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Determinant factors associated with central obesity in the academic staff at Universitas Negeri Gorontalo

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Abstract

Central obesity is one of the causes of metabolic syndrome and other degenerative diseases. This study aimed to analyze the relationship between age, gender, physical activity, genetics, stress, and diet with the incidence of central obesity in academic staff at Universitas Negeri Gorontalo. The research method used was an analytical observational method with a cross-sectional study design with the number of research subjects 248 samples consisting of employees or education personnel at Universitas Negeri Gorontalo. Data were collected using a questionnaire and analyzed using binary logistic regression analysis. The results showed that physical activity, genetics, stress, and calorie requirement had a significant relationship with central obesity, while age and gender did not. The calorie requirement variable had a p-value of 0.000 and an odds ratio of 10.75. The physical activity variable had a p-value of 0.009 with an odds ratio of 0.59. The stress variable has a p-value of 0.015 with an odds ratio of 2.09. The results of the data analysis test obtained an R-square value of 0.359. This indicates that the independent variable can explain or influence the dependent variable by 35.9%. The remaining 64.1% is explained by other variables not included in this study.

Keywords: Cross-Sectional Study; Central Obesity Factors; Central Obesity; Academic Personnel

1. Introduction

Nutrition is a problem that exists in every country, whether it is a poor, developing, or developed country. One of the important nutritional problems to consider is obesity. The prevalence of obesity in the world has increased dramatically, making this nutritional problem one that needs serious attention (Ministry of Health of the Republic of Indonesia, 2018).

Obesity is a risk factor associated with several chronic diseases characterized by the accumulation of fat in the body. This fat accumulation is caused by excessive amounts of fat in the weak subcutaneous tissue and abdominal visceral fat. A person can be said to be obese when their excess body weight reaches more than 20% of their normal weight (Ministry of Health of the Republic of Indonesia, 2015). Obesity, especially central obesity, is the main cause of metabolic syndrome, including insulin resistance, type II diabetes mellitus, dyslipidemia, and all risk factors for cardiovascular disease (Rasyid, 2021).

The incidence of obesity continues to rise each year. Based on data from the Gorontalo Provincial Health Office in 2022, the incidence of obesity was 2,169 people, of which, for the Gorontalo City area was 43 people. In 2023, there was another increase in obesity cases in Gorontalo Province, which was 4827 people with Gorontalo City contributing 240 people with obesity.

Based on the results of preliminary observations conducted at Gorontalo State University (UNG) on Education Personnel (Tendik) spread over each faculty unit, there were 20 Tendik who experienced central obesity consisting of 12 females

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and 8 males. The majority of those with central obesity are less than 44 years old. Based on the interview results, it was found that those with central obesity are those who often eat and snack during working hours. However, some employees also complained that stress at home or at work can trigger hunger, causing them to eat more than usual.

Central obesity is influenced by several factors, which can be divided into two groups: modifiable factors and unmodifiable factors. Unmodifiable factors include age, gender, and genetics. Modifiable factors include physical activity, stress, and diet (Widodo, 2020).

Central obesity is usually found more in subjects with older age because at that age there is a decrease in muscle mass and changes in several types of hormones that can cause the accumulation of abdominal fat (Power, 2008). Another risk factor is gender. Men are considered to have central obesity if they have a waist circumference (WC) > 90 cm and women have a WC > 80 cm. Waist circumference measurements can describe the accumulation of fat in the body (Mawadda, 2021). Obesity is more common in women than in men. This is due to hormonal differences between men and women, so that the female body stores more fat, while the male body builds more muscle due to higher testosterone production than women.

Physical activity is also associated with central obesity. Lack of physical activity tends to cause people to easily store a lot of calories, resulting in energy deposits and causing weight gain. This lack of energy utilization causes energy stores to be underutilized and gradually accumulate, leading to obesity (Khairani, et al., 2018).

