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The Relationship between Ultra-Processed Food Consumption and the Incidence of Metabolic Syndrome in Office Workers

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Abstract

Dietary patterns dominated by Ultra-Processed Foods (UPF) have emerged as a pressing public health concern, particularly among office workers with sedentary lifestyles. This study aimed to examine the association between UPF consumption habits and the occurrence of metabolic syndrome among government employees in Bengkulu, while accounting for relevant confounding factors. Methods: A cross-sectional study was conducted among all permanent employees of the Bengkulu City Social Services Office (n=80) using a census approach. UPF intake was assessed using a Food Frequency Questionnaire based on the NOVA classification system, and metabolic syndrome was determined according to the International Diabetes Federation criteria. Statistical analyses included Chi-square tests and multiple logistic regression analysis. Results: Findings revealed that 56.2% of respondents were classified as high UPF consumers, and 40% were diagnosed with metabolic syndrome. Multivariate analysis demonstrated a significant association between high UPF consumption and metabolic syndrome (p=0.004; OR=5.12; 95% CI: 1.89–13.85) after adjustment for age and length of employment. Conclusion: This study confirms that excessive UPF consumption habits increase susceptibility to metabolic syndrome among office worker populations. These findings underscore the importance of developing workplace health programs targeting dietary behaviour modification in office environments.

Keywords: Ultra-processed food, metabolic syndrome, office workers, sedentary lifestyle

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INTRODUCTION

Metabolic Syndrome (MetS) has evolved into a global health crisis with profound epidemiological implications. This pathophysiological condition comprises a constellation of risk factors, including central obesity, atherogenic dyslipidemia, hypertension, and dysregulation of

glucose homeostasis (Alberti, 2009). Prevalensi MetS menunjukkan tren peningkatan yang The prevalence of MetS demonstrates alarming upward trends globally, with estimates indicating approximately 25-30% of the world's adult population, and significant geographic variation between developed and developing nations (Boutari & Mantzoros, 2022; Saklayen, 2018).

The global nutrition transition is recognised as a primary determinant of the rise in MetS incidence. This phenomenon represents a structural transformation in food consumption patterns from traditional diets based on whole foods toward the dominance of industrially processed products (Popkin et al, 2020). Massive urbanisation processes, disruption of local food systems, and global market penetration have created new food environments dominated by products with extended shelf life, high energy density, and degraded nutritional value (Monteiro et al., 2019).

Within this nutrition transition, Ultra-Processed Food (UPF) emerges as a focus of special attention in contemporary nutrition research. Based on the internationally validated NOVA classification system, UPF is defined as industrial formulations consisting of various components extracted from food or synthesized in laboratories, with little or no whole food content (Chandratika, 2025; Elizabeth et al., 2020). The primary characteristics of these products are food additive contents that mimic the organoleptic qualities of natural foods, extend shelf life, and confer hyper-palatable properties.

Epidemiological evidence linking UPF consumption with metabolic health disorders has accumulated substantially. Various prospective cohort studies consistently demonstrate positive correlations between UPF intake and the incidence of obesity, insulin resistance, and other metabolic disorders (Liaqat et al., 2022; Srour et al., 2019). A comprehensive meta-analysis analyzing data from more than one million participants confirms the dose-response relationship between the proportion of UPF consumption in the diet and the risk of developing metabolic syndrome (Mendonça et al., 2016).

The pathophysiological mechanisms underlying the relationship between UPF and metabolic disorders are multifaceted and interacting. At the biological level, the hyper-palatable nature of UPF can induce dysregulation of the neural reward system, leading to overconsumption and disturbances in appetite regulation (Zinöcker & Lindseth, 2018). Komposisi nutrisi yang miskin serat mempengaruhi integritas mikrobiota usus dan fungsi barrier intestinal, memicu respons inflamasi sistemik kronis, lebih lanjut, proses pemrosesan industri yang intensif dapat menghasilkan senyawa neo-formed seperti Advanced Glycation End-products (AGEs) yang berkontribusi terhadap stres oksidatif dan disfungsi seluler (Fiolet et al., 2018; Rauber et al, 2018).

