The Relationship Between Parental Knowledge, Attitudes, and Preventive Efforts Toward the Risk of Diabetes Mellitus in Overweight and Obese Elementary School Children

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Abstract

Background: Childhood obesity is a growing public health problem globally, strongly linked to the early onset of type 2 diabetes mellitus (T2DM). In Indonesia, the prevalence of obesity in children aged 5–12 years has reached 9.2%, with higher rates in urban areas. Parental knowledge, attitudes, and preventive efforts are considered important determinants in shaping children's lifestyle behaviors and may influence their risk of T2DM.

Methods: This study employed a descriptive-analytic cross-sectional design at SDN Jelambar 08, including parents and students from grades 1 to 6. A purposive sampling method was used, resulting in 190 respondents. Independent variables were parental knowledge, attitudes, and preventive efforts, while dependent variables included risk of T2DM and overweight/obesity status. Data were collected using self-administered questionnaires for parents and anthropometric measurements for children. Data analysis was performed with SPSS, using descriptive statistics and chi-square tests.

Results: The study showed that 63.7% of parents were aware of diabetes risk factors, 71.1% demonstrated good attitudes, and 74.2% reported preventive efforts. Of the 190 children, 29.5% were classified as overweight or obese. Chi-square tests revealed no statistically significant association between parental knowledge (p=0.911), attitudes (p=0.140), or preventive efforts (p=0.872) and children's diabetes risk in the context of overweight and obesity.

Conclusions: Parental knowledge, attitudes, and preventive efforts were not significantly related to the risk of diabetes mellitus in overweight and obese children. A multifactorial approach that combines parental education, school-based programs, and pediatric monitoring is needed to address childhood obesity and prevent diabetes onset.

Introduction

Diabetes mellitus is a metabolic disorder characterized by increased glucose levels in the bloodstream. This condition is classified into several types, including type 1 diabetes, type 2 diabetes, gestational diabetes, and other types of diabetes.[1] Type 1 diabetes mellitus is caused by an autoimmune reaction in which the immune system attacks insulin-producing cells, resulting in either a complete absence or severe deficiency of insulin production. This condition commonly occurs in children and adolescents. Type 2 diabetes mellitus, on

the other hand, develops when the body does not respond effectively to insulin or fails to utilize insulin properly. It often occurs in adults but is increasingly being diagnosed in children and adolescents, primarily due to rising obesity rates and unhealthy lifestyles.[2]

According to the Indonesian Pediatric Society (Ikatan Dokter Anak Indonesia, IDAI), cases of diabetes in children in Indonesia increased significantly from 2010 to 2023. In 2023, the number of cases reached 1,645, which is a 70-fold increase compared to 2010. Type 1 diabetes is the most common among children, while type 2 diabetes accounts for about 5–10% of all cases. The distribution of cases was recorded in 13 major cities across Indonesia. Approximately 60% of patients were female. The highest prevalence was observed in children aged 10–14 years (46%) and those over 14 years (31%).[5] Over the past 10 years, the incidence and prevalence of type 1 diabetes have significantly increased across many groups, particularly among younger children, with growth rates ranging from 200% to 300%. In 1980, the number of type 1 diabetes cases in children across Indonesia was fewer than 100, but by 2014, the number had risen to more than 1,000 cases.[4]

The increase in type 2 diabetes among children aged 5–19 years has grown tenfold from 1975 to 2016 in Indonesia. According to the Indonesian Nutritional Status Survey (SSGI) 2022, 10.8% of children aged 5–12 years were overweight and 9.2% were obese, largely attributed to a lack of physical activity.[6] Obesity or overweight occurs due to an imbalance between dietary energy intake and energy expenditure.[7] According to IDAI, there were 42 million cases of diabetes in 2013, and this figure is projected to increase to 70 million in 2024.[8]

The symptoms of type 1 diabetes in children appear suddenly and progress rapidly, while in type 2 diabetes, symptoms are harder to detect and develop gradually. This study focuses on the risk of type 2 diabetes in children because its prevalence is higher than type 1 diabetes in this age group. This knowledge is expected to support preventive strategies by improving diet and lifestyle.[9]

Research on diabetes mellitus exists; however, no data have been found on the relationship between parental knowledge, attitudes, and preventive efforts against the risk of type 2 diabetes mellitus in obese and overweight elementary school children. Therefore, the researchers are interested in conducting such a study.