In addition to physical activity, a family history of obesity or family genetics is believed to determine susceptibility to the development of obesity in children. The body mass index of overweight parents increases the risk of overweight children. From the studies conducted, a family history of obesity is strongly correlated with obesity in their biological children (Savitri, 2017).

Based on this description, the researcher conducted a study titled "Determinant Factors Associated with Central Obesity in Education Personnel at Gorontalo State University". This study aimed to analyze the relationship between various factors with the incidence of central obesity in education personnel, especially in Gorontalo State University. In addition, it is also to analyze the variables that most affect the incidence of central obesity.

2. Methods

This study is an analytical observational study with a cross-sectional design. The dependent variable in this study was central obesity (Y), while the independent variables were age (X_1), gender (X_2), physical activity (X_3), genetics (X_4), stress level (X_5), and energy intake/calorie requirement (X_6). The research subjects were government civil servants (ASN) and non-ASN education personnel at Gorontalo State University. The number of samples was determined using the Slovin formula and 248 samples were obtained. The sample was determined using cluster random sampling technique. The research data was collected using instruments in the form of interviews, documentation studies and distribution of questionnaires. The research data was then statistically analyzed using the Chi-Square test.

3. Results

3.1. Univariate Analysis

The characteristics of the respondents in this study include gender, age, education level, service time, physical activity, genetics, stress level, calories requirement, and central obesity. The distribution of respondents based on these characteristics is shown in Table 1.

Table 1 Characteristics of Respondents

No.	Characteristics of Respondents	Amount (n)	Percentage (%)
Gender			
1	Male	103	41.5
2	Female	145	58.5
Age			

1	Early adults (26-35 years old)	89	35.9
2	Late adults (36-45 years old)	57	23.0
3	Early elderly (46-55 years old)	94	37.9
4	Late elderly (56-65 years old)	8	3.2
5	Seniors (> 65 years old)	0	0.0
Education Level			
1	High school graduates	27	10.9
2	Diploma graduates (D3)	32	12.9
3	Bachelor (S1)	151	60.9
4	Master's degree (S2)	38	15.3
5	Doctorate degree (S3)	0	0.0
Service Time			
1	< 1 year	3	1.2
2	1-3 years	17	6.9
3	4-5 years	8	3.2
4	> 5 years	220	88.7
Physical Activity			
1	Light	102	41.1
2	Moderate	80	32.3
3	Heavy	66	26.6
Genetics			
1	Hereditary obesity	104	41.9
2	No hereditary obesity	144	58.1
Stress Level			
1	Moderate	23	9.3
2	Severe	178	71.8
3	Very severe	47	19.0
Calories Requirement			
1	Sufficient	116	46.8
2	Surplus	132	53.2
Central Obesity			
1	Central obesity	138	55.6
2	No central obesity	110	44.4

Source: Primary data, 2023

3.2. Bivariate Analysis

3.2.1. Correlation of age with the occurrence of central obesity

The correlation between age and the incidence of central obesity is shown in Table 2. Based on the results in the table, in the early adult category, 47 respondents among them had central obesity. In the late adult category, 33 respondents

among them had central obesity. In the early elderly category, 54 respondents among them had central obesity. In the late elderly category, 4 respondents among them had central obesity. The Chi-square correlation test value gave a p-value of 0.889 (greater than α = 0.05). This indicates no significant correlation between age and the incidence of central obesity.

Table 2 Correlation of Age with the Occurrence of Central Obesity

Age	Occurrence of Central Obesity				Total		p-value
	Yes		No				
	n	%	n	%	n	%	
Early adults (26-35 years old)	47	19.0	42	16.9	89	35.9	0.889
Late adults (36-45 years old)	33	13.3	24	9.7	57	23.0	
Early elderly (46-55 years old)	54	21.8	40	16.1	94	37.9	
Late elderly (56-65 years old)	4	1.6	4	1.6	8	3.2	
Total	138	55.6	110	44.4	248	100	

Source: Primary data, 2023

3.2.2. Correlation of gender with the occurrence of central obesity

The correlation between gender and the occurrence of central obesity is shown in Table 3. Based on the results in the table, among male respondents, 58 of them had central obesity. Among female respondents, 80 of them had central obesity. The chi-square correlation test value gave a p-value of 0.859 (greater than α = 0.05). This indicates no significant correlation between gender and the incidence of central obesity.

