Original Research Article

The Differences in HDL Levels in Workers at Kupang El-Tari Airport Based on BMI Normal and Obese

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Abstract: *Background*: Body Mass index (BMI) is one of the measurements to determine a person's nutritional status. Nutritional status is often influenced by diet, physical activity, and health status. IMT results can affect High Density Lipoprotein (HDL) levels in the body which if excessive or obese will cause dyslipidemia events characterized by decreased HDL levels. *Objective*: Knowing the difference in HDL levels in El-Tari Kupang Airport Workers Based on Normal BMI and Obesity. *Methods*: Observational analytic study using Cross Sectional design conducted on ElTari Kupang Airport workers. BMI was obtained from height and weight measurements, HDL levels were obtained through blood collection tested using Biochemistry Analyzer (BA-200) at the Laboratory of RSUD S.K Lerik Kupang, and protein frequency was obtained through Food Frequency Questionnaire (FFQ) conducted on 88 research samples that have met the inclusion criteria. Sampling using purposive sampling technique. The results of univariate and bivariate data analysis using the Mann-Whitney test. *Results*: The prevalence of normal BMI and obesity is 50% of people in each BMI category. HDL levels were highest in the borderline group (68.18%) then the normal group (20.46%) and the low group (11.36%). The frequency of animal and vegetable protein consumption was found to be below average. The results of bivariate analysis using Mann-Whitney showed a *p* value = 0.001 ($p < 0.05$). *Conclusion*: There is a significant difference between High Density Lipoprotein (HDL) levels in workers at El-tari Airport Kupang based on normal and obese Body Mass Index (BMI).
Keywords: High Density Lipoprotein (HDL), Body Mass Index (BMI), Normal BMI, Obesity, Food Frequency Questionnaire (FFQ), Animal and Vegetable Protein.

INTRODUCTION

Regular lifestyle changes and physical activity can contribute to body weight control [1]. Body weight is important in determining a person's nutritional status and the parameter that often used to classify nutritional status is the Body Mass Index (BMI) [2]. Body Mass Index is one of the indices for measuring nutritional status in adolescents and adults [3]. BMI results are obtained from body weight in kilograms divided by height squared in meters so that the results are obtained in units (kg / m2) [4]. Body Mass Index is grouped into several categories based on the results and has a BMI matrix that can represent a person's obesity index which until now has been widely used as a risk factor for the prevalence of several existing health problems [1].

Overweight and obese results of excess fat, which is affects one's health. The relationship can be inversely proportional, that the intake of fatty acids can also lead to overweight and obesity. Based on the chemical structure, fatty acids divided into Saturated Fatty Acid (SAFA), Mono Unsaturated Fatty Acid (MUFA), and Poly Unsaturated Fatty Acid (PUFA) [5]. Based on WHO data in 2016 there were more than 1.9 billion people who were overweight with a total of 650 million adults were obesity [6]. The prevalence has increased until 2022, where there are more than one

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billion people who are obese and 650 million of them is adults [7].

Based on Riskesdas, 2018 in Indonesia, the prevalence of overweight at the age of >18 years according to the province was 13.6% and obesity was 21.8% from the total weighed of 624,563 people. The prevalence in the adult population (aged >18 years) according to the employment characteristics of private employees the overweight population was 14.3% and obesity was 21.8% from the total weighed 70,756 people. Data obtained from East Nusa Tenggara (NTT) is overweight was 8.76% and obesity was 10.29% of the total weighed was 10,842 residents [8]. The prevalence in the adult population (aged >18 years) based on the employment characteristics of private employees was 10.75% and overweight was 16.36% in obesity from a total weighted of 1,281 people [9].

Kupang City ranks fourth for overweight with the prevalence of 11.69% and ranks first for obesity with the prevalence of 20.09% from the total weighted population of 2,143 [9]. People with overweight and obesity tend not to pay attention of food intake in their bodies, one of that is foods that contain cholesterol which can trigger cholesterol level's changes in the body including High Density Lipoprotein (HDL).

High Density Lipoprotein is a type of good cholesterol that keeps cholesterol from settling in arteries and protects blood vessels during the process of atherosclerosis (plaque in blood vessels) [10]. According to Riskesdas 2018, the prevalence of low HDL cholesterol reached 24.3% of the total 34,820 population [8]. This issue is important because the prevalence of obesity is expected to increase in the next few years.[7] Obesity or an excessive increase in BMI is a risk factor for the onset of many diseases and one of them is dyslipidemia, especially characterized by a decrease in HDL cholesterol and a sign of inflammation in the heart [11, 12].

