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ORIGINAL

RISK FACTORS FOR OBESITY INCIDENTS AS SEEN FROM PARENTING PATTERNS AND PARENTAL CHARACTERISTICS IN PRESCHOOL AGE CHILDREN IN MANGGARUPI KINDERGARTEN, GOWA DISTRICT IN 2025: A CASE CONTROL STUDY

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ABSTRACT

Background: One of the provinces in Indonesia, namely South Sulawesi, shows that children who are overweight (9.3%) and obesity (6.2%). The impact of obesity on children can lead to health and social problems in both the short and long term. This study aims to identify risk factors for obesity in preschool-aged children. **Objective:** To analyze the risk factors for obesity incidents in terms of parenting patterns and parental characteristics in pre-school aged children. **Method:** This study used a case-control design involving mothers with preschool-aged children. Data were collected from June to July 2025 through anthropometric measurements and interviews using a questionnaire. Data analysis used univariate, bivariate, and multivariate analysis using the Stata application. **Results:** Overall, it shows that children with mothers with poor parenting patterns are at 3.01 times risk of experiencing obesity (OR=3.01; 95% CI 1.05-9.05); mothers with less knowledge have a 3.18 times risk of experiencing obesity (OR=3.18; 95% CI 1.11-9.57); mothers with low education have a 1.26 times risk of experiencing obesity (OR=1.26; 95 CI 0.35-4.07); working mothers have a 2.72 times risk of having obese children (OR=2.72; 95% CI 0.94-7.70); families with high socioeconomic status have a 0.44 times lower risk of having obese children (OR=0.44; 95% CI 0.15-1.22). **Conclusion:** The most influential risk factor was maternal occupation, after controlling for age

and child gender. Based on these results, it is hoped that health service program outreach efforts will be improved, particularly within the community and schools, to increase knowledge and awareness, and promote healthier lifestyles.

KEYWORDS: Parenting Patterns, Parental Characteristics, Obesity, Risk Factors

1. INTRODUCTION

Childhood obesity is a public health problem of growing global concern. A World Health Organization report noted that the prevalence of overweight and obesity in children under five continues to increase and has reached 37 million cases globally by 2022. Although previously considered a problem in high-income countries, this trend is now increasingly prevalent in developing countries, including Indonesia. Nearly half of the world's obese children in 2022 lived in Asia. In Southeast Asia, the prevalence of childhood obesity in Indonesia ranked highest at 12%. Indonesia currently faces a serious challenge in the form of a double burden of nutritional problems, namely high rates of stunting, wasting, and overweight simultaneously. Based on data from the Indonesian Health Survey, the prevalence of overweight in children aged 5–12 years was 11.9% and obesity was 7.8%. In South Sulawesi Province, the prevalence of overweight and obesity was 9.3% and 6.2%, respectively. Gowa Regency is recorded as one of the areas with a fairly high rate of childhood obesity in the province, namely 3.9% (Riskesdas, 2018). Childhood obesity has serious consequences not only for physical health but also for psychosocial and developmental issues. In the short term, obesity can lead to psychological disorders such as anxiety, depression, and low self-esteem, as well as physical complaints such as joint pain and limited physical activity (Di Cesare et al., 2019). In the long term, obese children are at high risk of developing degenerative diseases such as type 2 diabetes mellitus, hypertension, cardiovascular disease, and even premature death (Triana, Lestari, Anjani, & Yudiutami, 2020). The preschool period (ages 4–6 years) is a critical phase in a child's growth and development, greatly influenced by the family environment, particularly parental parenting styles (Shekari & Ahmadabad, 2023). Parenting styles play a major role in shaping a child's eating habits and lifestyle. Parents with poor control over their child's food consumption and activity tend to increase the risk of obesity in children (Zhou, 2020). In addition, classifications of parenting styles such as authoritative, authoritarian, and permissive have different impacts on the formation of children's eating and physical activity behaviors (Baumrind, 1967). Permissive parenting, for example, is often associated with unhealthy eating behaviors due to a lack of parental control. Parental characteristics such as education level, occupation, and nutritional knowledge also play an important role in child care and feeding. Mothers with

low levels of education and nutritional knowledge tend to have limitations in providing healthy food and controlling their children's diets (Hastuti, Afifah, Sugianto, Anjani, & Noer, 2024). Furthermore, working mothers also face challenges in monitoring their children's food consumption and physical activity, which can contribute to an increased risk of obesity (Oddo et al., 2017). Similarly, family income does not directly reflect dietary quality; both low- and high-income families can be at risk of obesity if not balanced with good consumption patterns and nutritional literacy (Dinsa, Goryakin, Fumagalli, & Suhrcke, 2012). By considering these various factors, comprehensive research efforts are needed to identify risk factors for obesity in preschool-aged children, particularly from parenting patterns and parental characteristics.

