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Nutritional Status and Lipid Profile of Office Workers: A Formative Study in Jakarta

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Abstract Nutritional and health status are important inputs to support work productivity and create a healthy, active, and productive society. Office workers are in a job that is vulnerable to health problems such as obesity, which can hamper worker productivity and directly increase the risk of non-communicable diseases (NCD's). This study aimed to analyze the relationship between nutritional status and the lipid profile of office workers in Jakarta. This research used a cross-sectional design using convenience sampling to select research subjects. The research involved workers from Jakarta aged 20–55 who have worked full time, are not yet menopausal women, are not pregnant or breastfeeding, and are not smoking. Nutritional status was evaluated using the Body Mass Index (BMI) (kg/m^2). Plasma lipid profile tests include triglyceride (TG), total cholesterol (TC), HDL-cholesterol (HDL-C), and LDL-cholesterol (LDL-C) levels. Pearson correlation was used to analyze the relationship between nutritional status and the dependent variable lipid profile (TG, TC, HDL-C, and LDL-C). A total of 55 people participated in this research as subjects. The majority of subjects were in the adult category (56.36%), and 5.45% were pre-elderly. Most subjects (61.8%) had normal nutritional status; the remaining 21.8% were overweight, and 16.4% were obese. The results of statistical analysis showed that nutritional status was significantly related to TC levels ($p<0.05$), but not to TG, HDL-C, or LDL-C, while TC was significantly related to LDL-C and TG was significantly related to HDL-C ($p<0.05$). The nutritional status was related to TC levels. The authors concluded that maintaining normal TC levels can slow the increase in TG and decrease in HDL, so that the lipid profile is well monitored and can prevent the risk of NCD's in office workers and increase work productivity.

Keywords BMI, Lipid Profile, Nutritional Status, Office Worker

1. Introduction

Nutrition status is strongly linked to health; the status of good nutrition will enhance individual health [1]. Nutrition and health status become essential inputs to support productivity at work and establish a healthy, active, and productive society [2]. Health is defined as a healthy state, both physically and mentally, as well as being free of diseases to live productively[3]. Public health disorders will reduce productivity and cause harm to countries, so it will require a transformation in the way of improving public health.

Not only does undernutrition status, but more nutrition status and obesity can also hamper productivity, which is

specific to office workers. Undernutrition can increase the risk of anemia in workers [4]. Conditions of nutrition also prevent productivity as a result of an increase in the risk of non-communicable diseases [5]. The World Health Organization (WHO) states that NDC's causes 41 million deaths each year [6]. The World Health Organization (WHO) states that there are more than 15 million 30 to 69-year- olds who die each year because of NCD's [6]. NCD's risk factors are generally classified into two groups, namely modifiable behavioral risk factors and metabolic risk factors. Behavioral factors include consumption of alcohol, tobacco, physical activity, and unhealthy diet, while metabolic risk factors include increased blood pressure, overweight, obesity, hyperglycemia (high blood glucose levels), and dyslipidemia (disruption of blood fat levels)[7].

Dyslipidemia is a condition that illustrates the abnormal levels of lipid in the human body. Dyslipidemia may be defined by the level of total cholesterol serum (TC) >240 mg/dl and/or cholesterol LDL >160 mg/dl (TG) >150 mg/dl in adults[8]. The prevalence of total cholesterol, total triglycerides, and high LDL cholesterol in Indonesia increased each by 7.6, 13.8, and 9% in 2018[9]. It is known from basic health research data that the prevalence of heart disease increased from 0.9% in 2007 to 1.5% in 2013[10]. In 2018, 1.5% of heart disease cases[9]. Especially in urban areas, NCD's cases were found to be higher than in rural areas. Jakarta, is one of the big cities in Indonesia and has the highest number of NCD's cases compared to other regions[9].

Risk factors for dyslipidemia include food intake and nutritional status. Previous research on office workers in Jakarta found that consuming fatty snacks more than once per day was closely related to body fat[5]. Increased body fat levels increase the risk of overweight and obesity[11]. Obese nutritional status with a BMI >25 kg/m^2 is a risk factor for dyslipidemia[12]. Considering the importance of nutritional status and optimal health, which are closely related to the work productivity of office workers, this study aims to analyze the relationship between nutritional status as seen from the Body Mass Index (BMI) and the incidence of dyslipidemia in office workers in Jakarta. Company management is not yet aware of the dangers that arise due to nutritional and health problems among workers. So that the results of this research are to provide support, evidence, and urgency for nutrition programs and education to be implemented in workplaces and companies.

2. Materials and Methods

2.1. Study Design, Sample and Sampling Techniques

This study used a cross-sectional design. Ethical approval has been obtained from the health research ethics commission of the Faculty of Medicine and Health, Muhammadiyah University, Jakarta (No. 143/PE/KE/FKK-UMJ/VII/2023). The research involved workers from Jakarta. Subjects are aged 20–55 years and have worked full time. This age includes the young adult to elderly categories, which are included in the productive age in Indonesia [13].