Based on Sitepu's research in 2017, it showed that there is a correlation between BMI and HDL cholesterol levels in a person which can be seen from the higher the BMI, that makes lower the cholesterol lipid levels in the blood [13]. This is inversely proportional from research by Putri HP and Ciptono F in April 2022 which showed no correlation between the two variables above [1]. Another study by Gani Hanif, *et al.,* (2013) related to the difference between the two variables in the female population and found that there was no difference between the two [14].

Based on the existing problems and differences in the results of the two studies above, the researchers wanted to conduct research related to the difference between HDL cholesterol levels based on BMI in workers at El-Tari Kupang Airport. This research was also based on seeing the density of work that occurs at any time resulting in poor sleep patterns, lack of sleep, poor diet and because of the lack of awareness of workers in conducting health tests.

RESEARCH METHODS

The research is an analytical observational with a cross sectional approach. Data collection was carried out from September 1 to September 23, 2023, starting with data collection through screening to find out the characteristics of respondents and requesting informed consent as research respondents. The research location was El-Tari Kupang Airport, Kupang City.

The total population of active El-Tari Kupang Airport workers is 100 people. Sampling using purposive sampling and calculation of the sample size that must be taken to be able to describe the relationship between the independent variable and the dependent variable using the Lemeshow formula the population is known and obtained as many as 88 people. These results were adjusted according to those who include the inclusion and exclusion criteria and it was 88 people. The respondents were divided into two different groups based on BMI category, each respondent consisting of 44 respondents with normal BMI and 44 respondents with BMI above normal (obesity).

Data collection in this study used an interview method that contained inclusion and exclusion criteria. The inclusion criteria in this study were El-Tari Kupang Airport workers who were adults (18-59 years old), willing to participate in the study by signing informed consent, include in the criteria of the pre-study questionnaire, able to stand upright, willing to fast 12 hours before blood collection (No eating and drinking except water), not consuming excessive protein such as milk protein, chicken breast, and high protein foods, not currently taking anti-cholesterol drugs, not suffering from metabolic disease and not having a history of metabolic disease, not pregnant, not doing excessive physical activity or excessive work during the last 24 hours and adequate rest, and blood specimens are not lysed, icteric.

The exclusion criteria in this study was respondents who could not have their blood drawn.

In this study, the research instruments used were digital scales (Omron HN289) and microtoise (GEA) used to measure the body weight and height of the sample. The results of measuring body weight and height were then adjusted to get the Body Mass Index (BMI). Researchers devided BMI groups into two groups, it were normal and obese.

To determine the pattern of intake of respondents, the instrument used is the Food Frequency Questionnaire (FFQ) which focuses on the protein intake of respondents. In the questionnaire there is a list of predetermined animal and vegetable protein food

ingredients. Each food ingredient is given a score or value according to the frequency of consumption of the food ingredient. The frequency of consumption was divided into six groups: >3 times/day (50), 1-2 times/day (25), 3-6 times/week (15), 1-2 times/week (10), 2 times/month (5), and never (0). The protein intake studied was the intake in the past month.

To determine HDL levels, researchers used a 3 cc blood sample taken from the mediana cubiti vein. Blood sampling was done after the respondents fasted for 12 hours. The blood sample was electrophoresed to separate serum and blood cells and then sent to the HDL examination laboratory at the S.K Lerik Hospital

Laboratory. The examination was carried out using a Biochemistry Analyzer (BA-200) with the method of passing light that has a certain wavelength on the sample placed in a cuvette.

Data on respondent's characteristics, BMI, HDL, and protein intake using FFQ were analyzed univariate and bivariate analysis using Mann-Whitney test in Jeffrey's Amazing Statistics Program (JASP) version 0.18.3.

RESEARCH RESULTS

Table 1: Respondent's Characteristics

Characteristics	Frequency (n)	Percentage (%)
Gender		
Male	62	70.45
Female	26	29.55
Total	**88**	**100**
Age (years)*		
15-19	4	4.55
20-24	20	22.73
25-29	15	17.04
30-34	21	23.86
35-39	10	11.36
40-44	8	9.09
45-49	6	6.82
50-54	4	4.55
Total	**88**	**100**
Jobs		
Field	31	35.22
Not a Field	57	64.77
Total	**88**	**100**

*Age Group Based on Statistics of Indonesia 2022[15]

The results of the characteristics of respondents found that the male gender was more than female, it's 62 people (70.45%). This is because of the total population that is dominated by men. In the age characteristics, the most were found at the age of 30-34 years with a total of 21 people (23.86) and the least were found at the age of 15- 19 years and 50-54 years with a total of 4 people

(4.55%). In the job characteristics, 57 people (64.77%) were not field workers, which means that workers at El-Tari Kupang Airport tend to be office workers/monitors such as check-in staff, officers, airlines workers, and so on while the field workers obtained were 31 people (35.22%) with professions as porters and logistics workers.

