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ORIGINAL RESEARCH

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PREDICTION MODEL OF OBESITY AMONG TEACHERS IN SENIOR HIGH SCHOOL IN KENDARI

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Abstract

Background: Obesity that occurs in adolescents (age >18 years) shows a significant increase, from 12% in 2007 to 13% in 2010 and 19% in 2019 in males, and from 13% to 28% in 2013 in females.

Objective: To analyze the prediction model of obesity among teachers in senior high school in Kendari, Indonesia.

Methods: This was a prediction cross-sectional study. There were 250 high school teachers were recruited from 12 senior high schools using a purposive sampling. The instruments used were questionnaires (food frequency, consumption recall, and activities recall questionnaire), Seca weight scale, anthropometry microtoice, meter, computer program, and stationery. Data were analyzed using Chi-Square.

Results: Findings showed that there was a significant correlation between age group ($p = 0.05$), knowledge ($p = 0.02$), stress ($p = 0.05$) and diet ($p = 0.013$). The prediction factor of obesity among high school teachers was that teachers with an upper age (age > 45 years) were likely to be obese 2.64 times than teachers at a young age (age < 45 years). If teachers experienced stress, they would suffer from obesity 2.17 times compared with teachers with no stress.

Conclusion: Factors associated with obesity in high school teachers in Kendari Indonesia were age, knowledge, stress and dietary factors. Factors that were not related with obesity were attitudes about nutrition, activity and smoking habits. The highest predictors of obesity were age and stress.

Keywords: prediction model; obesity; Kendari; Indonesia

INTRODUCTION

Overweight and obesity increased rapidly in different parts of the world toward epidemic proportions. This is due to the increased diet high in fat and sugar, along with a decrease in physical activity. In developed countries, obesity has become an epidemic by contributing 35% to morbidity and contributing 15-20% to death. Recent reports indicated that the prevalence of obesity worldwide in both developing and developed countries has risen in alarming numbers. Balanced Nutrition Behavior is essential to prepare a healthy lifestyle in the face of the

double burden of nutritional problems, namely deficiencies and excess nutrients that occur at the same time ([Widyantara et al., 2014](#)).

A previous research concludes that, in developed countries, women in low socioeconomic groups have an obesity prevalence six times higher than women in top socioeconomic groups ([Sobal & Stunkard, 1989](#)). In Sweden, low socioeconomic is a strong determinant of the incidence of overweight and obesity in middle-aged women. In Syria, the incidence of obesity

increased in women with multiparity and low physical activity. A study in Korea shows that low education and income levels are the leading cause of obesity in both sexes. However, in developing countries such as Africa and Asia, the incidence of obesity is more common in urban areas than in rural areas, meaning that obesity is more common in high socioeconomic groups ([Widianti & Candra, 2012](#)). In 2007, in Indonesia, it is found that the prevalence of central obese is higher with increasing socioeconomic status ([Jafar & Gobel, 2011](#)). The rise of fast food and unhealthy lifestyle are not only in big cities but also up in small towns in Indonesia. This affects changes in eating behaviors and healthy life behaviors, so some of them become obese until eventually suffering from obesity. Data in 2004 show that the population aged 15 years and over 85% had less physical activity, and only 6% of the population had physical activity ([Statistics Indonesia, 2003](#)).

The national prevalence of general obesity in adult population (above 15 years) in 2006 is 10.3%. A total of 12 provinces had prevalence of general obesity in adult population above the national prevalence, including Bangka Belitung, Kepulauan Riau, DKI Jakarta, Jawa Barat, Jawa Timur, Kalimantan Timur, Sulawesi Utara, Sulawesi Tengah, Gorontalo, Maluku Utara, Papua Barat, and Papua ([Department of Health, 2006](#)). In 2013, provinces with prevalence of general obesity were Sulawesi Utara, Gorontalo, Kalimantan Timur, Bangka Belitung, DKI Jakarta, Maluku Utara, Sulawesi Tengah, Sumatra Utara, Papua Barat, Aceh, Jawa Barat and Jawa Timur ([Department of Health, 2013](#)).