The sampling technique used was convenience sampling. This technique includes non-probability sampling [14]. This research aims to obtain an overview of the lipid profile and nutritional status of office workers. Convenience sampling is suitable to use to find out this picture. This method can collect data quickly from available subjects. The subjects in this study were available and had the same characteristics, namely office workers in residential locations [15]. Subjects who meet the criteria and are willing to participate are invited to take part in the lipid profile examination. The criteria that must be met include: men and women aged 20–55; not yet menopause for women [16], not currently pregnant or breastfeeding [18]; and not smoking [19].

2.2. Area of Study

The location of this study is in the south of Jakarta. This region was chosen through the method of purposive sampling because it is sufficiently representative of office workers. This is a tactical location. It is a metropolitan area close to Jakarta, Indonesia's capital. The choice of location was also based on previous research data, which showed that many office workers have a high percentage of body fat and visceral fat, 84.8% and 50.9% fat, respectively[5].

2.3. Data Collection Procedure and Analysis

Everyone who participated was required to complete a questionnaire about their own data, including information about their own qualities. Body weight was determined using SECA® digital scales (precision 0.1 kg), height was determined using a microtoise (accuracy of 0.01 cm), and nutritional status was evaluated using the anthropometric method/BMI (kg/m^2). Body weight and height measurements are carried out by enumerators who have training certificates in anthropometric measurements for determining nutritional status.

5 ml of the subject's blood for a complete lipid profile examination was taken via the cubital vein by medical personnel[12]. Plasma lipid profile tests include tests for triglyceride (TG), total cholesterol (TC), HDL-cholesterol (HDL-C), and LDL-cholesterol (LDL-C) levels. Plasma lipid profile tests (TC, TG, and HDL-C) used a DiaSys brand reagent kit (Diagnostic Systems GmbH), and the absorbance of the solution was read at λ 500 nm. LDL-C levels was determined using the Friedewald formula[20]. Lipid profile analysis was carried out in an accredited clinical laboratory (Labkesda Bogor City). The TC, TG, HDL-C, and LDL-C categories refer to the ATP III Guidelines. At-A-Glance Quick Desk Reference issued by the U.S. National Institutes of Health (National Heart, Lung, and Blood Institute). Department of Health and Human

Services[21].

SPPS version 24.0 (IBM Statistics) was used for statistical analysis. Descriptive analysis is used in subject characteristics (n,%). The data is presented as categorical data and means ± standard deviation for a percentage of nutritional status and lipid profile. Pearson correlation was used to analyze the relationship between nutritional status as an independent variable and the dependent variable, lipid profile (TG, TC, HDL-C, and LDL-C)

3. Results

The subject characteristics are shown in Table 1. The age range of the subjects is 20–55 years. The majority of subjects were in the adult category (56.36%). Only 3 people (5.45%) were pre-elderly subjects aged 55 years. There are far more female employees (83.64%) than male employees (16.36%). Each subject underwent measurements of body weight and height to determine nutritional status using BMI. Most subjects (61.8%) had normal nutritional status; the remaining 21.8% had overweight nutritional status, and 16.4% were obese. The educational level of the subjects was dominated by high school education (54.55%), and the remainder (45.45%) had completed education at the university level.

The distribution of subjects' nutritional status based on lipid profile can be seen in Table 2. Most subjects with TC <200 mg/dl had normal nutritional status (82.35%). Likewise with TG, 85.29% of subjects with normal nutritional status had TG levels in the normal category (<150 mg/dl). A total of 14 subjects with normal nutritional status had HDL-C levels in the optimal category. In contrast to other lipid profiles, subjects with normal nutritional status actually had LDL-C levels that were not optimal, starting from near optimal (44.12%) and borderline high (14.71%). There were subjects who were overweight and obese had normal lipid profiles, starting from TC (50% and 88.89%, respectively), TG (58.33% and 66.67%, respectively), HDL-C (66.67% and 44.44%, respectively), and LDL-C (33.33% and 55.56%, respectively). The results of statistical analysis showed that nutritional status was significantly related to TC levels ($p<0.05$), but not to TG, HDL-C, or LDL-C.

The correlation between BMI and the subject's lipid profile was further analyzed using Pearson's Product Moment Correlation Coefficient (PPMC). The results of the analysis can be seen in Table 3. It can be seen that there is a significant correlation between TC levels and LDL-C ($p<0.01$). The R-square value shows a positive value (0.785). This means that there is a positive correlation between TC and LDL-C; the higher the TC, the higher the LDL-C level. There was also a significant correlation between TG and HDL-C ($p<0.01$), with a negative R-Square value (-0.387). These results show that there is a negative correlation between TG and HDL-C, where the higher the TG, the lower the HDL-C level.