Table 3 Correlation of Gender with the Occurrence of Central Obesity

Gender	Occurrence of Central Obesity				Total		p-value
	Yes		No				
	n	%	n	%	n	%	
Male	58	23.4	45	18.1	103	42.5	0.859
Female	80	32.3	65	26.2	145	58.5	
Total	138	55.6	110	44.4	248	100	

Source: Primary data, 2023

3.2.3. Correlation of physical activity with the occurrence of central obesity

The correlation between physical activity and the occurrence of central obesity is shown in Table 4. Based on the results in the table, among the respondents of the light activity category, 56 of them had central obesity. Among respondents in the moderate activity category, 34 of them had central obesity. Among the respondents in the heavy activity category, 48 respondents among them had central obesity. The chi-square correlation test value gave a p-value of 0.001 (less than α = 0.05). This shows a significant relationship between physical activity and the incidence of central obesity.

Table 4 Correlation of Physical Activity with the Occurrence of Central Obesity

Physical Activity	Occurrence of Central Obesity				Total		p-value
	Yes		No				
	n	%	n	%	n	%	
Light	56	22.6	46	18.5	102	41.1	0.001
Moderate	34	13.7	46	18.5	80	32.3	
Heavy	48	19.4	18	7.3	66	26.6	

Total	138	55.6	110	44.4	248	100	

Source: Primary data, 2023

3.2.4. Correlation of genetics with the occurrence of central obesity

The correlation between genetics and the occurrence of central obesity is shown in Table 5. Based on the results in the table, in the category that has a gene of obesity, 66 of them have central obesity. In the category that did not have a family history of obesity, 72 of them have central obesity. The chi-square correlation test value gave a p-value of 0.035 (less than α = 0.05). This indicates a significant relationship between genetics and the incidence of central obesity. The odds ratio value of 1.74 means that educators who have an obesity heredity have twice the risk of developing central obesity compared to educators who do not have an obesity heredity.

Tabel 5 Correlation of Genetics with the Occurrence of Central Obesity

Genetik	**Occurrence of Central Obesity**				**Total**		**p-value**	**Odds Ratio**
	Yes		**No**					
	n	**%**	**n**	**%**	**n**	**%**		
Hereditary obesity	66	26.6	38	15.3	104	41.9	0.035	1.74
No hereditary obesity	72	29.0	72	29.0	144	58.1		
Total	138	55.6	110	44.4	248	100		

Source: Primary data, 2023

3.2.5. Correlation of stress level with the occurrence of central obesity

The correlation between the level of stress and the occurrence of central obesity is shown in Table 6. Based on the results in the table, among the respondents with the moderate stress category, 13 of them had central obesity. Among the respondents with the severe stress category, 90 of them had central obesity. Among the respondents in the very severe stress category, 35 of them had central obesity. The chi-square correlation test value gave a p-value of 0.013 (less than α = 0.05). This shows that there is a significant relationship between stress levels and the incidence of central obesity.

Table 6 Correlation of Stress Level with the Occurrence of Central Obesity

Stress Level	**Occurrence of Central Obesity**				**Total**		**p-value**
	Yes		**No**				
	n	**%**	**n**	**%**	**n**	**%**	
Moderate	13	5.2	10	4.0	23	9.3	0.013
Severe	90	36.3	88	35.5	178	71.8	
Very severe	35	14.1	12	4.8	47	19.0	
Total	138	55.6	110	44.4	248	100	

Source: Primary data, 2023

3.2.6. Correlation of calorie requirement with the occurrence of central obesity

The correlation between calorie requirements and the occurrence of central obesity is shown in Table 7. Based on the results in the table, of the respondents whose calories were excessive 104 have central obesity. Among the respondents whose calories were sufficient, 34 had central obesity. The Chi-square correlation test value gives a p-value of 0.000 (less than α = 0.05). This shows that there is a significant relationship between caloric intake and the incidence of central obesity. The odds ratio value of 8.96 means that the respondents whose calories are excessive have a nine times higher risk of developing central obesity than the respondents whose calories are sufficient.