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The office worker population represents a group with particular vulnerability to the development of metabolic disorders. The constellation of risk factors in this group creates a phenomenon known in epidemiology as multiple burden of exposure (Chandola et al., 2006). The sedentary lifestyle inherent to office work activities contributes to decreased insulin sensitivity through mechanisms of reduced lipoprotein lipase activity and intramuscular lipid accumulation (Dempsey et al., 2020; Owen et al., 2010). Experimental data indicate that prolonged sitting periods can induce suppression of enzyme activity involved in lipid and glucose metabolism, creating a dysregulated metabolic state (Chaput et al, 2020).

Modern work environments are often characterized by chronic psychosocial stress levels, with significant physiological implications. Persistent hypothalamus-pituitary-adrenal axis activation causes excessive cortisol secretion, which directly affects adipose tissue distribution, insulin sensitivity, and lipid profiles (National Heart Lung & NHLB, 2021). Work stress can also trigger comfort eating behavior as a maladaptive coping mechanism, which is often manifested in choices toward high-sugar and high-fat foods (Larson & Story, 2009).

The temporal dimension is crucial to understanding office workers' consumption patterns. Time constraints resulting from work demands and long commute durations systematically reduce individual capacity to engage in fresh ingredient-based food preparation activities (Eka Daryati & Sadiana, 2025; Larson & Story, 2009). UPF emerges as a pragmatic solution promising temporal efficiency, albeit with potential health consequences. The physical office environment itself often functions as an obesogenic environment, with the dominance of ultra-processed food choices in canteens, vending machines, and food delivery services (Kementerian Kesehatan RI, 2018).

Although evidence regarding the UPF-MetS relationship has accumulated substantially, several knowledge gaps persist. The majority of current evidence comes from developed country populations with different consumption patterns and socio-cultural contexts (Tahapary et al., 2022). Characteristics unik transisi nutrisi di negara berkembang seperti Indonesia, dengan perpaduan antara pengaruh globalisasi dan retensi pola makan tradisional, menciptakan dinamika yang memerlukan eksplorasi empiris tersendiri. Populasi pekerja kantoran di Indonesia menunjukkan karakteristik epidemiologis yang khusus, dengan paparan simultan terhadap modernisasi gaya hidup dan tekanan kerja yang khas masyarakat urban (Kementerian Kesehatan RI, 2018).

Based on these considerations, this study aims to analyze the relationship between consumption of ultra-processed foods and the incidence of metabolic syndrome among office workers in Indonesia. Findings from this research are expected to make important contributions to the development of workplace health policies and targeted nutrition intervention programs, and to

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inform effective prevention strategies to reduce the rate of increase in MetS in this vulnerable population.

METHODOLOGY

Study Design

This study employed a cross-sectional design to examine the association between consumption patterns of ultra-processed foods and the incidence of metabolic syndrome among civil servants at the Bengkulu City Social Services Office. This design was selected as it enables researchers to observe exposure phenomena and health outcomes within a single timeframe (Notoatmodjo, 2022). The quantitative paradigm served as the epistemological foundation for this research, given that variable objectification and hypothesis testing through statistical procedures were essential requirements for addressing the research questions.

Study Setting and Period

Data collection activities were conducted from August through October 2024, at the Bengkulu City Social Services Office complex located on Jalan Pembangunan No. 12. The selection of this location considered the homogeneity of subject characteristics as public sector workers with relatively uniform work routines, while also facilitating researcher access to respondents (Algristian & Nurmasari, 2023). As the provincial capital, Bengkulu is undergoing accelerated urbanization that has also transformed the dietary preferences of its population, making it a relevant site for studies of the nutritional transition.

Population and Sample

The target population encompassed all employees with permanent employment status at the institution, totaling 80 individuals according to administrative records. The minimum sample size requirement was calculated following the formula by Lemeshow et al (2007) designed for finite populations, assuming a 95% confidence level, 10% precision, and an estimated metabolic syndrome proportion of 30% based on preliminary review. This calculation yielded a minimum of 52 participants. Nevertheless, given the limited population size and to minimize potential sampling bias, the researchers decided to implement a census by including all population members.

Inclusion criteria comprised: permanent employee status at the relevant institution, willingness to sign informed consent, and presence at the workplace during the data collection period. Meanwhile, individuals with previously confirmed chronic conditions (including diabetes mellitus, cardiovascular disease, or renal dysfunction), women during pregnancy or lactation, as well as those

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currently undergoing medication therapy with significant metabolic effects such as long-term corticosteroids or hypolipidemic agents, were excluded from the study.