2. Participants & Methods

This study design is a case-control study. This study was conducted in a kindergarten within the working area of the Samata Community Health Center, Gowa Regency. This study has obtained ethical permission from the Research Ethics Committee of the Faculty of Public Health, Hasanuddin University with number: 988/UN4.14.1/TP.01.01/2025. The population in this study were mothers who have preschool-aged children (5-6 years) in kindergarten. Involving 100 samples consisting of 25 cases and 75 controls. The case group was selected using simple random sampling while the control group used systematic random sampling. Data were collected from June to July 2025. Parenting variables and parental characteristics such as level of knowledge, education, occupation and socioeconomic status were collected using a structured interview questionnaire. Children's weight and height were measured using a 0.1 kg scale and a 200 cm microtoise. Before stepping on the scale, the children removed their socks and shoes. They were then asked to step onto the scale after the number "0.0" appeared on the screen. The measurement results were displayed on the screen and recorded by the researcher. Height was measured using a wall-mounted microtoise. Before taking the measurement, the children were asked to remove their shoes and stand with their backs to the wall, facing forward. The backs of their feet, calves, buttocks, upper backs, and heads should touch the wall. Their position should be directly below the lowerable scale. BMI data was determined based on BMI/U. The Z-score for BMI/U was determined and classified based on Indonesian Minister of Health Regulation No. 2 of 2020. The data were analyzed using STATA software version 14. This research analysis used the chi-square test to determine the relationship between the dependent and independent variables. Then the Odds Ratio test was used. To assess the estimated risk of each factor influencing obesity, multivariate logistic regression analysis was used to determine the dominant variables and their extent of influence on obesity in preschool children.

3. Findings

3.1 Respondent Characteristics

Table 1 shows the distribution of characteristics of respondents who have obese and non-obese children. It is known that the highest percentage of children in the case group is 5 years old (72%). Then, based on gender, in the case group, those who are obese are more likely to be male, at 52%. Based on maternal occupation, it is known that the highest percentage in the case group with obese children are housewives at 72%.

Table 1: Distribution of Respondent Characteristics

VARIABLES	THE INCIDENCE OF OBESITY			
	CASE		CONTROL	
	n	%	n	%
AGE				
5 YEARS	18	72.00	62	82.67
6 YEARS	7	28.00	13	17.33
GENDER				
MAN	13	52.00	37	49.33
WOMAN	12	48.00	38	50.67
MOTHER'S JOB				
HOUSEWIFE	19	72.00	56	74.67
TEACHER	0	0.0	1	100
HONORARY EMPLOYEES	0	0.0	1	100
CIVIL SERVANTS/TNI/POLRI/BUMN/BUMD	4	30.77	9	69.23

3.2 Bivariate Analysis

Table 2(a): Analysis of Risk Factors for Obesity

VARIABLES	THE INCIDENCE OF OBESITY				OR (95% CI)	P VALUE
	CASE		CONTROL			
	n	%	n	%		
PARENTING					3.01 (1.05-9.05)	0.02
NOT GOOD	17	68.00	31	41.33		
GOOD	8	32.00	44	58.67		
LEVEL OF KNOWLEDGE					3.18 (1.11-9.57)	0.01
NOT ENOUGH	17	68.00	30	40.00		
GOOD	8	32.00	45	60.00		
MOTHER'S JOB					2.72 (0.94-7.70)	0.67
WORK	12	48.00	19	25.33		
DOESN'T WORK	13	52.00	56	74.67		
SOCIOECONOMIC STATUS					0.44 (0.15-1.22)	0.08

Table 2(b): Analysis of Risk Factors for Obesity

VARIABLES	THE INCIDENCE OF OBESITY				OR (95% CI)	P VALUE
	CASE		CONTROL			
	n	%	n	%		
TALL	10	40.00	45	60.00		
LOW	15	60.00	30	40.00		
AGE					1.85 (0.53-5.91)	0.24
5 YEARS	18	72.00	62	82.67		
6 YEARS	7	28.00	13	17.33		
GENDER					1.11 (0.40-3.05)	0.81
MAN	13	52.00	37	49.33		
WOMAN	12	48.00	38	50.67		