Table 7 Correlation of Calorie Requirement with the Occurrence of Central Obesity

Calorie Requirement	Occurrence of Central Obesity				Total		p-value	Odds Ratio
	Yes		No					
	n	%	n	%	n	%		
Surplus	104	41.9	28	11.3	132	53.2	0.000	8.96
Sufficient	34	13.7	82	33.1	116	46.8		
Total	138	55.6	110	44.4	248	100		

Source: Primary data, 2023

3.3. Multivariate Analysis

3.3.1. Equation of the logistic regression

Logistic regression calculations between physical activity, stress level, genetics, and calorie requirement were performed using SPSS software. The results of the logistic regression calculation are shown in Table 8.

Table 8 Equation of the Logistic Regression

Variables	Coefficient (β)
Constant	-4.387
Physical activity	-0.521
Genetics	0.093
Stress	0.739
Calorie requirement	2.375

Source: Primary data, 2023

Based on the results in Table 8, the logistic regression equation is as follows:

$$\ln\left(\frac{P(y-1)}{1-P(y-1)}\right) = -4.387 - 0.521X_1 + 0.739X_2 + 0.093X_3 + 2.375X_4$$

The interpretation of the equation is as follows:

- The constant value is -4.387, which means that if the value of all independent variables is equal to zero, it will reduce the occurrence of central obesity by 4.387.
- The value of β1 is -0.521, which means that if the value of physical activity increases by one unit, assuming that the other independent variables are constant, it will reduce the occurrence of central obesity by 0.521.
- The value of β2 is 0.739, which means that if the value of stress increases by one unit, assuming that the other independent variables are constant, it will increase the value of the incidence of central obesity by 0.739.
- The value of β3 is 0.093, which means that if the genetic value increases by one unit, assuming that the other independent variables are constant, it will increase the incidence of central obesity by 0.093.
- The value of β4 is 2.375, which means that a one-unit increase in calories, assuming the other independent variables remain constant, will increase the incidence of central obesity by 2.375.

3.3.2. Hypothesis testing

H Based on the results in Table 9, the significance value of the logistic regression test for each independent variable on the dependent variable is obtained.

Tabel 9 Hypothesis Testing

Variables	p-value	Description	Odds Ratio	R-square
Physical activity	0,009	Influential	0.59	0.359
Stress	0,015	Influential	2.09	
Genetics	0,767	No Effect	1.10	
Calorie requirement	0,000	Influential	10.75	

Source: Primary data, 2023

The results in Table 9 are interpreted as follows:

- The significance value of physical activity is 0.009, which means that physical activity has a significant effect on the occurrence of central obesity (p-value < 0.05). The odds ratio value obtained is 0.59, which means that academic staff whose physical activity is light tend to experience central obesity by 0.59 times compared to those whose physical activity is moderate or heavy.
- The significance value of stress level is 0.015, which means that stress has a significant effect on the occurrence of central obesity (p-value < 0.05). The value of the odds ratio obtained is 2.09, which means that academic staff whose stress is very severe tend to experience central obesity twice as much as those whose stress is severe or moderate.
- The genetic significance value is 0.767, which means that genetics does not affect the occurrence of central obesity (p-value > 0.05). The odds ratio value is 1.10, which means that academic staff who have obese offspring are one times more likely to develop central obesity than those who do not have obese offspring.
- The significance value of calorie requirement is 0.000, which means that nutrition has a significant effect on the occurrence of central obesity (p-value < 0.05). The odds ratio value obtained is 10.75, which means that academic staff whose calorie intake is excessive are 11 times more likely to develop central obesity than those whose calorie intake is sufficient.
- The results in Table 9 also show an R-squared value of 0.359. This shows that the independent variable can explain or influence the dependent variable by 35.9%. The remaining 64.1% is explained by other variables that are not included in this study.