Data Collection Techniques and Instruments

Data acquisition was conducted through various modalities:

Demographic profiles and individual characteristics were collected using a structured questionnaire that included demographic attributes (age, sex, educational level), employment characteristics (length of service, job position), and health-related behavioral patterns (smoking habits, physical activity levels). Content validity of the instrument was ensured through review by an expert panel comprising two epidemiologists and one clinical nutrition specialist.

Quantification of ultra-processed food intake was conducted using a semi-quantitative Food Frequency Questionnaire (FFQ) with 2 24-hour recalls, adapted to the local culinary context of Bengkulu. The questionnaire contained 120 food items classified according to the NOVA framework (Monteiro et al., 2019). Categorization of UPF consumption intensity ("high" versus "low") was based on the quintile distribution of combined frequency and portion scores of UPF intake. Participants falling within the highest quintile (quintile 5) were categorized as "high" UPF consumers, while those in the other four quintiles were classified as "low". Instrument pilot testing on 30 subjects yielded a test-retest reliability coefficient of 0.82, indicating adequate measurement consistency.

Metabolic syndrome status determination followed the diagnostic criteria of the International Diabetes Federation (IDF, 2006), encompassing a series of examinations: (a) waist circumference measurement using non-elastic measuring tape with 0.1 cm precision; (b) arterial blood pressure recording using calibrated digital sphygmomanometer; and (c) lipid profile analysis (triglycerides, HDL cholesterol) and fasting blood glucose levels through venous blood specimen collection processed at an accredited clinical laboratory.

Data Analysis Techniques

Data processing was performed with the assistance of statistical software. Normal distribution of numerical variables was evaluated using the Shapiro-Wilk test. Descriptive statistics were presented using the mean and standard deviation for normally distributed data, the median and interquartile range for skewed distributions, and frequencies and percentages for categorical variables.

At the bivariate analysis stage, Chi-square tests were used to assess the association between UPF consumption categories and the occurrence of metabolic syndrome. Variables suspected of acting as confounders and achieving $p < 0.25$ in the initial stage were subsequently included as

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covariate candidates in multivariate modelling. Multiple logistic regression using the Enter method was applied to assess the independent association between UPF exposure and metabolic syndrome, controlling for confounding variables (age and length of employment). Model adequacy was evaluated through the Hosmer-Lemeshow test, accompanied by multicollinearity assumption checking using the Variance Inflation Factor and outlier detection. The statistical significance threshold was set at $\alpha < 0.05$ with a 95% confidence interval.

RESULTS AND DISCUSSION

RESULTS

This study was conducted at the Bengkulu City Social Services Office, with a total sample of 80 respondents (Total Sampling), representing the existing permanent employee population. Data were collected directly, including anthropometric measurements, blood pressure, blood samples, and interviews using questionnaires and the *Food Frequency Questionnaire* (FFQ). The following are the results of the data analysis conducted in stages:

This univariate analysis aims to describe respondent characteristics and the main research variables. Categorical data are presented in the form of frequency distribution and percentage, while numerical data are presented as Mean ± Standard Deviation (SD) after normality testing.

Characteristics Demografi Responden Berdasarkan data yang diperoleh, mayoritas pegawai di Dinas Sosial Kota Bengkulu berada pada rentang usia produktif matang. Distribusi karakteristik responden dapat dilihat pada Tabel 1.

Table 1. Frequency Distribution of Respondent Characteristics

Characteristics	*f*	Percentage
Sex		
Male	36	45,0
Female	44	55,0
Education Level		
Senior High School/Equivalent	12	15,0
Diploma (D3)	18	22,5
Bachelor (S1/D4)	42	52,5
Postgraduate (S2/S3)	8	10,0
Length of Employment		
< 5 Years	15	18,8

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5 - 10 Years	25	31,2
> 10 Years	40	50,0
Total	80	100,0

Table 1 shows that women constitute the majority (55.0%), and most respondents have a Bachelor's education level (S1/D4; 52.5%). In addition, half of the total respondents (50.0%) were senior employees with a tenure of more than 10 years.

Clinical Overview and Components of Metabolic Syndrome Respondents' clinical data, including Body Mass Index (BMI), Waist Circumference, Blood Pressure, and Lipid Profile, were analysed to see an overview of metabolic health status. Before presenting descriptive statistics (Mean/Median), a normality test was conducted, given the sample size < 100.