Table 2 shows the results of the analysis of risk factors for obesity. Based on the results of statistical tests, it was found that children whose mothers had poor parenting patterns had a 3.01 times risk of experiencing obesity compared to children whose mothers had good parenting patterns (OR=3.01; 95% CI=1.05-9.05; p=0.02). Based on the results of the analysis, it was shown that children whose mothers had low levels of knowledge had a 3.18 times chance of experiencing obesity compared to children whose mothers had good levels of knowledge (OR=3.18; 95% CI=1.11-9.57; p=0.01). Children whose mothers had low educational status had a 1.26 times chance of experiencing obesity compared to children whose mothers had high educational status (OR=1.26; 95% CI=0.35-4.07; p=0.67). The analysis results showed that children whose mothers worked had a 2.72 times higher risk of obesity compared to children whose mothers did not work (OR=2.72; 95% CI=0.94-7.70; p=0.03). Children from families with high socioeconomic status had a 0.44 times lower chance of experiencing obesity compared to children from families with low socioeconomic status (OR=0.44; 95% CI=0.15-1.22; p=0.08). The analysis results showed that 6-year-old children had a 1.85 times lower chance of experiencing obesity compared to 5-year-old children (OR=1.85; 95% CI=0.53-5.91; p=0.24).

3.3 Multivariate Analysis

Table 3: Final Multivariate Analysis Model

VARIABLES	OR	SE	Z	P	95% CI
PARENTING	2.90	1,612	2.17	0.030	1,006-8,358
WORK	5.35	3,149	2.76	0.008	1,558-18,428
SOCIOECONOMIC STATUS	0.28	0.152	-2.30	0.035	0.087-0.915

There are 5 variables that meet the requirements (p<0.25) for multivariate analysis. There are 3 analysis models so that the 3rd model is the final analysis model resulting in 3 variables related to the incidence of obesity

in preschool children, namely parenting, employment and socioeconomic status. The results of the multivariate analysis in table 3 show that the Odd Ratio (OR) value is smaller than 1, namely socioeconomic status (OR=0.28) is a protective and significant factor because the Lower and Upper values do not contain the value 1. The parenting variable has an OR value of 2.90 greater than 1 so it is a risk factor, with a Lower value of 1.006 and Upper 8.358 does not contain a value of 1 which means it is statistically significant so it can be interpreted that mothers with poor parenting patterns have a 2.90 times risk of obesity in children. The occupational variable is the most influential factor on the incidence of obesity with an OR value of 5.35 greater than 1 so it is a risk factor, the Lower 1.558 and Upper 18.42 values do not contain a value of 1 which means statistically significant so it can be interpreted that respondents who work are at 5.35 times greater risk of obesity in children. It can be concluded from the 7 variables analyzed; there are 3 variables that are most related consisting of 2 variables that are risk factors for obesity. Meanwhile, there is 1 protective factor, namely the socioeconomic status variable (Table 3).

4. Discussion

Childhood obesity is a risk factor for diabetes, cardiovascular dysfunction, and other comorbidities in adulthood. Children are a particularly vulnerable group to nutritional problems. This can occur because 5-year-olds experience a crucial transitional phase in their development, marked by behavioral and physiological changes that contribute to an increased risk of obesity (Farooq et al., 2020). Furthermore, children begin to demonstrate independence in choosing foods, including ultra-processed foods high in salt, sugar, and fat. Recent research conducted in the UK suggests that up to 60% of a 5-year-old's caloric intake comes from ultra-processed foods (UPFs) consumed from the age of 3, and consumption of these UPFs is associated with an increased risk of obesity and chronic disease in the future (Jebb, Aveyard, & Hawkes, 2013). Based on gender, the most cases occurred in boys, namely 52% compared to girls, namely 48%. The results of this study are in line with research (Zimmermann, Gübeli, Püntener, & Molinari, 2004) in 8 kindergartens in Denpasar City, which showed that the proportion of obese children was dominated by boys, namely 29.8% compared to girls, namely 2.7%. The study also stated that in certain races, including in Asia, the male gender is known to be mostly over weight. Compared to girls, he said, of 50 overweight boys, 86% will remain obese into adulthood, and of 50 obese girls, 80% will remain obese into adulthood. The results of this study are in line with Triana's research which stated that there is a relationship between parenting patterns and the incidence of obesity (Triana et al., 2020). The results of this study are strengthened by research conducted (Permata, 2023) which found that there is a relationship between nutritional parenting patterns and the nutritional status of toddlers in kindergarten. According to Ulfa et al. (Ulfa,