Table 1. Subject characteristic

Variable	n	%
Age		
Young adult (20-34)	21	38.18
Adult (35-54)	31	56.36
Pre-Elderly (55-74)	3	5.45
	55	100.00
Sex		
Male	9	16.36
Female	46	83.64
	55	100
Nutritional status		
Underweight (BMI < 18.5 kg/m^2)	0	0
Normal (BMI 18.5-25 kg/m^2)	34	61.8
Overweight (BMI >25 - 27 kg/m^2)	12	21.8
Obese (BMI >27 kg/m^2)	9	16.4
	55	100
Education		
High School	30	54.55
Collage	25	45.45
	55	100.00

Key: n = number of respondents, %= percentage, BMI= Body Mass Index

Table 2. Lipid profile of respondents according to nutritional status

Lipid profile		Nutritional status						Total	
		Normal		Overweight		Obese			
		n	(%)	n	(%)	n	(%)	n	(%)
TC	Desirable (<200 mg/dl)	28	82.35	6	50.00	8	88.89	42	76.36
	borderline high (200-239 mg/dl)	6	17.65	5	41.67	1	11.11	12	21.82
	High (>240 mg/dl)	0	-	1	8.33	0	-	1	1.82
	Total	34	100.00	12	100.00	9	100.00	55	100.00
	Mean ±SD	173.15 ±27.11		191.92 ±37.25		173.00 ±22.80		P=0.048*	
TG	Normal (<150 mg/dl)	29	85.29	7	58.33	6	66.67	42	76.36
	Borderline high (150-199 mg/dl)	4	11.76	3	25.00	2	22.22	9	16.36
	High (200-499 mg/dl)	1	2.94	2	16.67	1	11.11	4	7.27
	Total	34	100.00	12	100.00	9	100.00	55	100.00
	Mean ±SD	99.62 ±44.97		128.17 ±60.31		130.33 ±43.74		P=0.127ns	
HDL-C	Low (< 40 mg/dl)	12	35.29	1	8.33	3	33.33	16	29.09
	Optimal (40-60 mg/dl)	14	41.18	8	66.67	4	44.44	26	47.27
	High (> 60 mg/dl)	8	23.53	3	25.00	2	22.22	13	23.64
	Total	34	100.00	12	100.00	9	100.00	55	100.00
	Mean ±SD	49.03 ±13.18		49.83 ±11.33		46.67 ±12.17		P=0.811ns	
LDL-C	Optimal (< 100 mg/dl)	14	41.18	4	33.33	5	55.56	23	41.82
	Near optimal (100-129 mg/dl)	15	44.12	3	25.00	3	33.33	21	38.18
	Bordeline high (130-159 mg/dl)	5	14.71	4	33.33	1	11.11	10	18.18
	High (160-189 mg/dl)	0	-	1	8.33	0	-	1	1.82
	Total	34	100.00	12	100.00	9	100.00	55	100.00
	Mean ±SD	104.24 ±23.89		116.33 ±32.59		100.33 ±20.75		P=0.556ns	

Key: TC= Total Cholesterol, TG= triglyceride, HDL-C= High-density Lipoprotein, LDL-C= Low-density Lipoprotein, BMI= Body Mass Index, *Correlation is significant at the 0.05 level (2-tailed)- Chi Square, ns: not significant

Table 3. Correlation of BMI and lipid profile of the respondents

	TC	TG	HDL	LDL	BMI
TC	1	0.28	0.161	.785**	0.076
	.	0.06	0.284	0	0.617
		46	46	46	46
TG		1	-.387**	0.128	0.242
		.	0.008	0.397	0.105
			46	46	46
HDL-C			1	0.099	-0.088
			.	0.512	0.563
				46	46
LDL-C				1	-0.043
				.	0.778
					46
BMI					1
					.

Key: TC= Total Cholesterol, TG= triglyceride, HDL-C= High-density Lipoprotein, LDL-C= Low-density Lipoprotein, BMI= Body Mass Index
**Correlation is significant at the 0.01 level (2-tailed)- Pearson's Product Moment Correlation Coefficient (PPMC)

4. Discussion

Age 20–54 is the productive age of workers in Indonesia. Population census data states that the percentage of productive age has now reached 69% [22]. The nutritional and health status of office workers greatly influences work productivity [23]. If a high workload is not balanced with optimal health, it will result in the emergence of various diseases and health problems in workers. There were workers who were overweight or obese, even though the majority of subjects had normal nutritional status. Overweight and obesity in office workers are conditions that increase the risk of dyslipidemia and cause cardiovascular disease [24]. Office workers have a higher risk of overweight and obesity due to the sedentary activities carried out in their work [25]. Elevated TG is associated with abdominal obesity [26]. Obese subjects in this study were not included in the abdominal obesity category, so it is suspected that this caused the TG of obese subjects to be mostly normal. In contrast to TG, obese subjects have high TC. Similar to the results of this study, previous research shows that there is a significant relationship between obesity and increased TC [27]. TC is the total amount of cholesterol found in the blood, consisting of LDL cholesterol, HDL cholesterol, and 20% triglycerides.