The percentage of overweight nationally in 2007 was 12.2%, and increased in 2010 to 14.0%. In Southeast Sulawesi, 11.9% of overweight in 2013. Obesity among adolescents (age > 18 years) increased, which was from 12% in 2007 to 13% in 2010 in males, and from 13% in 2007 to 28% in 2013 in females ([Department of Health, 2013](#)).

Similarly, obesity (male abdominal circumference >90 cm and female >80 cm) in

Southeast Sulawesi also increased from 18% in 2007 to 27% in 2013. Based on body mass index (BMI) at age >18 years, obesity also increased from 10.3% in 2007 to 12.2% in 2010 and 15.4% in 2013. However, the prevalence of general obesity in men is lower than women (13.9% and 23 respectively, 8%) globally.

According to demographic characteristics, the prevalence of general obesity is higher in those in urban area, having higher level of household expenditure per capita per month, and having more weight and obese. High school teachers in Kendari Indonesia are living in the urban environment and having less activity, which therefore they might be at risk of obesity. This study aimed to analyze the prediction model of obesity among teachers in senior high school in Kendari, Indonesia.

METHODS

Study design

This was a cross-sectional study conducted in the Senior High School in Kendari City, Indonesia.

Sample

There were 250 high school teachers were recruited from 12 senior high schools using purposive sampling based on the inclusion criteria, including: the teacher who was still active working, suffered from overweight and obesity, and were ready to be respondent. The exclusion criterion was respondent who was pregnant.

Instrument

The instruments used in this study were questionnaires (food frequency, consumption recall, and activities recall questionnaire) developed by the authors with sound validity and reliability. The other instruments were Seca weight scale, anthropometry microtoice, meter, computer program, and stationery.

Data analysis

Data were analyzed using univariate and bivariate analysis. Bivariate analysis used Chi-

Square test.

Ethical consideration

This research has been approved by the Medical Research Ethics Commission of Hasanudin University Faculty of Medicine the Number: UH16070578.

RESULTS

Distribution of respondents' characteristic aged <45 years as many as 122 people (48.8%) and > 45 years as many as 128 people (51.2%). The majority of respondents were women as many as 155 people (62.0 %), and most of them were working in private sectors as many as 127 people (50.8%) (see Table 1).

Table 1 Characteristics of respondents

Characteristics of respondent	Total	Percentage
Age (years)		
≤ 45	122	48.8
> 45	128	51.2
Sex		
Men	95	38.0
Women	155	62.0
Employment		
Government	97	38.8
Military	6	2.4
Private sectors	127	50.8
Housewife	20	8.0

Table 2 shows that 163 people (65.2%) were not stress, 155 people (62.0%) were in a good diet, 195 people (78.0%) with obesity status, and 198 people (79.2%) with light activity

category. Based on the category of knowledge and attitude, 179 people (71.6%) had a good knowledge, and 143 people (57.2%) had good attitude.

Table 2 Distribution of respondent by stress factor, diet and obesity status

Variable	Total	Percentage
Stress factors		
Stress	87	34.8
Not	163	65.2
Dietary habit		
Good	155	62.0
Not good	95	38.0
Obesity status		
Obesity	195	78.0
Overweight	55	22.0
Activity		
Heavy	52	20.8
Light	198	79.2
Knowledge		
Good	179	71.6
Not good	71	28.4
Attitude		
Good	143	57.2
Not good	107	42.8

Table 3 shows that there were significant relationships between age group, stress, diet and knowledge with obesity status ($p < 0.05$),

while attitude and activity had no correlation with obesity status ($p > 0.05$).

Table 3 Relationships of age group, stress status, diet, knowledge and activities with obesity status in high school teachers in Kendari, Indonesia

Variable	Status obesity				Total		Pv X ² hit
	Obesity		Overweight		n	%	
	n	%	n	%			
Age group (years)							
< 45	86	70.49	36	29.51	122	100	0.005
≥45	109	85.16	19	14.84	128	100	7.828
Status of stress							
Stress	59	67.82	28	32.18	87	100	0.005
No stress	136	83.44	27	16.56	163	100	8.065
Dietary habit							
Good	113	72.90	42	27.10	155	100	0.013
Not good	82	86.32	13	13.68	95	100	6.175
Knowledge							
Good	133	74.30	46	25.70	179		0.025
Not good	62	87.32	9	12.68	71		5.024
Attitude							
Good	108	75.52	35	24.48	143	100	0.278
Not good	87	81.31	20	18.69	107	100	1.193
Activity							
Heavy	41	78.85	11	21.15	52	100	0.869
Light	154	77.78	44	22.22	198	100	0.027

Bivariate test results show a significant relationship between age, diet, stress, and knowledge. Analysis of this model provides an overview of the variables that are very

influential on the incidence of obesity. Furthermore, model analysis/path analysis is shown in Figure 1.