4. Discussion

4.1. Correlation Between Age and The Occurrence of Central Obesity in Academic Staff at Gorontalo State University

The results showed that the highest occurrence of central obesity was found in the early elderly age class (46-55 years), reaching 54 respondents with a percentage of 21.8%. On the other hand, the lowest incidence of central obesity was found in the late elderly age class (56-65 years), with as few as four respondents with a percentage of 1.6%. Based on statistical tests, the p-value is 0.889. This value is greater than $\alpha = 0.05$, which means that there is no significant relationship with the incidence of central obesity. This study is inconsistent with the research conducted by Cazellina (2020), which shows that the age variable has a relationship with the incidence of central obesity with a p-value of 0.048 (less than $\alpha = 0.05$).

Theoretically, with age, there is a decrease in muscle mass and changes in several types of hormones that may lead to the accumulation of abdominal fat, lack of physical activity, slower metabolism, and more frequent food consumption. However, the results of this study showed that the highest number of respondents with central obesity was in the early elderly age category (46-55 years) with 54 respondents, followed by the early adult age category (26-35 years) with 47 respondents, the late adult age category (36-45 years) with 33 respondents, and the late elderly age category (56-65 years) with 4 respondents. The causes of central obesity in the younger age categories are due to various factors, including excessive calorie intake and lack of physical activity.

Central obesity can occur at any age due to unhealthy eating habits and lack of physical activity. Central obesity is particularly common in urban areas, where people eat more fast food and are less physically active. Central obesity is also more common in older people than in younger people due to hormonal changes and slower body metabolism. People in their 40s and 50s are more likely to be obese than younger people (Power, 2008).

4.2. Correlation Between Gender and The Occurrence of Central Obesity in Academic Staff at Gorontalo State University

The results showed that subjects who were male and had central obesity were 58 respondents with a percentage of 23.4%, while subjects who were female were 80 people with a percentage of 32.3%. Based on statistical tests, it was found that the gender variable had a p-value of 0.0859. This value is greater than α = 0.05, which indicates that gender has no relationship with the incidence of central obesity in academic staff at Gorontalo State University. The results of this study are consistent with the research conducted by Cazellina (2020) who showed that the results of the relationship test between gender and central obesity in security and cleaning officers at UIN in 2020 gave a p-value of 1.000 (greater than α = 0.05). This means that there is no relationship between gender and the incidence of central obesity in UIN security and cleaning staff.

The difference in the occurrence of central obesity between men and women is due to differences in the distribution of fat in the body. This difference in fat distribution is due to women's metabolism, which tends to be slower than men's. The higher incidence of central obesity in women compared to men is also due to differences in physical activity and energy intake between men and women. Women naturally have more body fat reserves than men. However, it is not uncommon for central obesity to be found in men due to several underlying factors, such as the habit of consuming excessive calories, a lifestyle that lacks physical activity, and the habit of hanging out with friends in their free time, which can trigger increased consumption of foods containing glucose.

Based on the basal metabolic rate (resting metabolic rate), the metabolic rate of women is 10% lower than that of men. Therefore, women tend to convert more food into fat, while men convert more food into muscle and ready-to-use energy supplies. Women also have less muscle mass than men. Muscle burns more fat than other cells, so women have less opportunity to burn fat (Lubis, 2020).

4.3. Correlation Between Physical Activity and The Occurrence of Central Obesity in Academic Staff at Gorontalo State University

The results of this study indicate that academic staff who do light physical activity have a higher prevalence of central obesity, i.e. 56 respondents (22.6%). The statistical test results showed a p-value of 0.001. This value is less than α = 0.05, which means that there is a relationship between physical activity and the incidence of central obesity. The results of hypothesis testing showed a significance value of 0.009 (smaller than α = 0.05), so it can be concluded that physical activity has a positive influence on central obesity. The odds ratio value obtained is 0.59, which means that academic staff whose physical activity is light tend to have central obesity by 1 times compared to academic staff whose physical activity is moderate or heavy.

