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Research Article

The Effect of Family-Based Empowerment on Obesity among Adolescents in Tana Toraja

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Abstract

Background and Objective: Obesity is a major nutritional problem among adolescences and is becoming an epidemic. Globally, it is estimated that obesity is the fifth main cause of death and many factors underlie this problem. The rise in obesity prevalence in children and adolescents is due to environmental factors, such as diet and physical activity. This study aimed to examine a family-based empowerment model to prevent obesity in adolescents in Tana Toraja. **Materials and Methods:** This was a quasi-experimental study that was conducted using pre- and post-test measurements with a control group design. A total of 64 study participants were divided into two groups: 32 adolescents in the intervention group and 32 others in the control group. Data were obtained through a structured questionnaire regarding nutritional knowledge, attitude and behaviour. Nutritional status was determined after measuring weight and height by using digital scales. In addition, eating behaviours were measured using a food frequency questionnaire and 2 24 h recall forms. **Results:** The results showed that there were differences in nutritional knowledge ($p < 0.001$), nutritional attitudes ($p < 0.001$) and nutritional behaviour ($p < 0.001$) in both the intervention and control groups after the implementation of the family-based empowerment programme. The results of this study also showed that a family-based empowerment model for obesity prevention can be applied in the family and school settings in Indonesia. **Conclusion:** Nutritional education through the empowerment of families regarding the prevention of obesity has positive impacts on nutrition knowledge, attitudes and behaviour of adolescents, providing the tools to adopt an effective and controlled diet.

Key words: Diet, eating behavior, nutrition attitude, nutritional knowledge, obesity

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Data Availability: All relevant data are within the paper and its supporting information files.

INTRODUCTION

The World Health Organization reported that obesity is a major health problem that increases the incidence of many metabolic diseases in both developed and developing countries¹. In Asian countries, the prevalence of obesity has increased and the proportions of obese individuals vary from one country to another and among geographical regions within a country². Studies conducted in Bangladesh, Nepal and India from 1996-2006 in women aged 15-49 years showed a substantial increase in the prevalence of obesity in these countries. In Bangladesh, the prevalence of obesity increased from 2.7-8.9%, while in Nepal and India, the prevalence increased from 1.6-10.1 and 10.6-14.8%, respectively³. Obesity occurs in individuals of all ages, including adolescents, which contributes to a negative impact in the future; thus, addressing this problem is crucial. Obesity among adolescents contributes to the risk of cardiovascular disease, high blood glucose, high blood pressure, dyslipidaemia, high body mass index and low insulin sensitivity⁴. Obesity increases the risk of non-communicable diseases (NCDs)⁵.

The Indonesian Basic Health Research Survey (Riskesdas) demonstrated that the prevalence of obesity among adolescents increased from 1.4% (2007) to 7.3% (2013)⁶. In South Sulawesi Province, the prevalence of overweight and obesity among school-aged children reached 6.5% for overweight and 4.2% for obesity. Although these numbers were lower than the national prevalence among school-aged children, 10.8% for overweight and 8.0% for obesity, the high prevalence is still a big concern⁷. An initial study conducted at a junior high school in Tana Toraja confirmed that the problem of obesity among children is serious. The result of this survey showed that, of a total of 1,633 students measured, 9.74% were underweight, while 14.64 and 19.77% of students were overweight and obese, respectively. This finding indicates that the increase in overweight/obesity is a warning sign for the government and the public and that the increased prevalence will be a serious threat for the young Indonesian generation in the future. The governments should be aware of this problem and provide a good intervention.

It is well known that obesity is complex and caused by multiple factors, including knowledge, attitudes and behaviour. A lack of the appropriate knowledge, attitudes and behaviour results in an escalation of the risk of the causative factors of obesity, such as energy-dense food intake, high sugar-sweetened beverage consumption, large meal consumption, high frequency of snack consumption, high levels of sedentary behaviour and low levels of physical activity⁸. Having a better understanding of nutrition and a

good attitude may promote healthy lifestyle behaviours that can maintain health and reduce obesity risk in individuals, including adolescents.

Behavioural change programmes may be essential to combat the increasing incidence of obesity in the population. These programmes can also address the long-term impact of obesity in the future, which is more detrimental than before⁹. One of the strategies that may be a good alternative is family-based empowerment, which aims to provide health education for overweight adolescents to improve their lifestyle behaviours. Family or parents are categorized as a reinforcing factor that can improve adolescent eating behaviour and physical activity¹⁰. Family-based empowerment can be performed by providing nutritional education about balanced nutrition and eating behaviours and physical activity monitoring, as well as body weight and height monitoring¹¹. Considering the geographical situation in Tana Toraja, it is important to evaluate the nutritional status of the people, including adolescents, in this mountainous area. This study aimed to examine the family-based empowerment model for the prevention of obesity in adolescents in Tana Toraja.

