



NUTRITIONAL KNOWLEDGE, DIETARY ASSESSMENT, PHYSICAL ACTIVITY, BODY FAT PERCENTAGE, AND NUTRITIONAL STATUS OF POLICE OFFICERS

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Abstract

Background: Overweight on the police can decrease work productivity and become a risk factor for non-communicable diseases. This study aims to determine the relationship of nutrition, energy intake, physical activity, and body fat percentage to nutritional status and risk factors that affect it.

Methods: A cross-sectional research design with a sample of 104 respondents was applied in this research. The data was analysed through bivariate analysis using Pearson correlation and Rank Spearman and multivariable analysis using multiple linear regression.

Results: The results revealed that there was a correlation between nutritional knowledge, the intake of energy, carbohydrates, fats and proteins, physical activity, as well as percentage of body fat and nutritional status ($p < 0.05$) with the most influential variable is energy intake.

Conclusion: The researchers suggest to provide counseling about balanced nutrition in order to create motivation and self awareness to achieve normal nutritional status.

BACKGROUND

Police have responsibility to protect security, public order, law enforcement, and provide protection, security, and service to the community. A police officer has to be in good health both physically and spiritually in order to carry out his responsibilities properly.

Data from WHO (2009) showed that 2.8 million adults experience deaths due to overnutrition. In Indonesia, the number of excess body weight has been increasing. In adult males, there was an increase from 13.9% and 7.8% in year 2007 and 2010 respectively to 19.7% in 2013. Meanwhile, the overnutrition prevalence of adult females in 2013 was 32.9% increasing from 13.9% and 15.5% in 2007 and 2010, respectively (Ministry of Health of RI., 2013). Sari, Kencana & Amaliah, (2014) suggested that the prevalence of overnutrition in Indonesian adults who work as civil servants/ employees/ National Military/ National Police had been increasing from 25.39% in 2007 to 33.38% in 2010. In addition, the adults who work as civil servants/ employees/ National Military/ National Police and live in the city were the most vulnerable group to suffer from overnutrition. Overnutrition status in the city of Jakarta in 2013 was included as the second highest prevalence and belonged to the sixteen provinces with higher overnutrition prevalence than the nation's (Ministry of Health of RI., 2013).

Overnutrition is the risk factor for non-communicable diseases, such as hypertension, heart disease, and diabetes mellitus (Kruger, Venter and Vorster, 2001). The problem of overnutrition in adults is a concern. Therefore, it is necessary to raise awareness of sustainable monitoring of nutritional status by each person.

The monitoring of nutritional status can be maintained through the measurement of the body weight divided by the square of the height (BMI). Other than calculating the BMI, nutritional status can also be measured through body fat percentage

(Gallagher *et al.*, 2000). Body fat percentage has impacts on the weight and shape of the body as well as affecting a person's health (Arroyo *et al.*, 2004). The monitoring act will usually be carried out as a result of knowledge possessed by a person, especially the knowledge related to nutrition.

A person's knowledge related to nutrition is also associated with overnutrition occurrence. A research by Gomez, G., Martinez, J., Levy, S., Guerra, G., Curiel, A., & Aquilar, (2011) showed that there was a correlation between nutritional knowledge and overnutrition.

Gropper, S. S., & Smith, (2013) argued that overnutrition occurs due to the discrepancy between energy intake and expenditure. In addition, the energy intake has a significant relationship with nutritional status. The better energy intake the better nutritional status it is going to be and vice versa (Ramsey, Hostetler and Andrews, 2013). The carbohydrate intake as the main source of energy has a correlation with overnutrition occurrence (Jitnarin *et al.*, 2010). A research by Kustiyah, Widhianti and Dewi, (2014) suggested that there was a significant correlation between fat intake and overnutrition status. Furthermore, protein intake also affects the overnutrition status as stated by Jitnarin *et al.*, (2010) in their research. The inequality in intake and insufficient physical activity can affect nutritional status. Meanwhile, physical activity has significant correlation with nutritional status (Pate *et al.*, 2015).

METHODS

A cross-sectional design was applied in this research. It was carried out in January until April 2017. This research took place at West Jakarta Metropolitan Resort Police. Around 684 police officers were involved as the population of the research. The sample number was further defined by the Fisher transformation formula.