Tabel 2: Univariate Analysis of Body Mass Index (BMI)

Characteristic	Frequency (n = 88)	Percentage (%)
BMI Category		
Normal	44	50
Obesity	44	50
BMI Category Based on Age Group		
15-19 (n = 4)		
Normal	3	75
Obesity	1	25
20-24 (n = 20)		
Normal	14	70
Obesity	6	30
25-29 (n = 15)		
Normal	10	66.67

Characteristic	Frequency (n = 88)	Percentage (%)
Obesity	5	33.33
30-34 (n = 21)		
Normal	10	47.61
Obesity	11	52.39
35-39 (n = 10)		
Normal	2	20
Obesity	8	80
40-44 (n = 8)		
Normal	2	25
Obesity	6	75
45-49 (n = 6)		
Normal	1	16.67
Obesity	5	83.33
50-54 (n = 4)		
Normal	2	50
Obesity	2	50
BMI Category Based on Occupation		
Field (n = 31)		
Normal	15	48.39
Obesity	16	51.61
Not Field (n = 57)		
Normal	29	50.88
Obesity	28	49.12

Based on these results, in the BMI category, it shows that the same results were obtained between respondents with normal BMI (≤25 kg/m2) and obese or BMI above normal (>25 kg/m2), namely 44 people (50%). In the HDL level group based on age, the results of normal BMI examination were found the most in the 20-24 year age group with a total of 14 people and the least found in the 45-49 year age group, with the total only 1 person. In obesity, the most was found in the age group 30-34 years with a total of 11 people and the least was found in the age group 15-19 years, with the total only 1 person. In the group of HDL levels based on occupation, it was found that most respondents with normal BMI were not field workers, namely 29 people and 28 people were obese. In contrast to respondents who are field workers, it was found that there are only 15 people with normal BMI and 16 people who are classified as overweight/obese.

Tabel 3: Univariate Analysis of High Density Lipoprotein (HDL)

Characteristics	Frequency (n = 88)	Percentage (%)
HDL Levels		
Normal	18	20.46
Borderline	60	68.18
Low	10	11.36
HDL Levels Based on Age Group		
15-19 (n = 4)		
Normal	-	-
Borderline	4	100
Low	-	-
20-24 (n = 20)		
Normal	4	35
Borderline	7	45
Low	9	20
25-29 (n = 15)		
Normal	3	20
Borderline	12	80
Low	-	-
30-34 (n = 21)		
Normal	3	14.29
Borderline	15	71.42
Low	3	14.29

Characteristics	Frequency (n = 88)	Percentage (%)
35-39 (n = 10)		
Normal	1	10
Borderline	7	70
Low	2	20
40-44 (n = 8)		
Normal	4	50
Borderline	4	50
Low	-	-
45-49 (n = 6)		
Normal	-	-
Borderline	6	100
Low	-	-
50-54 (n = 4)		
Normal	-	-
Borderline	3	75
Low	1	25
HDL Levels Based on Occupational		
Field (n = 31)		
Normal	3	9.68
Borderline	21	67.74
Low	7	22.58
Not Field (n = 57)		
Normal	15	26.31
Borderline	39	68.42
Low	3	5.27

The results of the examination of HDL levels showed that HDL levels tended to be in the borderline category (women 50-59 mg/dL and men 40-59 mg/dL) with a total of 60 people (68.18%) followed by HDL results in the normal category (≥60 mg/dL) as many as 18 people (20.46%) and the least was found in the low HDL category (women <50 mg/dL and men <40mg/dL) which was less at 10 people (11.36%).

In the HDL level group based on age, it was found that the most in the normal HDL group was the 20-24 year and 40-44 year age group as many as 4 people, the borderline HDL group was the 30-34 year age group as many as 15 people, and 9 people was the 20-24 year age group.

Normal and borderline HDL examination results tend to be found in respondents who are not field workers, namely 15 people and 39 people respectively. In contrast, low HDL is most commonly found in respondents who are field workers, namely 7 people.