MATERIALS AND METHODS

Study design: This was a quasi-experimental study that was conducted using a pre- and post-test design at Makale Junior High School in Tana Toraja District, Indonesia, in February 2018. This study was carried out with 64 overweight students who were divided into two groups, the intervention (32 participants) and control groups (32 participants), using a simple random sampling method.

Materials and research tools: Some variables, such as demographics, eating behaviours, physical activity and nutritional status of the children, were assessed. These data were collected through questionnaires and anthropometric measurements. The questionnaires that were used were a food frequency questionnaire, a repeated 24 h recall questionnaire and a structured questionnaire, while the measurements were weight and height, which were measured using digital scales¹².

Parameters measured: Obesity status was determined using the body mass index for age Z-score (BAZ). The z-score was calculated using WHO Anthro Plus 2007 software.

Statistical analysis: Univariate analysis was used to obtain an overview of the sample characteristics. Bivariate analysis was

used to analyse the association between the characteristics and the intervention. Additionally, bivariate analysis revealed the effect of the intervention on the three domains: knowledge, attitude and behaviour.

RESULTS

In Table 1, the dominant characteristics of both groups were 13 years of age (59.4%) and female (53.1%). For the treatment group, 62.5% of students were in seventh grade, the average body weight was 55.7 kg and the average height was 151.9 cm. A greater percentage of subjects in the control group were in eighth grade (62.5%) and the average body weight and height were 54.9 kg and 152.0 cm, respectively. The results of the chi-square test and independent t-test showed that the age, sex, weight and height in the treatment group did not differ from the same parameters in the control group (homogeneous).

The effect of family-based empowerment on changes in knowledge scores, attitudes and nutritional behaviour before and after the intervention in Tana Toraja is shown in

Table 2. All subjects demonstrated an increase in nutritional knowledge on post-test 1 and post-test 2 compared to their pre-test results. This result shows that there were differences in participant knowledge between pre-test and post-test 1 and post-test 2 for both groups. The increase in nutritional knowledge was higher in the control group than in the treatment group. All subjects had increased nutritional attitudes at post-test 1 and post-test 2. This finding also shows that there were differences in attitudes between pre-test and post-test 1 and post-test 2 in both the treatment and control groups. Nutritional attitudes and obesity scores were higher in the treatment group than in the control group. In terms of nutritional behaviour, all groups obtained a higher score on post-test 1 and post-test 2 compared to the pre-test scores. Nutritional behaviour scores were higher in the control group than in the treatment group.

Multivariate analysis was used to simultaneously assess the effect of the intervention in the treatment group. The effect of family-based empowerment on the changes in knowledge, attitudes and behaviours related to nutrition in the context of obesity prevention in Table 3. The Table 3

Table 1: Analysis of subject characteristics in the treatment and control groups

Characteristics	Groups				p
	Treatments		Control		
	No. 32	Percentage	No. 32	Percentage	
Age					
11 years old	2	6.3	0	0.0	1.000*
12 years old	9	28.1	7	21.9	
13 years old	19	59.4	19	59.4	
14 years old	2	6.3	6	18.8	
Sex					
Male	15	46.9	15	46.9	0.236*
Female	17	53.1	17	53.1	
Class					
Seventh grade	20	62.5	12	37.5	0.046*
Eighth grade	12	37.5	20	62.5	
Weight (kg)	55.75±4.79		54.88±4.17		0.439*
Height (cm)	151.94±6.77		152.00±5.93		0.969*

*Homogeneity Test, p = chi-square/independent t-test

Table 2: The effect of family-based empowerment on overweight adolescents in Tana Toraja

Family-based empowerment	Pre-test	1st post-test (p*)	Diff.	2nd post-test (p**)	Diff.
Nutrition education					
Treatment	15.72	19.78 (0.000)	4.06	23.13 (0.000)	7.41
Control	15.28	19.94 (0.000)	4.66	23.38 (0.000)	8.10
Attitude					
Treatment	42.38	46.50 (0.000)	4.12	49.28 (0.000)	6.90
Control	42.81	45.91 (0.000)	3.10	48.41 (0.000)	5.60
Behaviour					
Treatment	39.38	55.69 (0.000)	16.31	67.91 (0.000)	28.53
Control	43.00	58.00 (0.000)	15.00	71.78 (0.000)	28.78

*Chi-Square **Wilcoxon

Table 3: Multivariate analysis-the effect of family-based empowerment after intervention in both groups

Variables	Value	F	Sig.
Hotelling's Trace	0.671	6.372	0.000
Nutrition knowledge	1.000	1.216	0.274
Attitude about nutrition	12.250	15.761	0.000
Nutritional behavior	240.250	16.365	0.000

shows that the results of Hotelling's T test were $F = 6.372$ and $p < 0.001$. This finding indicates that there were differences in nutritional behaviour among adolescents who received the family-based empowerment intervention. Family-based empowerment also affected the nutritional attitudes and nutritional behaviours of adolescents ($p < 0.05$), while family-based empowerment did not affect nutrition knowledge ($p > 0.05$).