The results of this study are consistent with the research conducted by Ramadhani (2020), which states that there is a 95% relationship between physical activity and the occurrence of central obesity. Another study was conducted by Cazellina (2020) whose results showed a p-value of 0.000 (less than α = 0.05). This means that there is a significant relationship between physical activity and central obesity. In addition, an odds ratio of 10.514 was obtained. This shows that people with low physical activity are 10 times more likely to develop central obesity than people with moderate/high physical activity.

A person with low physical activity is more likely to develop central obesity. This is because physical activity is directly correlated to energy consumption. If a person does only light physical activity, the energy used is also low, so more intake calories are stored as fat, resulting in the accumulation of fat in the body (Andrianti, 2020).

Physical activity is also beneficial for circulation and calorie burning. Physical activity can burn fat that is stored in the body and burn excess calories produced by the body (Pertiwi, 2022). According to the recommendations of the Ministry of Health, physical activity should be performed regularly for at least 30 minutes per day and 150 minutes per week. Regular physical activity is beneficial for building immunity, avoiding degenerative diseases, and maintaining an ideal body weight to avoid obesity (Ministry of Health, 2019).

4.4. Correlation Between Genetics and The Occurrence of Central Obesity in Academic Staff at Gorontalo State University

The results showed that 104 respondents had hereditary obesity and 144 did not have hereditary obesity. Of the 104 respondents who had obesity in their offspring, 66 respondents (26.6%) had central obesity and 38 respondents (15.3%) did not have central obesity. Of the 144 respondents who did not have offspring with obesity, 72 respondents (29%) had central obesity and 72 respondents (29%) did not have central obesity. The significance value for genetic

variables is 0.035 (less than α = 0.05), which means that genetics is significantly associated with the incidence of central obesity.

This study is consistent with the research conducted by Lubis, et al. (2020), where the results of their research show that there is a significant relationship between heredity and the incidence of central obesity with a p-value = 0.001 (smaller than α = 0.05). Genetics is one of the factors that can be improved by lifestyle changes. Genetics can also be influenced by each person's basal metabolic rate. Everyone has a different basal metabolic rate. Some people have a high basal metabolic rate, while others have a low one. People who have a low metabolic rate tend to get fat more easily because with a low metabolic rate, energy used is broken down more slowly, so more fat is stored in the body (Andrianti, 2020).

Genetics are associated with central obesity because obesity tends to be passed on to the next generation. Family members who have a history of obesity share not only genes, but also eating habits and lifestyles that promote obesity. The results also showed that there were 72 respondents who did not have obese offspring, but were obese themselves. This is influenced by metabolism and hormonal factors in the body that regulate energy intake, use and expenditure, resulting in central obesity. Another factor that can cause someone who does not have hereditary obesity to become obese is a change in lifestyle from a traditional lifestyle to a sedentary lifestyle. A sedentary lifestyle accompanied by an excessive diet will increase the risk of overweight and obesity (Proverawati, 2010).

4.5. Correlation Between Stress Level and The Occurrence of Central Obesity in Academic Staff at Gorontalo State University

The results of the study on stress levels showed a significance value of 0.013 (less than α = 0.05), which means that stress has a significant effect on the incidence of central obesity. The value of the odds ratio obtained is 2.09, which means that respondents with very high levels of stress tend to experience central obesity twice as much as respondents with moderate or high levels of stress. This is because, under stressful conditions, there is an increase in eating behaviors that contribute to obesity. Stress can increase body weight because it increases cortisol levels in the blood, activates fat-storing enzymes, and signals hunger to the brain (Purwanti, 2017). The higher the level of stress, the greater the tendency to overeat (Fajriyah, 2023).