Tabel 4: Univariate Analysis of Food Frequency Quesionnaire Protein Frequency

Protein	Frequency (n)	Percentage (%)
Animal*		
Above Average	34	38.63
Below Average	54	61.36
Vegetable**		
Above Average	35	39.77
Below Average	53	60.22

*Average = 80.17, **Average = 42.72

The results of the Food Frequency Questionnaire (FFQ) was obtained after respondents filled in how often a food ingredient was consumed in the past month. The more frequently consumed will indicate that the higher the value or score will be obtained. The frequency of food consumption is divided into >3 times/day (50), 1-2 times/day (25), 3-6 times/week (15), 1-2 times/week (10), 2 times/month (5), never (0).

The results of the summation based on the frequency of consumption of each respondent will then be grouped into two categories, namely above average and below average. The average value is first determined based on the results of 88 respondents. The average value of animal FFQ is different from the average value of vegetable FFQ.

Based on the results of the study, it was found that there was no significant difference between

respondents who consumed vegetable and animal protein. The number of consumption below the average for animal and vegetable protein was 34 and 35 people respectively. The results obtained above the average were more, it was 54 and 53 people.

Tabel 5: Bivariate Analysis

BMI Category	HDL Levels						Total (%)	Mean	Median	Standard Deviation	Normality Test	Significance *p* Value
	Normal		*Borderline*		Low							
	n	%	n	%	n	%						
Normal	13	29.55	31	70.45	0	0	100	56.06	53.150	12.639	0.008*	0.001**
Obesity	5	11.4	29	65.9	10	22.7	100	47.83	45.800	11.810		0.001**

*Kolmogorov Smirnov is normally distributed if *p* value > 0.05, **Mann-Whitney significant when *p* < 0.05

Bivariate analysis was conducted to determine the difference between HDL levels in El-Tari Kupang Airport workers based on normal BMI and obesity. This data analysis was preceded by conducting a normality test to determine the normal or abnormal distribution of research data using the Kolmogorov Smirnov test because the respondents were more than 50 people. Based on the results of the normality test, it was found that the researcher's data was not normally distributed which was characterized by a *p* value 0,05. Based on the table 5, there are significant results between the differences in HDL levels in workers at El-tari Airport Kupang based on normal BMI and obesity. This is indicated by the results of the analysis of the significance level of the variable is 0.001 ($p < 0.05$).

DISCUSSION

High Density Lipoprotein (HDL) is a good or positive lipoprotein that functions as a transporter of bad cholesterol from the blood vessel endothelium [16, 17]. The main mechanism of HDL plays an important role in Reverse Cholesterol Transfer (RCT) which functions to return cholesterol to the liver to be excreted as a protective function of the body from the risk of atherosclerosis [10, 18, 19]. HDL function is problematic in certain diseases indicated by low HDL levels. This condition often occurs in patients with chronic kidney disease, diabetes, cardiovascular disease, liver disease, and others [20]. Body Mass Index (BMI) also affects HDL levels in the body.

Body Mass Index (BMI) is influenced by the intake of food consumed. The more that is consumed will cause an increase in BMI or obesity. If the intake is less, it will result in a low BMI [21, 22]. Complications related to obesity such as inflammation or diabetes can also cause HDL dysfunction [20]. In obesity, there is excess adipose tissue with a large size and triggers the development of dyslipidemia through the production of Free Fatty Acid (FFA) and increased lipoprotein synthesis which is then followed by an increase in triglyceride levels and causes a decrease in HDL levels [23, 24].

The results of research related to differences in HDL levels in workers at El-tari Kupang Airport based on normal BMI and obesity, found that the average HDL levels in the normal and obese BMI groups were 56.06 and 47.83 respectively with a higher average found in the normal BMI group. These results are in line with research conducted by Sitepu (2017) related to the relationship between BMI and serum lipid profile as a risk factor for cardiovascular disease in Nommensen University students who said that the average normal BMI obtained was 46.75 and obesity was 38.5 [13].

Based on the results of bivariate analysis conducted, significant results were obtained with a value of $p = 0.001$ ($p < 0.05$). These results mean that there is a difference between HDL levels in normal BMI and obesity with a negative correlation in each BMI group. This is indicated by the higher the BMI, the lower the HDL levels, otherwise the more normal the BMI, the higher or normal the HDL levels in the body. These results are in accordance with the theory presented by Stadler JT and Marsche G (2020) with title Obesity-Related Changes in High-Density Lipoprotein Metabolism and Function which provides a statement that is in line with and supports the results of this study [20].