A simple random sampling was adopted in this research. The total sample of this research was

150 police officers but only 104 of them participated when it was conducted since the rest of them did not meet the inclusion and exclusion criteria such as reluctant to be respondent or unable to take part in the research until the end.

The data were collected by the researchers and 6 students of nutritional science study program who acted as enumerators in this research. The characteristic data were obtained through questionnaires filled by the respondents. The intake data like energy and macro nutrition were collected through recalling method using food recall forms within 2x24 hours (1 working day dan 1 day off). The food recalls were complemented by food photographs. The physical activity data were obtained through 2x24 hours physical activity questionnaire. The questionnaire was completed by the respondents' activities that were performed during one working day and one day off accompanied by the duration written in minutes. The anthropometric data like body weight and

height as well as body fat percentage were measured by BIA tool by OMRON HBF 375 with 0.1% accuracy. Then the height was measured using microtoise.

All the data obtained were input into SPSS 23 software to be analysed. Beforehand, the intake data acquired were processed using Nutrisurvey 2007 software. The data of physical activity were interpreted to get the Physical Activity Ratio (PAR) which then were calculated using the formula.

RESULTS AND DISCUSSION

The age of the respondents involved in this research ranged from 20 until 58 years, with the average age of 104 police officers at West Jakarta Metropolitan Resort was 37.55 ± 10.44 years. The majority gender of the police was male with 90 people (86.5%) whereas female police officers were only 14 people (13.5%).

Table 1. Univariate and Bivariate Analysis Results

Variable	Mean	SD	Min-Max	95% CI	p-value	Correlation (r)
Nutritional Knowledge	60.26	15.53	15.38-92.30	57.24-63.28	0.036	-0.206
Energy Intake	2708.25	308.85	1958.20-3437.10	2648.18-2768.31	0.0001	0.774
Carbohydrate Intake	283.25	7.52	128.60-530	277.26-307.12	0.001	0.315
Fat Intake	130.87	33.13	60.40-240	124.42-137.31	0.001	0.335
Protein Intake	102.76	21.27	54.90-194.60	98.62-106.89	0.001	0.309
Physical Activity	1.55	0.11	1.40-1.80	1.53-1.58	0.0001	-0.656
Body Fat Percentage	27.13	3.90	19-37.80	26.37-27.89	0.0001	0.646
Nutritional Status	25.85	3.97	17.30-38.65	25.08-26.63		

The table presents the average count of nutritional knowledge, the intake of energy and macronutrients, physical activity, and body fat percentage as well as nutritional status.

The bivariate analysis result on table shows that there is a correlation between nutritional knowledge (p-value 0.036), the intake of energy (p-value 0.0001), carbohydrates (p-value 0.001), fats (p-value 0.001), proteins (p-value 0.001), physical activity (p-value 0.0001), body fat percentage (p-value 0.0001) and the nutritional status of police officers.

The Nutritional Status of Police Officers

On average, the nutritional status of 104 police officers is around 25.85 kg/m². Their nutritional status is then categorized as mildly overweight (overnutrition).

The average results above prove that there is a problem with the police regarding over nutrition. If the nutritional status is categorized based on age, the majority of overnutrition status belongs to 38 police officers (67.9%) with age ranged from 20 – 49 years. If the nutritional status is categorized based on gender, 51 male officers (49.04%) and 5 female officers (4.8%) are included as overnutrition. This overnutrition status is affected by excessive energy intake from overconsumption of fats and proteins, insufficient physical activity, as well as high body fat percentage.

The result of this research conforms to Santana *et al.*, (2012) research that indicated that the mainstream nutritional status of Brazilian police is overnutrition. Meanwhile, the result of research carried out by Hoque, M., & Babu, (2016) on Bangladesh police showed that 27% of them have overnutrition status with the average BMI 27.75±4.28 kg/m². According to both researches, it is evident that there is a problem of nutritional status on police. The occurrence of overnutrition status among police is mostly occurred due to their tendency of consuming high energy foods with insufficient physical activity. Austin, Ogden and

Hill, (2011) stated that when energy intake exceeds energy expenditure, there will be an increase in body mass index, of which 60 to 80 percent consists of body fats.

The Correlation between Nutritional Knowledge and Nutritional Status

The mean score of nutritional knowledge of 104 police officers at West Jakarta Metropolitan Resort is 60.26±15.53. If the score is classified, their nutritional knowledge is in moderate category.