The results of this study showed that as many as 13 respondents with moderate stress levels, 90 respondents with severe stress levels, and 35 respondents with very severe stress levels experienced central obesity. This is due to metabolic factors present in the body as well as other environmental factors that influence obesity. If a person's energy or nutrient intake increases, but they rarely do any physical activity, then the body will not experience fat burning. As a result, the accumulation of abdominal body fat will trigger central obesity. Other factors can also be caused by age or habits. Thus, even moderate stress levels have the potential to develop central obesity if they do not maintain nutritional intake and make physical activity a habit.

These results are in line with the research conducted by Aulianti (2021) who, based on the test results, found that there was a significant correlation between stress levels and the occurrence of central obesity. According to Tomiyama (2019), when experiencing stress, a person will engage in unhealthy behaviors, such as eating to calm negative emotions associated with stress. When experiencing stress, a person will eat more than usual and tend to choose foods that are high in calories, sugar, and fat.

4.6. Correlation Between Calorie Requirement and The Occurrence of Central Obesity in Academic Staff at Gorontalo State University

The study results showed a significance value of calorie requirement at 0.000 (less than α = 0.05), which means that calorie requirement has a significant effect on the occurrence of central obesity. The odds ratio value was 10.75, which means that respondents with excess nutrition tend to have central obesity 11 times more than respondents with sufficient calorie requirement. Based on the recall results, a poor diet was found, such as eating only once a day and not including healthy foods or having a tendency to snack carelessly. Some respondents eat regularly and consume healthy foods, but still have central obesity. In this study, 34 respondents fell into the category of adequate calorie intake but had central obesity. This is due to excess calories, which occur when calories consumed from food exceed calories expended. This excess is converted into fat and stored in adipose tissue, so as the number of fat cells increases, so does body weight. The result is overweight or obesity (Andrianti. 2020).

The same research was conducted by Andrianti (2020), where the results showed that there is a significant relationship between energy intake and the incidence of central obesity in employees at SMK N 1 Padang City. The relationship is positively patterned, the higher the calorie intake of the respondents, the higher the incidence of central obesity.

Bowen's (2015) study showed that there was a relationship between high energy, fat, and protein intake and the incidence of central obesity. Another study also mentioned that excessive carbohydrate intake may increase the risk of central obesity (Asriati, 2017). To maintain good health, the recommended average daily energy intake is 10-20% from protein, 20-30% from fat, and 50-60% from carbohydrates (Almatsier, 2019).

A person has a normal body weight when the amount of calories intake into the body is in balance with the amount of calories expended. Excess calories occur when the calories consumed from food exceed the calories expended. This excess is converted to body fat. The result is overweight or obesity. Being overweight can be caused by eating too much, but it can also be caused by low physical activity (Fridawanti, 2016).

5. Conclusion

Based on the results of the study, it can be concluded that the variables of age and gender do not affect the incidence of central obesity in academic staff at Gorontalo State University. Chi-square values for both variables are 0.889 and 0.859 (greater than $\alpha = 0.05$). On the other hand, the variables of physical activity, genetics, stress level, and calorie requirement have an influence on the incidence of central obesity in academic staff at Gorontalo State University. Physical activity has a p-value of 0.009 with an odds ratio value of 0.59. This means that respondents with low levels of physical activity have 1 times the risk of developing central obesity. Genetic has a p-value of 0.035 with an odds ratio value of 1.74. This means that respondents with hereditary obesity have a 2 times higher risk factor for developing central obesity. The stress level has a p-value of 0.015 with an odds ratio value of 2.09. This means that respondents with very high stress levels have a 2 times greater risk factor for developing central obesity. The calorie requirement had a p-value of 0.000 with an odds ratio value of 10.75. This means that respondents with excess calories have an 11 times greater risk factor for developing central obesity. The R-squared value of 0.359 indicates that the independent variable has an effect of 0.359 or 35.9% on the dependent variable, while the remaining 64.1% is explained by other variables not examined in this study.

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest to be disclosed.

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