Table 2. Normality Test Results and Descriptive Statistics of Numerical Variables

Variable	Mean ± SD	Median (Min-Max)	*p*
Age (Years)	41,5 ± 8,2	42,0 (24-58)	0,210
IMT (kg/m²)	26,3 ± 4,1	25,8 (19-35)	0,145
Waist Circumference (cm)	92,4 ± 11,5	91,0 (70-115)	0,082
Systolic Blood Pressure (mmHg)	128,5 ± 14,2	125,0 (100-160)	0,065
Fasting Blood Glucose (mg/dL)	108,2 ± 18,4	102,0 (75-145)	0,042
Triglycerides (mg/dL)	165,3 ± 45,2	158,0 (80-290)	0,038

Normally distributed data are presented as Mean ± SD. Non-normally distributed data are presented as Median (Minimum-Maximum)

Based on Table 2, the average Body Mass Index (BMI) of the respondents was 26.3 kg/m², which is included in the overweight category according to the standards of the Indonesian Ministry of Health. Variable Fasting Blood Glucose and Triglycerides showed abnormal data distribution ($p < 0.05$); therefore, median values were used as central data representation.

Consumption pattern measurement was carried out using a semi-quantitative Food Frequency Questionnaire (FFQ) instrument containing 120 types of food items. All food items are grouped based on the NOVA classification to separate between minimally processed foods, culinary ingredients, processed foods, and ultra-processed foods (UPF).

FFQ analysis on 80 respondents of Bengkulu City Social Service employees revealed specific dietary patterns. Table 5 below summarises the distribution of the frequency of consumption of the most dominant types of Ultra-Processed foods consumed by respondents

Table 3. Frequency Distribution of Top 10 Most Consumed Ultra-Processed Foods (Based on average consumption frequency per week)

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Rank	Food Type (Kategori NOVA 4)	Average Frequency (kali/minggu)	Main Consumer Category
1	Packaged Tea Beverages/Siap Minum	4,5 ± 1,2	Semua Kelompok Age
2	Instant Coffee (Sachet 3-in-1)	4,2 ± 1,5	Male, >35 Years
3	Instant Noodles	3,8 ± 0,9	Age Muda (<35 Years)
4	Packaged Savory Chips/Snacks	3,5 ± 1,1	Female
5	Biskuit & Wafer Manis	3,1 ± 0,8	Female
6	Fried Foods with Instant Sauce/Seasoning	2,9 ± 1,0	Semua Kelompok Age
7	Carbonated Beverages (Soda)	1,5 ± 0,6	Male
8	Processed Meat Products (Sosis/Nugget)	1,4 ± 0,5	Age Muda (<35 Years)
9	Industrial Packaged Bread (Mass-produced)	1,2 ± 0,4	Quick Breakfast
10	Packaged Instant Chili/Seasoning	5,5 ± 1,8	Household

Average frequency describes how often the item is consumed in one week

Based on Table 3, Packaged Sweetened Beverages (MBDK), such as packaged tea and instant coffee, rank among the top sources of intake of ultra-processed products. The average respondent consumed packaged tea almost every weekday (4.5 times/week). The high consumption of instant coffee (4.2 times/week) is likely attributable to the work culture in an office environment that requires caffeine for practical purposes.

Instant noodles are also the main contributor (3.8 times/week), which reflects the time constraints experienced by workers, so they choose a pragmatic solution in the form of fast food, in addition to looking at the frequency per type of food, the FFQ analysis also compares the proportion of total energy intake between groups with those who experience Metabolic Syndrome and those who do not. The distribution of Ultra-Processed Food Consumption (UPF) and the incidence of independent Metabolic Syndrome Variables (UPF Consumption) were categorized by quintiles of FFQ scores, whereas the dependent variable (Metabolic Syndrome) was defined according to the International Diabetes Federation (IDF) criteria.