In this study, there were quite different results between HDL levels in normal BMI and obesity. In normal BMI, normal HDL levels were found to be 13 people, borderline HDL as many as 31 people and no low HDL levels were found. In obesity, there were fewer normal HDL levels, namely 5 people, borderline 29 people and low HDL levels, namely 10 people. These results are also in line with research conducted by Fidyana M, *et al.,* (2020) on type 2 diabetes mellitus patients who said that out of 56 respondents, 33 people were found with excessive BMI and 23 others were classified as normal BMI and there were 27 people who had low HDL and 29 people had normal HDL [25].

The results of HDL levels that dominate in the borderline category occur due to the pattern of animal and vegetable protein intake consumed by respondents. Based on table 4 related to the distribution of Food Frequency Questionnaire (FFQ) in the last month, it is found that the distribution of animal and vegetable protein consumption is higher in the group below the average. This causes respondents with normal BMI to not have normal HDL levels and obese respondents to have HDL levels that tend to be low and borderline. This statement is supported by research conducted by

Fadzilah AD, *et al.,* (2023) and Suryandari BD, *et al.,* (2015) which shows that consuming protein can reduce the occurrence of fat storage where if fat storage occurs, there is a risk of decreasing HDL and decreasing blood lipid levels [26, 27].

Borderline results are also influenced by the physical activity of respondents seen from the type of work. In table 1, respondents tend to do indoor activities or are not field workers, resulting in the group of respondents with normal BMI, HDL levels dominate in the borderline category. Similarly, obese respondents tended to have HDL levels in the low and borderline categories. This statement is also supported by research by Fadzilah AD, *et al.,* (2023) [26].

The significant results of this study are based on the theory that obesity is associated with the incidence of atherogenic dyslipidemia. In normal BMI, lipoprotein lipase will hydrolyze triglycerides from chylomicrons and VLDL which then causes particle shrinkage and transfer of surface phospholipids and apolipoproteins to HDL so that there is an increase in HDL. In contrast to obesity, the response of lipoprotein lipase activity to glucose stimulation is shown to be reduced, resulting in decreased HDL in obesity [20].

Similar research has been conducted in Indonesia which was also studied by Gani Hanif, *et al.,* (2013). In the study, different results were obtained, there was no significant difference between HDL levels in obese and non-obese women. This is because the respondents in the study tended to consume a lot of fish containing omega-3. The content of Poly Unsaturated Fatty Acid (PUFA) contained in omega-3 can affect metabolic activity in adipose tissue which then results in increased HDL levels in the blood [14].

The results of this study indicate that there are differences in HDL levels in workers at El-Tari Kupang Airport based on normal BMI and obesity with an inverse correlation between BMI and HDL which is indicated by the higher the BMI, it is means the lower HDL in the body, otherwise the more normal BMI means the higher HDL levels in the body.

CONCLUSION

Based on the results of existing research, it was found that there were differences in High Density Lipoprotein (HDL) levels in El-Tari Kupang Airport workers based on normal and obese Body Mass Index (BMI) with the test results using Mann Whitney obtained p value = 0.001 ($p < 0.05$). The results of the measurement of Body Mass Index (BMI) of workers at El-Tari Kupang Airport are categorized into two groups, namely the normal category with a total of 44 people and obesity with a total of 44 people out of a total of 88 people. The results of measuring HDL levels are categorized into three groups, namely 18 people who have normal HDL levels, 60 people with borderline HDL

levels, and 10 people with low HDL levels from a total of 88 people. From the results obtained from 44 people with normal BMI there were 13 people with normal HDL levels and 31 people with borderline HDL levels and in 44 people with obese BMI categories obtained 5 people with normal HDL levels, 29 borderline people, and 10 people with low HDL levels.

SUGGESTION

1. Based on the hypothesis, since in this study a p-value of 0.001 was obtained (Mann Whitney significant if p < 0.05), therefore H1 is accepted and H0 is rejected, indicating a significant difference in High Density Lipoprotein (HDL) levels among workers at El-Tari Kupang Airport based on normal and obese Body Mass Index (BMI).
2. The measurement results of Body Mass Index (BMI) among workers at El-Tari Kupang Airport varied and were categorized into two groups: normal category with 44 individuals and obese category with 44 individuals out of a total of 88 individuals.
3. The measurement results of High Density Lipoprotein (HDL) levels also varied and were categorized into three groups: 18 individuals with normal HDL levels, 60 individuals with borderline HDL levels, and 10 individuals with low HDL levels out of a total of 88 individuals.

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