pose risks such as hypertension and cardiovascular diseases[20]. This study aligns with Atmarita's (2016) research, emphasizing that exceeding the recommended salt limit can lead to central obesity[10]. Excessive salt intake induces water retention, increasing thirst and contributing to fluid weight gain. Salt contains natrium and sodium inside; when sodium enters the body can cause water weight gain. Salty foods can stimulate opioid receptors in the brain and trigger a heightened desire for consumption[22].

There was a positive correlation between the consumption of diverse sodium-rich foods and the onset of central obesity. Excessive intake of high-sodium foods can have a negative impact on metabolic outcomes[23]. Those containing high-sodium flavor enhancers such as Monosodium Glutamate (MSG) are commonly added into cooking for enhanced taste in substantial quantity can lead to neuronal damage in the nucleus, disrupting the supply of tissues with leptin and precipitating leptin resistance, thereby contributing to the development of obesity[14].

The study reveals a significant association between oil consumption patterns and central obesity (p = 0.019). Higher oil intake (exceeding 50 g per day) corresponds to an elevated risk of increased abdominal circumference. Employee dietary habits encompass various oil sources, including fried food, coconut oil, palm oil, olive, and coconut milk. Palm oil and coconut milk emerged as frequently used in cooking based on the FFQ results. Oil plays a crucial role in food preparation through processes such as stir-frying and frying. Oil has approximately 20 types of fatty acids. However, oxidation of oil can lead to undesirable changes in color, taste, and odor, causing vitamin and essential fatty acid damage[24].

Excessive sugar, salt, and fat consumption are linked to increasing non-communicable disease risks. Therefore, there is a need for studies about estimating added sugar, salt, and fat intake in specific populations purposing in formulating specific dietary recommendations promoting food habit quality and public health. The assessed total added sugar intake ranged from 34.9 to 45.9 g/capita/day, with the highest in school-aged boys. Beverages and snacks are identified as the main sources of added sugar. Salt intake varied between 5.46 and 7.43 g/capita/day, and fat intake ranged from 49.0 to 65.1 g/capita/day. Notably, street/restaurant/fast food primarily contributed to salt and fat intake. Males showed a higher salt and fat consumption than females. A significant percentage of adult females (65.5%) exhibited a waist-to-hip ratio (WHR) above 0.8, indicating an increased health risk, whilst 70.2% of adult males were also categorized at risk with WHR values surpassing the standard (≥0.95)[25].

High oil consumption among the majority of respondents poses a risk of fat accumulation, contributing to obesity. Calorie from fat can disrupt energy balance, leading to its storage in adipose tissue. This adiposity increases prompts heightened leptin hormone levels that influence energy balance regulation and potentially accelerate obesity[26]. Fried foods are a frequently consumed source of food that is high in oil absorption and contributes to increased energy intake. The stored fat in adipose tissue influences hormonal dynamics and energy balance, leading to central obesity[27].

CONCLUSIONS

Central obesity, an abdominal fat accumulation condition, is influenced by unfavorable dietary habits, such as excessive sugar, salt, and oil consumption beyond

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the recommended level. Research findings indicate an average daily sugar intake of 55.26 grams, salt intake of 8.16 grams, and oil consumption of 64.80 grams surpassed the Indonesian balanced diet recommendation (*Tumpeng Gizi Seimbang*), correlating with central obesity in the majority, 22 individuals, of Government Employees at the Regional Library and Archives Office of Bengkulu Province. Encouraging the consumption reduction of sugar, salt, and oil from sources like salted fish, canned sardines, dried shrimp (ebi), instant chili sauce, soy sauce, instant noodles, palm oil, and coconut milk are recommended. Additionally, raising awareness through informational resources like posters, leaflets, and banners about the risk of excessive consumption and promoting regular exercise at a minimum of twice a week may mitigate the risk of central obesity in these employees.

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