The nutritional knowledge will affect nutritional status of the police. According to the statistical measure, there is a significant relationship between nutritional knowledge and status of police at West Jakarta Metropolitan Resort with p-value 0.036 (p<0.05). The correlation coefficient between nutritional knowledge and status is -0.206, which means that the nutritional knowledge variable has weak, negative correlation so that the higher the nutritional knowledge the greater nutritional status the police will have (normal nutritional status).

In this research, the nutritional knowledge of the police is within moderate category while the mean of their status is overnutrition. This circumstance might happen due to the nutritional knowledge that the police have is not implemented in their daily life. The knowledge on nutrition will have no significant effect on nutritional status if it is not accompanied by strong perseverance to implement the knowledge. Increased knowledge is very effective and important to improve nutrition status (Handayani, Oktia, Woro *et al.*, 2018). This research is consistent with a research performed by Laz *et al.*, (2015) who revealed that there is a significant correlation between the degree of nutritional knowledge and nutritional status (p-value 0.001).

The Correlation between Energy Intake and Nutritional Status

Overall, mean energy intake in this research is 2708.25 ± 308.85 Kcal. In contrast to Recommended Dietary Allowance (RDA) in 2013 based on age and gender, the mean energy intake in this research is higher. The recommended dietary allowance of male police with average age 38 years is 2625 Kcal while female police on average age 36 years is 2150 Kcal.

According to food recalls, it was reported that the reason for excessive energy intake comes from overconsuming fats. In this research, the average fat intake of the police is approximately 130.87 gram. Fats provide more energy than other sources of energy such as carbohydrates and proteins. Consequently, the average fat intake above can provide energy for around 1177.83 Kcal (43%) resulting in an excess of energy intake.

Excessive energy intake can be a cause for overnutrition status on police. It is evident from the result of statistical assessment using Pearson that reveals that there is a significant correlation between energy intake and nutritional status of police officers at West Jakarta Metropolitan Resort with p-value of 0.0001 ($p < 0.05$). Further, the correlation coefficient between energy intake and nutritional status is reported 0.774, meaning that the energy intake variable has strong, positive relationship with nutritional status. Accordingly, the greater intake of energy the higher nutritional status the police will have. In other words, the average energy intake of them is reported 2708.25 Kcal resulting overnutrition (25.85 kg/m^2) on police officers at West Jakarta Metropolitan Resort.

The police officers with all their overwhelming responsibilities and jobs require sufficient energy. Therefore, energy intake must be balanced with energy expenditure. However, the intake of energy that exceeds its expenditure will be stored in adipose tissue in the form of fats (Almatsier, 2009). According to Hall *et al.*, (2012), adults who have overnutrition status would likely have 4 times more deposits in their adipose tissue

that contain 2 times more fats. Therefore, excessive energy intake can effect nutritional status. The result of this research is consistent with a research by Austin, Ogden and Hill, (2011) that there is a significant correlation between energy intake and nutritional status ($p < 0.01$).

The Correlation between Carbohydrate Intake and Nutritional Status

The result of analysis shows that the median score of carbohydrate intake variable from 104 police officers at West Jakarta Metropolitan Resort is reported 283.25 gr. The amount of carbohydrate intake revealed in this research is lower than RDA (2013). The carbohydrate intake of male police with average age 38 years is 394 grams and for female police with average age 36 years is 323 grams. This can be caused by the source of carbohydrates that is often consumed by the police at West Jakarta Metropolitan Resort based on 2 days of non-consecutive food recalls comes from white rice and sugar. Indonesian Food Composition Table (TKPI) year 2011 explained that 100 grams of white rice only contain 39.8 grams of carbohydrates and sugar sugar has 94 grams of carbohydrates per 100 grams. Sugar is usually added into drinks like coffee and tea. It was added into the drinks only 2 tablespoons at most so that it only provides approximately 18.8 grams of carbohydrates.

Further, the statistical assessment using Spearman Rank shows that there is a significant correlation between carbohydrate intake and nutritional status of the police officers at West Jakarta Metropolitan Resort with P-value 0.0001 ($P < 0.05$) has been reported. The correlation coefficient between carbohydrate intake and nutritional status is 0.315 which means that the two variables have moderate, positive correlation hence the higher intake of carbohydrates of the police the higher nutritional status (overnutrition) they will have.