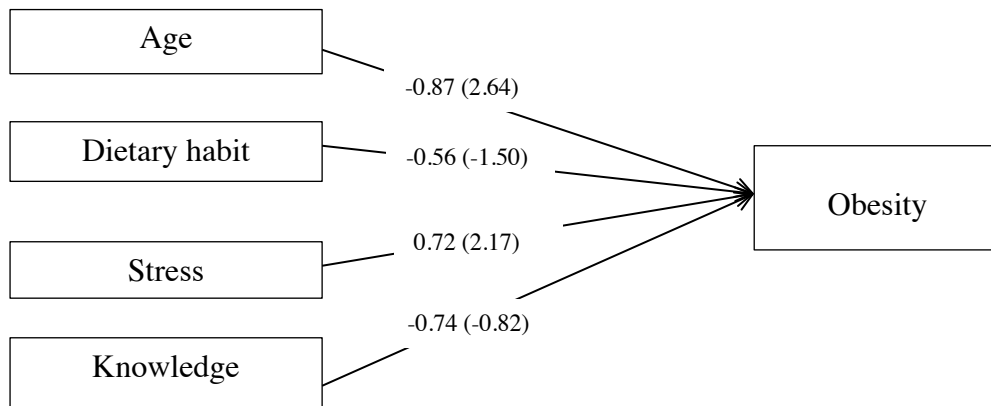


Figure 1 Analysis of model / path analysis of prediction of obesity by age, diet, stress, and knowledge

Figure 1 illustrates that the higher age would affect the increase in the value of BMI or obesity that was equal to 2.64 times compared with under-age. Similarly, stress conditions indicated that the more stress the high school teacher would increase the value of BMI or obesity, with a ratio of 2.17 times compared with no pressure. In addition, the less proper diet would increase the value of BMI or obesity. But good food would decrease the amount of BMI or obesity, and the lower level

of knowledge would lead to an increase in BMI or obesity.

DISCUSSION

Age with obesity status in high school teachers

Age is one factor that causes obesity in high school teachers in Kendari. Age includes elements that cannot be fixed in obesity

conditions. With the age that there will be attention in the field of health improvement, both at a higher age and at a young age ([Aini, 2014](#)). This study found that there was a significant relationship between age groups with obesity status among high school teachers, which teachers with an upper age (age > 45 years) were likely to be obese than the prevalence of obesity at a young age (age < 45 years). Increased age group in men and women would have higher metabolic syndrome and obesity in adolescents. The addition of age was one of the factors triggering obesity in high school teachers in Kendari, which should be a main concern in Kendari, Indonesia ([Jafar & Gobel, 2011](#)).

This study was in line with other studies on the relationship between characteristic factors, hypertension and obesity with the incidence of diabetes mellitus in regional general hospital Dr. H. Soewondo Kendal. The results of this study explained that there was a statistical relationship between age with the incidence of obesity, the higher the age of high school teachers, the more the occurrence of obesity ([Bhatta et al., 2014](#); [Rahayu et al., 2012](#))

Knowledge with obesity status in high school teachers

Education is the result of knowing. It happens after people do the sensing of an object against a particular purpose. Sensing occurs through post-human senses, namely the sense of sight, sound, smell, taste, and touch. Most knowledge is obtained through the eyes and ears. Understanding of cognitive is a very important predominant in shaping one's actions ([Notoatmodjo, 2007](#); [Supariasa & Nyoman, 2012](#)).

The results showed that from 250 samples, there were 179 having good knowledge. This is because in general, the respondents knew about the definition of obesity, the risk of obesity and efforts made to combat the occurrence of obesity, it is in accordance with the results of interviews with informants who suggested that obesity was the advantage weight, and of course if exceeded weight from standard weight. This was in line with the

opinion of the researchers that obesity is a condition where someone is overweight compared with normal weight, and then respondents also knew and made efforts to lose weight. The first informant stated that she had been on a diet and exercises to lose weight, then the fourth respondent also stated that the effort made to lose weight was to consume herbal food ([Sada et al., 2012](#)).