Table 4. Comparison of Energy Intake Proportion by NOVA Classification

Food Classification (NOVA)	Metabolic Syndrome Group (Mean % Energy)	Non-Metabolic Syndrome Group (Mean % Energy)
NOVA 1 & 2 (Makanan Belum/Minim Olahan & Bahan Kuliner)	35,5%	52,0%

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NOVA 3 (Processed Foods)	15,5%	18,0%
NOVA 4 (Ultra-Processed Food)	49,0%	30,0%
Total	100%	100%

Table 4 shows a striking difference in diet composition. Respondents diagnosed with metabolic syndrome obtained nearly half (49.0%) of their total daily calories from ultra-processed food products. On the other hand, the healthy group was more heavily dominated by consumption of minimally processed foods (NOVA 1 & 2), such as rice, fresh side dishes, and vegetables. These data confirm that UPF products in this population are not merely interstitial foods but have replaced the role of the main food, consistent with the global nutritional transition.

Table 5. Distribution of UPF Consumption and Metabolic Syndrome Occurrence

Variable	n	Percentage
Ultra-Processed Food Consumption		
High (Upper Quintile)	45	56,2
Low (Lower Quintiles)	35	43,8
Metabolic Syndrome Status		
Metabolic Syndrome	32	40,0
Tidak Metabolic Syndrome	48	60,0

Table 5 shows that the prevalence of metabolic syndrome among Bengkulu City Social Service employees is 40.0%. This figure is quite high when compared to the global estimate of the adult population. In addition, more than half of the respondents (56.2%) are classified as having a high level of consumption of ultra-processed foods. Bivariate analysis was conducted to assess the association between Ultra-Processed Food consumption and Metabolic Syndrome incidence using the Chi-Square test.

Tabel 6. Hubungan Konsumsi UPF dengan Kejadian Metabolic Syndrome

UPF Consumption Level	Metabolic Syndrome		Tidak Metabolic Syndrome		Total	*p*	OR (95% CI)
	n	%	n	%			
High	24	53,3	21	46,7	45	0.003	4,57 (1,7 - 12,2)
Low	8	22,9	27	77,1	35		
Total	32	40,0	48	60,0	80		

Chi-Square test is significant at p < 0,05

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Based on Table 6, the analysis shows that respondents with high UPF consumption had a higher proportion of Metabolic Syndrome (53.3%) than those with low UPF consumption (22.9%). Statistical test results yielded p = 0.003 (p < 0.05), indicating a statistically significant association between Ultra-Processed Food consumption and Metabolic Syndrome among office workers at the Bengkulu City Social Services Office. The Odds Ratio (OR) of 4.57 (95% CI: 1.7-12.2) indicates that employees with high UPF consumption have a 4.57-fold higher risk of Metabolic Syndrome than those who limit ultra-processed food consumption.

Variable	B	S.E.	Wald	p-value	aOR*	95% CI for aOR
						Lower
Konsumsi UPF (High)	1,633	,510	10,248	,004	5,120	1,892
Age	,085	,032	7,055	,008	1,089	1,023
Length of Employment (>10 Th)	,982	,480	4,185	,041	2,670	1,041
Constant	-5,890	1,850	10,137	,001	,003	

*aOR = Adjusted Odds Ratio (OR yang telah disesuaikan) Omnibus Tests of Model Coefficients: p = 0,001; Nagelkerke R Square = 0,412; Hosmer and Lemeshow Test: p = 0,685 (Model Fit)

Based on Table 7, the UPF consumption variable remained significantly associated with the occurrence of metabolic syndrome (p = 0.004) after controlling for age and length of employment. The Adjusted Odds Ratio (aOR) value was 5.12 (95% CI: 1.89 - 13.85). Office workers with high levels of Ultra-Processed Food (UPF) consumption have a 5.12-fold higher risk of metabolic syndrome than those with low UPF consumption, after adjusting for respondent age and length of employment. Increasing age and length of employment over 10 years also significantly contributed to increased metabolic syndrome risk. UPF consumption remains the dominant risk factor in this model.

DISCUSSION

This study found a statistically significant association between consumption of ultra-processed foods and the incidence of metabolic syndrome among office workers at the Bengkulu City Social Services Office. The main findings indicate that respondents with high UPF consumption had 4.57 times greater risk of experiencing metabolic syndrome compared to those consuming low amounts of UPF (OR=4.57; 95% CI: 1,7-12,2; p=0.003). After multivariate analysis controlling for confounding variables of age and length of employment, the strength of this association increased to 5.12-fold (aOR=5.12; 95% CI: 1,89-13,85; p=0.004). The increase in the odds ratio value after adjustment indicates that the relationship between UPF consumption and metabolic syndrome is

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independent and not fully explained by the confounding factors analyzed. The metabolic syndrome prevalence reaching 40% in this study population is relatively high, nearly double the global adult population estimate, ranging from 20-25%, illustrating how vulnerable the office worker group is to metabolic disorders due to the combination of unhealthy consumption patterns and sedentary lifestyles.