Overnutrition status would happen when big amount of carbohydrate intake is stored in the body. The intake of carbohydrate in the body will be converted into simpler form such as glucose. If glucose stored in the body exceeds the need, the remaining glucose will not be broken down but stored in the liver and muscles in form of glycogen as short-term backup energy source. If glycogen storage capacity is limited, the excess glucose then will be stored as fats for long-term backup energy (Gropper, S. S., & Smith, 2013). This matter becomes a cause for overnutrition if it happens perpetually and lasts for a long time. Besides, carbohydrate intake as the primary source of energy needs to be balanced with energy expenditure. The more unused intake of carbohydrate the more fats will be stored in the body. Therefore, this circumstance shows that there is a relationship between carbohydrate and nutritional status. The significant correlation between carbohydrate intake and nutritional status is $p=0.01$ ($p<0.05$) as reported by Merchant *et al.*, (2010) through his research on adults in Canada.

The Correlation between Fat Intake and Nutritional Status

The correlational measure using Pearsons reveals that the average score of fat intake from 104 police officers at West Jakarta Metropolitan Resort is 130.87 ± 33.13 grams. The average intake of fats found in this research is higher than RDA (2013). The fat intake based on RDA in 2013 for male adults with average age 38 years is 73 grams while woman adults with average age 36 years is 60 grams.

According to 2x24 hours food recalls, the average score of excess fat intake above is caused by the consumption of high-fat foods like fried foods, coconut-milk based foods, and egg yolks. These results are the cause of the high average fat intake. Based on Indonesian Food Composition Table (2011), 100 grams of oil provide 98 grams of fats, coconut milk provides 24 grams of fats, and

one egg yolk provides 32 grams of fats (Mahmud, M. K., Hermana, Zulfianto, N. A., Apriyanto, R. R., Ngadiarti, I., Hartati, B., 2011).

Furthermore, this research reveals that there is a significant relationship between fat intake and nutritional status of police officers at West Jakarta Metropolitan Resort with p -value 0.001 ($p<0.05$). The correlation coefficient between fat intake and nutritional status is 0.335 which means that the fat intake variable has moderate, positive relationship so that high fat intake (130.87 grams) affects the police to have BMI 25.85 kg/m^2 and be categorized as overnutrition status.

Thus the significant correlation between fat intake and nutritional status is obtained from fat intake as nutrition that serves as primary source of energy compared to carbohydrates and proteins. Then the energy derived from fats will be used if carbohydrates as the body main source of energy is limited. On the other hand, if fats are unused, they will be stored as alternative energy. When this happens continuously, it will become fat deposits in the body that affect nutritional status. The result of this research is supported by Ledikwe *et al.*, (2003) who state in his research that there is a correlation between fat intake and nutritional status ($p<0.05$).

The Correlation between Protein Intake and Nutritional Status

The result of analysis reveals that the average protein intake variable of 104 police officers at West Jakarta Metropolitan Resort is 102.76 ± 21.27 grams. The score suggests that the protein intake is higher than RDA (2013) around 158% for male police with average age 38 years and 180% for female police with average age 36 years. Based on 24 hours food recalls during non-consecutive 2 days, the police protein intake comes from both animal and vegetable proteins. protein hewani dan nabati. The most consumed food sources of animal protein by the police are chicken and eggs while of vegetable proteins are *tempe* and tofu. The excess

average protein intake is caused by the eating habits of the respondents who consume one food source of animal protein and two or more food sources of vegetable protein in one meal.

According to correlational assessment, there is a significant relationship between protein intake and nutritional status of police at West Jakarta Metropolitan Resort with p-value 0.001 ($p < 0.05$). The correlation coefficient between protein intake and nutritional status is 0.309 which means that the variable of protein intake has moderate, positive relationship so that the average protein intake of the police reported as 102.76 grams is included as overnutrition status.

Proteins will provide energy when carbohydrates (glucose) and fats (fatty acid) in the body is insufficient. Then the excess proteins will be processed through deamination. Nitrogen will be removed from the body and the remaining carbon bonds will be converted into fat and restored in the body. In addition, food sources of proteins generally contain fats (Almatsier, 2009). Therefore, excessive protein intake can affect nutritional status. The result of this research conforms to a research by Bujnowski *et al.*, (2011) who states that protein consumption has significant correlation with obesity with $p < 0.01$.