The respondents' revelation was in line with the researcher's opinion that the effort taken to lose weight was a lot of exercises, reducing consumption that contains high fat, eating-time setting especially not eating at night time, avoiding stress causing high consumption, consuming weight loss herb but must be balanced with enough activity. Further research results also indicated that there were 71 people had poor knowledge, because they did not understand about the definition of obesity and risk and efforts to prevent obesity ([Lutfiah, 2013](#)).

The findings revealed that there was a significant relationship of knowledge with obesity status in high school teachers in Kendari, Indonesia. Education can be a guideline to maintain body condition and the healthy weight. Preventive and promotive efforts in dealing with obesity are made by providing knowledge about the ideal weight. The ability to select information from the mass media is also an important thing that must be cultivated to the public to obtain correct information from the mass media ([Ma & Xiao, 2010](#); [Tammelin et al., 2004](#)).

Dietary habit with obesity status in high school teachers

Diet is a variety of information that provides an overview of the kinds and amount of food eaten every day by one person and has a unique characteristic for a community group. Food consumption is the total amount of food available for use ([Newell & Cousins, 2015](#))

The result showed that there was association of eating pattern with obesity status in high school teachers in Kendari city, of 250 respondents, 155 of them had a proper diet and

95 had a poor diet. From 155 people who had adequate intake, 72.90% were obese and 27.10% were overweight. And from 95 people who had poor diet, there were 86.32% were fat and the remaining 13.68% overweight.

Five informants stated that the causes of obesity in line with the opinion of the researchers that many factors that cause obesity such as stress that leads to many meals, and yet stress will also cause less appetite, lack of exercise and diet and food consumption contain excessive carbohydrates. The other factor is the use of hormonal contraceptive acceptor ([Stewart et al., 2008](#)).

It is also supported by another opinion that the occurrence of obesity is generally related to the balance of energy in the body. The energy balance is determined by the energy intake derived from the energy-producing nutrients of carbohydrates, fats, and proteins and energy requirements established by the basal energy requirements, the activity of energy, and the thermic effect of food (TEF) i.e., the energy required to process the nutrients into energy ([Dieny & Dieny, 2007](#)).

Overweight people are more responsive than average body weight to external hunger requirements, such as taste and smell of food, or it is time to eat. Fat people tend to eat when they feel like eating, not eating when they are hungry. This excessive pattern makes them difficult to get out and overweight if the individual has no self-control and a strong motivation to lose weight ([Dewi & Mahmudiono, 2013](#); [Dieny & Dieny, 2007](#)).

Another factor causing obesity is poor eating behavior. Poor eating behavior is caused by several reasons, such as environmental and social. This is evidenced by the increasing prevalence of obesity in developed countries. Another cause of poor eating behavior is psychological factor, which eating behavior seems to be used as a means of stress distribution. Unhealthy eating behavior in childhood resulting in excess nutrients also contributes to obesity, this is based because the rate of formation of new fat cells increases

primarily in the first years of life, and the higher the fat storage rate, the higher also the number of fat cells. Therefore, obesity in childhood tends to lead to obesity in adult later ([Çolak et al., 2016](#)).

Stress with obesity status in high school teachers

The body responses to emotional, mental health is the release of hormones and neurotransmitters, the most dominant of which is the expenditure of adrenaline and noradrenaline. Also, emotional, psychological health also secretes the adrenocorticotrophic hormone, cortisol, aldosterone, vasopressin, and thyroid-stimulating hormone. When these substances increase in the body, the heart rate will grow faster and stronger, blood vessels carrying vasoconstriction, increased blood cholesterol, increased blood sugar, blood cells tend to clot ([Fox et al., 2016](#)).