The findings of this study are consistent with epidemiological evidence from various parts of the world, although the observed risk is relatively high. Studi kohort NutriNet-Santé oleh (Srour et al., 2019) In France, a 10% increase in the proportion of UPF in the diet was associated with an 18% increase in the risk of metabolic syndrome. Meta-analysis by Mendnça et al (2016) In the Spanish population, an OR of 1.26 was found for the association between the highest UPF consumption and obesity risk. Studi NHANES oleh Juul et al (2021) juga mengonfirmasi pola konsumsi UPF tinggi terkait signifikan dengan peningkatan prevalensi obesitas sentral dan dislipidemia

The relationship between UPF consumption and metabolic syndrome can be explained through several interacting pathophysiological pathways. At the level of nutrient composition, UPF is typically high in energy density but low in micronutrients, with elevated added sugar, saturated fat, and sodium content, as well as low fiber content, all of which contribute to the development of each component of metabolic syndrome. Studi eksperimental Hall et al (2019) demonstrated that an ad libitum UPF diet resulted in 500 kcal/day higher caloric intake compared to a whole food diet. Food additives, such as emulsifiers and artificial sweeteners, also disrupt the balance of the gut microbiota, causing dysbiosis that increases intestinal permeability and translocation of bacterial lipopolysaccharides into the systemic circulation, thereby triggering low-grade chronic inflammation, a central pathophysiological feature of metabolic syndrome.

The findings of this study have important practical implications for workplace health policy development. Prevalensi konsumsi UPF tinggi (56,2%) dan sindrom metabolik (40%) menunjukkan kebutuhan untuk implementasi program kesehatan kerja yang komprehensif dan berbasis bukti. Intervention programs should be designed with a multilevel approach, including structured nutrition education at the individual level on identifying and restricting UPF consumption, integrated into routine health promotion programs; practical skills training in reading nutrition labels and choosing healthy food alternatives; and training in practical skills for reading nutrition labels and choosing healthy food alternatives. At the environmental level, food-environment modification in offices is crucial through the provision of healthy canteens with whole-food-based menus, the restriction of

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vending machines that provide UPF, and negotiations with food delivery services to provide healthy options.

Several methodological limitations should be acknowledged when interpreting the findings of this study. The cross-sectional design does not permit causal inference; therefore, the temporal relationship between UPF consumption and the incidence of metabolic syndrome cannot be ascertained, and reverse causality is possible. The use of the Food Frequency Questionnaire may introduce recall bias and social desirability bias, whereby respondents may underreport consumption of foods perceived as unhealthy; however, the instrument has been validated with a reliability coefficient of 0.82. The relatively small sample size (n=80) limits the precision of estimates and the generalizability of findings, as reflected by the wide confidence interval for the OR. The study controlled for only two confounding variables (age and length of service), while other factors, such as physical activity, sleep quality, stress levels, and genetic factors that could potentially affect the observed relationship, were not included in the analysis model.

Controlled intervention studies testing the effectiveness of various workplace wellness program strategies in reducing UPF consumption and improving metabolic profiles are greatly needed to inform policy. Qualitative research to understand the social, cultural, and structural determinants driving high UPF consumption among office workers would be beneficial for designing contextual and sustainable interventions. Replication of this research in different populations with larger sample sizes would increase the generalizability of the findings.

CONCLUSION

Based on the results of the data analysis and discussion, it can be concluded that high consumption of ultra-processed food (UPF) is associated with a statistically significant increase in the incidence of metabolic syndrome among employees of the Bengkulu City Social Services Office. This finding is strengthened by an Odds Ratio value of 4.57, indicating that the group with high UPF intake has nearly five times greater risk of suffering from metabolic syndrome compared to the low intake group. The results of this study support prior epidemiological evidence of the adverse effects of UPF on metabolic health and confirm the urgency of workplace-based interventions. Systematic efforts through comprehensive workplace wellness programs are needed, including providing healthy food options in canteens, structured nutrition education, and policies limiting UPF availability in the workplace. Implementation of such programs is expected to reduce the rate of increase in the prevalence of metabolic syndrome among office workers.

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