The Correlation between Physical Activity and Nutritional Status

The result of analysis reveals that the average score of physical activity variable from 104 police at West Jakarta Metropolitan Resort is 1.55 ± 0.11 . If the data were classified, the average physical activity of the police officers in this research is considered sedentary. This is due to the fact that the police who participated in this research were mostly followed by the staff police rather than those working in the field.

According to physical activity recalls, a kind of physical activity performed by the staff police in the office is working in front of a computer. Meanwhile, the police who work in the field have

more activities. The regular physical activities performed by the police are morning assembly or ceremony and joint gymnastics on each Friday. On their way home from work or vice versa almost all police officers use their private transportation such as cars or motor cycles. Based on the interview, it is revealed their physical activity during work days is more active in comparison with their day off. On their break, the police use their time to leisure after several days of working.

It is reported in this research that there is a significant relationship between physical activity and nutritional status of the police at West Jakarta Metropolitan Resort with p-value 0.0001 ($p < 0.05$). The correlation coefficient between physical activity and nutritional status is -0.656 which means that the variable of physical activity has strong, negative correlation so that sedentary physical activity (on average 1.55) cause overnutrition on police (BMI 25.85 kg/m²). On the other hand, the more active physical activity the better nutritional status the police will have (normal nutritional status).

Overnutrition occurs due to imbalance energy. The intake of energy is higher than its expenditure. The energy expenditure will be optimal when balanced with physical activity. Physical activity can increase energy expenditure and help an individual to maintain energy balance or lose weight. Austin, Ogden and Hill, (2011) state that ideal body weight can be maintained by performing vigorously active physical activities accompanied by high energy intake. When the physical activity is at sedentary level, it is necessary to control energy intake for the sake of maintaining ideal body weight. This kind of situation suggests a correlation between physical activity and nutritional status. A research by Rashid *et al.*, (2011) on Malaysian military suggest similar result that physical activity ($p < 0.05$) is associated with nutritional status.

The Correlation between Body Fat Percentage and Nutritional Status.

The result of analysis reveals that the average score of body fat percentage variable from 104 police at West Jakarta Metropolitan Resort is 27.13 ± 3.90 . If the data are classified based on gender, the average body fat percentage of male police and female police were 26.42% and 31.71%, respectively. Then the aforementioned result is interpreted and categorized as obese body fat percentage.

Based on a statistical measure, there is a significant relationship between body fat percentage and nutritional status of police officers at West Jakarta Metropolitan Resort with p-value 0.0001 ($p < 0.05$). The correlation coefficient between body fat percentage and nutritional status was 0.646. This measurement was highly positively correlated with body fat percentage so that the higher body fat percentage the higher nutritional status one can have. In other words, the average body fat percentage obtained from this research was considered high (27.13%) resulting in overnutrition status of the police (BMI 25.85 kg/m^2).

The relationship between body fat percentage and nutritional status is caused by the body components that consist of adipose and fat-free tissues. Adipose is an inactive tissue that functions as energy reserves consisting of fats in the form of triglycerides that is stored under the skin, stomach, and some stored in the liver, muscles, and kidneys (Hall *et al.*, 2012).

Body fat percentage is also associated with diet intake. The energy intake in this research exceeded recommended dietary allowances. The excess energy intake accompanied by insufficient physical activity will be stored as energy reserves in the form of fat. In this research, the physical activity of the police was observed as sedentary. Therefore, it is expected that the police had high body fat percentage. Akindele, Phillips and

Igumbor, (2016) in their research stated similar result that there was a significant correlation between body fat percentage and nutritional status ($p < 0.01$).

CONCLUSION

In conclusion, the average nutritional status of police at West Jakarta Metropolitan Resort in 2017 was $25.85 \pm 3.97 \text{ kg/m}^2$. This measurement was categorized as overnutrition. Overall, there was a significant correlation among nutritional status, the intake of energy, carbohydrates, fats, and protein, physical activities and nutritional status. It is necessary to improve knowledge on balanced nutrition so that the police are expected to reduce their high intake of energy obtained from fats, and proteins. More importantly, it is suggested that the police should improve their physical activities such as doing sports at least 3 times a week

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