Anggari, & Nuzula, 2022), children who receive good care and are given sufficient and nutritious food, the growth of brain cells and their physical will take place well. The impact of poor parenting patterns is that children have difficulty eating so that it can affect the amount of nutritional needs of the body per day in children which can lead to obesity and overweight in children. Based on the research that has been conducted, the results obtained show that the majority of respondents in the case group applied an authoritative parenting style and the lowest was an authoritarian parenting style. A good parenting style is an authoritative parenting style, because authoritative parenting does not only prioritize the interests of parents over the interests of children and vice versa (Ulfa et al., 2022). Parents with an authoritative parenting style provide supervision of every child's activity, where parents provide freedom accompanied by a full sense of responsibility that children can carry out activities and socialize. Although authoritative parenting is an ideal parenting style, in this study it was found that more mothers applied an authoritative parenting style in the case group. This shows that the effectiveness of authoritative parenting in preventing childhood obesity is greatly influenced by the mother's knowledge of nutrition and child diet management. In addition, the role of culture and environment can also influence the impact of parenting on children's nutritional status. The results of this study are in line with research conducted by (Amalia & Jayanti, 2022) showing that there is a relationship between knowledge and the incidence of overweight in children. Knowledge is the main capital for mothers to improve the health and quality of life of their families, the level of education plays a major role in receiving and understanding existing information, the higher the mother's education, the better the mother's knowledge regarding good parenting patterns, food selection and food processing that contain balanced nutrition to prevent children from becoming obese (Amalia & Jayanti, 2022). The lack of maternal knowledge regarding balanced nutrition is also influenced by one of them, education. The results of this study show that the majority of mothers have a low education, namely elementary school graduates (36.36%). According to (Sari, 2022) the higher level of education, the better their absorption of information becomes. Not only that, mothers with a high level of education will also be better in terms of their mindset. So, a good mindset will cause someone to have better analytical abilities (Sari, 2022). The results of statistical analysis show that children whose mothers have low education have a 1.26 times greater chance of experiencing obesity. The results of this study are in line with research conducted by (Riany & Ahmad, 2021) which showed that maternal education has a two-fold greater risk of experiencing obesity and is not statistically related. Similar research also shows that there is a positive relationship between maternal education and the incidence of overweight in Colombia with OR = 1.90 and Kenya with OR = 4.80. Where the majority of mothers are highly educated so they have a tendency to have extensive

knowledge and easily understand information both from formal education they have taken and from the mass media to maintain children's health in achieving good nutritional status so that children can develop optimally. The results of this study are in line with research conducted by Ferdian et al., (Ferdian, Shaluhiyah, & Kartini, 2023) who stated that working mothers are twice as likely to have overweight children. Maternal employment is associated with less time for maternal activities related to child-rearing, such as selecting food ingredients, spending time with children, and preparing food. This condition can be associated with an increased risk of obesity in children due to the lack of maternal involvement in regulating children's food intake, which results in unbalanced eating patterns and the possibility of excess calorie intake. The results of this study are in line with research conducted by (Permata, 2023) stating that there is no relationship between family income level and the nutritional status of kindergarten children. In addition, the results of Nugraha's (Nugraha, Relaksana, & Siregar, 2021) study also showed different results where individuals with higher socioeconomic status were positively and significantly correlated with overweight and obesity. This may be caused by individuals with higher income levels tending to behave more consumptive, especially in consuming food and drinks, which will increase the number of calories entering the body.

5. Conclusion

The results of this study indicate that maternal occupation and parenting styles are the factors influencing obesity in preschool-aged children. Socioeconomic status, on the other hand, is a protective factor. This study recommends that parents be more active in monitoring and maintaining their children's normal nutritional status, paying attention to meal frequency and the types of food consumed to ensure balanced nutrition.

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Author Contributions

Auwlya Zhafitry Haris, Andi Zulkifli Abdullah, Ansariadi: Study concept and design. Auwlya Zhafitry Haris: Collecting and processing research data. All authors: preparation of the publication manuscript.

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