Education and physical activity intervention programs in the workplace for office workers are effective in increasing worker wellness [28, 29]. Workplace nutrition education and intervention programs have been widely implemented in workplaces using training implemented in various workplaces [30]. Not only physical activity, but changes in diet also play an important role, such as increasing fruit and vegetable consumption. This nutritional intervention program has been proven to have a positive impact on changes in body weight, blood glucose, insulin, and lipid profile [31]. Changes in consumption patterns can return nutritional status to normal and reduce the prevalence of worker obesity [32]. Fiber intake in food also has an impact on increasing plasma HDL-C in male workers. Dietary fiber can be effective in preventing cardiovascular disease [33]. Fiber intake can maintain a normal BMI, prevent obesity, and prevent the appearance of lipid profile abnormalities in adults [34].

The worker's lifestyle is identic with sedentary activities [35]. Working time is spent mostly in a sitting position [34]. One of the diseases associated with this condition is dyslipidemia. A lot of sitting activity is related to lipid profile abnormalities [36]. Previous research has proven that the prevalence of obesity is higher among office workers than other workers [37]. Obesity is a risk factor for disorders of lipid metabolism[38]. There is a positive correlation between BMI and increased levels of TC, TG, and LDL-C, and an inverse relationship with HDL-C levels[38]. The results of this study show that there is a relationship between nutritional status and TC levels, but not with TG, HDL-C, and LDL-C. The results of this study are in line with research by Pisharody and Prasad (2018), which found no relationship between BMI and LDL-C [39]. This is associated with gender. An increase in BMI is directly associated with an increase in LDL. For this reason, further research is needed to assess the consistency of the relationship between BMI and LDL-C [40]. LDL-C may not change or decrease despite a decrease in BMI from the overweight and obesity categories [41]. LDL-C in overweight and obese subjects was also normal compared to subjects with normal BMI (38). Male subjects have a higher prevalence of HDL and TG [42]. Male subjects have a higher prevalence of HDL and TG [43]. This study did not compare male and female subjects because the majority of subjects were female (83.64%) as shown in Table 1.

Nutritional status is a predictor of metabolic disorders, which are characterized by an imbalance in the plasma lipid profile[44]. Lipids in the body circulate as lipoproteins consisting of unesterified cholesterol, triglycerides, phospholipids, and proteins. Lipoproteins in the blood include LDL and HDL. High triglycerides (TG), followed by low HDL cholesterol (HDL-C), is one of the characteristics of metabolic markers in the body. Variations in the ratio of TC and HDL-C are predictive of the risk of metabolic diseases such as dyslipidemia[45]. Previous research also shows that there is a relationship between total cholesterol and increased LDL. This concludes that high total cholesterol will be associated with high levels of LDL in the blood. TG is a compound that cannot dissolve in the water phase, so it is transported through the blood to various tissues in the body via lipoproteins. Serum TG levels vary due to several factors, such as the composition of fat in food, genetic factors, metabolic aspects, and hormonal interactions in various organs, including the liver, pancreas, intestines, and visceral fat tissue[46]. Hypertriglyceridemia often causes a decrease in HDL levels. Triglycerides can also influence the development of atherosclerosis through various mechanisms, including excessive release of free fatty acids, production of proinflammatory cytokines, fibrinogen, and blood clotting factors, as well as interference in the process of fibrinolysis [47].

The weakness of this study is the unequal number of male and female subjects. This is because the number of male employees who meet the subject criteria is limited, one of which is related to smoking habits. Male employees who smoke were not included as subjects in this study. Smoking can increase free radicals in the body and is a risk factor for lipid profile abnormalities [48]. Both the long-term and short-term effects of smoking can affect lipid metabolism [49]. Smoking has been shown to increase TC, TG, and LDL-C levels and reduce HDL-C levels [50]. In this study, the physical activity and consumption of subjects were not recorded, so it cannot be known what causal factors might cause abnormal lipid profiles or nutritional status. Recording physical activity and consumption can enrich data and provide justification for discussions.

5. Conclusion

There was a relationship between nutritional status and TC levels, but not for TG, HDL-C, or LDL-C. It is also known that there is a positive relationship between TC and TG levels, while there is a negative relationship between TG levels and HDL-C. Through the results of this research, efforts need to continue to be made to maintain the nutritional status of office workers to remain normal. Education on nutrition and physical activity, as well as regular health checks for office workers, can be carried out to maintain health and increase productivity of office workers.

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