The results showed that there was a significant relationship between stress and obesity status in high school teacher in Kendari. Of 250 respondents, 163 people experienced stress and 87 people were not stress. From 163 people who were suffering stress, there were 67.82% were obese and 32.18% were overweight. And from 87 people who were not stress, 83.44% were fat and 16.56% were overweight. This study was in line with other studies indicated that emotional factors can also cause obesity. Fat people often say they tend to eat more when they are tense or anxious, and experiments prove the truth. Fat people eat more in a very tense situation while people with normal weight eating in less stressful situations ([Ma & Xiao, 2010](#)).

In a study on a group of overweight people and a group of people with underweight weight, serving chips (snacks) after they watched four different films invite different emotions, tense, cheerful, stimulating sexual arousal and a boring lecture. In obese people found that they spend more on chips after watching a tight film that after watching a boring movie. While people with less weight appetite chips remain the same after watching

a tense movie or a boring movie ([Manurung, 2009](#)).

The results of this study also were in line with a popular view is that obesity begins and emotional problems are not resolved. Fat people thirst for love, like children, food is considered as a symbol of mother's affection, or overpopulation is as the substitution for substitute other satisfaction that is not achieved in life. Although such explanations are appropriate in some cases, some people who are overweight are not more psychologically disturbed than people with the healthy weight ([Park et al., 2013](#)).

Although many opinions say that obese people are usually unhappy, in fact, the inward pressure more results as a result of obesity. This is because in a society is often a skinny body equated with beauty, so fat people tend to play with the appearance and difficulty of controlling themselves, especially in matters relating to eating behavior ([Ma & Xiao, 2010](#); [Manurung, 2009](#)).

Activity with obesity status in high school teachers

Performing physical activity or motion on a regular basis is the initial concept of efforts to prevent cardiovascular disease and reasonable efforts for patients with cardiovascular disorders ([Tammelin et al., 2004](#)). Results from many studies have shown that physical activity decreases the incidence of hypertension, obesity, stroke, osteoporosis, urinary and coronary heart disease ([Khairuddin, 2014](#)). In association with coronary heart disease, it has been reported that inactive persons are 1.9 times more likely to have coronary heart disease than those who are active in exercise ([Tammelin et al., 2004](#)).

In this study, there was no relationship between physical activities with obesity p-value (0.869), X^2 count (0.027). Indeed, this is supported by some opinions. The influence of physical activity on adolescent weight is still controversial. There is evidence that obese teenagers are less active than usual, but the aspects of the physical activity that are very

influential on obesity cannot be clearly defined. A study suggested that there is a connection between sedentary lifestyles (such as mention television) with obesity. Where the total amount of physical activity or duration and the severity of physical activity performed is a critical factor in the occurrence of obesity ([Okop et al., 2016](#)).

A study in adolescent females and males in the United States age 11-15 years showed that, the lack of severe physical activity is the only risk factor for obesity in children and adolescents ([Yusuf et al., 2005](#)). In American children aged 8-16 years, the prevalence of obesity in children who watch TV <1 hour per day, and the highest in children who watch > 4 hours per day ([Wang et al., 2002](#)). Girls generally perform less physical activity than boys, and watching TV has a positive correlation with obesity in girls, controlling for age, race, family income, weekly physical activity, and energy intake ([Piepoli et al., 2016](#)). In Pima Indians aged 5 and 10 years old children show that obesity in 5-year-olds is associated with decreased participation in exercise, increased TV time, but is not associated with reduced participation Physical Activity Level (PAL), while obesity at the age of 10 years relates these three factors. Based on these results, it can be concluded that the decline in PAL seems to follow, rather than precede the development of obesity ([Piepoli et al., 2016](#); [Tammelin et al., 2004](#)). Physical activity done outdoors will be associated with eye exposure to the risk of obesity and heart function. Outdoor activities exposed to the sun will affect the metabolic processes that will affect obesity. Besides, more eye exposure will be associated negatively, especially in skin cancer ([Córdova, 2016](#)).

CONCLUSION

Factors associated with the incidence of obesity in high school teachers in Kendari Indonesia were age, knowledge, stress, and diet. The prediction factor of obesity among high school teachers was that the teachers with an upper age (age > 45 years) were likely to be

obese 2.64 times than the teachers at a young age (age <45 years). If the teachers experienced stress, then they would suffer from obesity 2.17 times compared with the teachers who had no stress.

Declaration of Conflicting Interest

None declared.

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Author Contribution

All authors contributed equally in this study.

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