DISCUSSION

Knowledge about nutrition: Family-based empowerment, by increasing the provision of information about obesity prevention, is expected to change family behaviour, including increasing knowledge and changing attitudes and behaviours, as well as increasing the health awareness of family members. Increased knowledge and awareness related to maintaining and improving health is the beginning stage of feeling empowered to carry out health measures so that families understand how to live healthily. Through empowerment, via persuasion, the family is expected to take actions to maintain and improve their health. Maintenance actions and resulting health improvements are based on knowledge and awareness of nutrition through the learning process. Thus, the behaviour is expected to last for a long time because it is based on own awareness^{7,9,13}.

Knowledge about nutrition and obesity is a very important aspect because it is an initial step in changing a person's behaviour, which leads to a healthy life. Thus, obesity in children requires serious attention and involves the participation of family, especially parents. Parents who are responsible for children's health take the initiative to provide all types of food that are considered to meet the needs of the children, especially those originally from a high-income family since they will have a greater chance to have a choice regarding the type of food. The existence of these opportunities results in not selecting the type and amount of food based health needs and considerations but rather based on practical considerations that, if not balanced with physical activity, will affect the amount of calories burned^{8,14}. The results of the Wilcoxon test analysis showed that there was a difference in the nutritional knowledge of respondents' after

the intervention in the treatment group. This finding shows that knowledge of family nutrition increased after the intervention through modules, role play and focus group discussions. Knowledge is a person's ability to remember facts, symbols, technical procedures and theories¹⁵.

One strategic effort to improve adolescent health is to increase the knowledge of family and community nutrition to maintain the health of overweight children. The parents or families of teenagers provide healthy, nutritious and balanced foods that are low in fat and in accordance with the instructions of a nutritionist¹⁶. It can be posited that health education via the implementation of a family-based empowerment intervention for obesity prevention is very effective. Good nutritional knowledge is strongly supported by the increasing role and self-confidence of families. Families have high confidence to change their habits to adopt a healthy lifestyle at younger ages. Good youth nutritional knowledge is also in line with the knowledge and family culture that increased from the first to the sixth month. Knowledge of family nutrition is very important in maintaining and controlling overweight in teenagers, so that it will have an impact on the weight loss or BMI of overweight teenagers.

Similar results have been reported by Chu and Choe¹⁶ and Sulisnadewi *et al.*¹⁷, who showed that family health education is very effective in fighting diarrhoea in children in the treatment group. The research of Huriah and Lestari¹⁸ showed that there were significant differences in maternal knowledge in terms of caring for children with upper respiratory tract infections after being given health education. The health education approach for 6 months through the implementation of family-based empowerment in the treatment group resulted in an increase in nutritional knowledge regarding the prevention of obesity, stimulating adolescent weight loss⁹. Parents' knowledge that instils the importance of healthy eating resulted in increased attention of youths in terms of food selection. This is a good method to prevent the development of excessive body weight in the future, which may lead to obesity¹¹.

Family knowledge regarding how to control children's lifestyles will impact the reduction of adolescent body mass index (BMI). Family nutritional knowledge related to overweight and obesity is very important in changing children's behaviour. This study shows that changes in nutritional knowledge in the treatment group increased over time. This is because at the beginning of the study, the family, as companions of overweight adolescents, were given a module and then given 6 healthy nutrition counselling interventions at each visit, including health education about healthy and nutritious food, physical activity, healthy lifestyle

behaviours and health impacts. Thus, all families received knowledge for preventing and controlling lifestyle factors in overweight and obese adolescents.

Family-based empowerment related to obesity prevention is expected to help obese adolescents. This empowerment in providing education at home is more practical for adolescents because family has a stronger influence on the adoption of healthy behaviours in children. Family education provides more security and comfort for children than education provided by Hu³, Ryu *et al.*⁹ and Kant and Graubard¹⁹.

Attitude about nutrition: The recent study indicates that adolescents have good knowledge and attitudes regarding nutrition aspects and thus can independently choose foods required based on their nutritional needs²⁰. Therefore, adolescents need to have sufficient nutritional knowledge to improve their consumption habits²¹. The attitude in controlling diet has an impact on weight loss and this impact is influenced by the seriousness and perseverance of adolescents restricting foods that are high in calories²². Adolescent nutrition attitudes related to overweight and obesity are very important for changing adolescent behaviour. Table 2 shows that changes in nutritional attitudes in the treatment group increased from month to month. This increase occurred because at the beginning of the visit, the family, as companions of overweight adolescents, was given a module and then given 6 healthy nutrition counselling interventions at each family visit, including education about healthy and nutritious food, physical activity, healthy lifestyle behaviours and health impacts so that all overweight and obese adolescents could develop good nutritional attitudes for preventing and controlling lifestyle patterns. In this study, many obese adolescents were indifferent to their excess weight and many did not feel embarrassed by their weight condition, difficulty breathing, large cheeks, or enlarged buttocks, thighs and arms. In fact, most consider obesity a symbol of prosperity, which causes adolescents to reject the idea of reducing the intake of foods that may be high in fat and carbohydrates^{23,24}.

After receiving a family-based empowerment intervention, the adolescents tended to have a good nutritional attitude and the intervention also impacted their diet. Attitudes towards nutrition will greatly contribute to change the nutritional behaviour of adolescents. This result is because consumption behaviour is often influenced by more complex factors, especially the culture of eating with families in Tana Toraja, such as in the context of traditional parties and deaths requiring a long process¹¹. Through this process, the

experience gained is perceived as pleasant or unpleasant, which may be mostly influenced by an attitude of liking or disliking a food. In this case, nutritional education is essential because it can shape mental attitudes and positive behaviours towards nutrition. Moreover, an attitude can be learned and the environment also influences the attitude of the people²⁵. Different results were obtained by Haristia²⁶, who found that obesity prevention behaviours are mostly adopted by respondents with unfavourable attitudes, as high as 72.9%, compared to respondents with good attitudes, as high as 65.6%. However, in reality, many youths in this study gained more weight because of their poor attitude towards nutrition. As a result, their attitude influenced their food choice and resulted in more weight gain and ignorance regarding how to lose weight. In the end, many teenagers behave indifferently in terms of their body condition and tend to lose weight in the wrong way, such as taking medicine or reducing their daily meals. This study found a significant relationship between nutritional attitudes and the incidence of obesity but found that obesity tends to occur more in groups with negative attitudes, with a rate of approximately 52.3%.

Nutritional behaviour: Nutritional behaviours are the habits of an individual in procuring, preparing and consuming food. The related feelings and views are expressed in the form of eating and choosing healthy foods²⁷. If this situation is continuously done by the people, then it will become an eating habit. In this study, there was no difference in adolescent nutrition behaviour between the treatment group and the control group on post-test 1 and post-test 2. Changes in nutritional behaviours are reflected by variety of lifestyle habits, behaviours and experiences in terms of determining what to eat, which greatly affects the nutritional state of teenagers. Most school-age children in Toraja have fixed food patterns, which may be because of the nutritional behaviours of their family members or parents. This pattern is influenced by the cultural tradition of eating that is handed down from generation to generation. Although, there is a wide range of food intake, those who consume more food consistently do so, while those who eat less food maintain a relatively lower food intake than their counterparts^{6,28}. One of the underlying factors was the business entities that offer fast food because the Tana Toraja area is very popular and visited often by tourists. The availability of fast food caused changes in food consumption behaviour²⁹. This study was supported by the research conducted by Lopes³⁰ who showed that being exposed to fast food restaurants can support behavioural changes resulting in excessive food consumption^{6,11}. The absence of public policy in regulating unhealthy food,

including sugar-sweetened beverages sold in many fast food restaurants, may increase the possibility of excessive food intake³¹.

A good method for the prevention of excess weight gain is providing good nutritional knowledge regarding food choice^{22,28}. The Toraja traditional food is high in fat because the cultural eating behaviours among Toraja tribes are different from those of other tribes in Indonesia. According to Lee *et al.*¹ and Pearson and Biddle³², overeating behaviour was significantly associated with obesity in adolescents. However, contrary to previous research conducted in Makassar, eating behaviour has no effect because the eating pattern was controlled¹³. Parental eating behaviour can influence children's eating behaviour by making certain foods available and influencing attitudes towards certain situations^{6,14}. Thus, focusing on promoting healthy habits in adolescence is important because it can contribute a long-term effect on physical and mental health, especially in terms of consuming healthy and nutritious foods.

CONCLUSION

Nutritional education provided by empowering families in the effort to prevent obesity has positive impacts on nutrition knowledge, attitudes and behaviour of adolescents, especially in terms of effective diet control.

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