The research questions are as follows:

1. What is the level of parental knowledge, attitudes, and preventive efforts regarding the risk of type 2 diabetes mellitus in obese and overweight children?
2. What is the nutritional status profile of children at SDN Jelambar 08?

This study aims to examine the relationship between parental knowledge, attitudes, and preventive efforts regarding the risk of type 2 diabetes mellitus in obese and overweight children at SDN Jelambar 08, and to determine the prevalence of obesity among children at SDN Jelambar 08 Pagi.

Material And Methods

This study employed a descriptive-analytic approach with a cross-sectional design. The target population comprised all parents and students from grades 1 to 6 at SDN Jelambar 08 Elementary School. Sampling was conducted using a purposive sampling technique based on predefined inclusion criteria. One class from each grade level was selected, resulting in a total sample size of 190 participants, which was determined using the standard formula for cross-sectional studies.

The independent variables in this study were parental knowledge, attitudes, and preventive practices toward the risk of type 2 diabetes mellitus. The dependent variables included the risk of type 2 diabetes mellitus as well as overweight

and obesity status among children. Data collection utilized a self-administered questionnaire distributed via Google Forms, accompanied by an informed consent form for parents. For children, anthropometric measurements (weight and height) were obtained to assess nutritional status.

Primary data consisted of parental questionnaire responses and children's anthropometric measurements. The collected data were subsequently analyzed using Statistical Package for the Social Sciences (SPSS) software. Both descriptive statistics and inferential analysis were performed, with the chi-square test applied to evaluate the study hypotheses regarding the association between parental factors and diabetes/obesity risk.

Result

The characteristics of respondents are presented in Table 1. Of the total 190 children included, slightly more than half were female (52.6%) and the remainder were male (47.4%). The distribution of age was relatively even, with each age group from 7 to 12 years contributing between 16.3% and 16.8% of the sample. Likewise, the grade distribution was uniform across classes 1 through 6, each comprising approximately one-sixth of the participants.

Table 1. Respondent Characteristics

Characteristic	Frequency	Percentage (%)
Sex		
Male	90	47.4
Female	100	52.6
Age		
7 years	32	16.8
8 years	31	16.3
9 years	32	16.8
10 years	31	16.3
11 years	32	16.8
12 years	32	16.8
Grade		
Grade 1	32	16.8
Grade 2	31	16.3
Grade 3	32	16.8
Grade 4	31	16.3
Grade 5	32	16.8
Grade 6	32	16.8

Research variables related to knowledge, attitudes, and preventive efforts toward the risk of diabetes mellitus are shown in Table 2. A majority of parents were aware of diabetes risk factors (63.7%), while 36.3% reported being unaware. Regarding attitudes, 71.1% demonstrated good attitudes toward prevention, compared to 28.9% with poor attitudes. Preventive efforts were reported by 74.2% of respondents, whereas 25.8% indicated no preventive actions.

Table 2. Research Data on Variables Related to the Risk of Diabetes Mellitus in Children

Variable	Frequency	Percentage (%)
Knowledge		
Aware	121	63.7
Not Aware	69	36.3
Attitude		
Good	135	71.1
Not Good	55	28.9
Preventive Effort		
Practicing Prevention	141	74.2
Not Practicing Prevention	49	25.8

Table 3. Analysis Results of the Relationship Between Knowledge and BMI

	BMI		
	Underweight – Normal	Overweight – Obese	Total
Knowledge			
Aware	85	36	121
Not Aware	49	20	69
Total	134	56	190

The relationship between research variables and children's nutritional status, measured using BMI categories, is summarized in Tables 3–5. Table 3 presents the association between knowledge and BMI, showing that among those who were aware, 85 children were underweight–normal and 36 were overweight–obese, while in the unaware group, 49 were underweight–normal and 20 were overweight–obese. Table 4 illustrates the distribution based on attitude, with 91 children classified as underweight–normal and 44 as overweight–obese in the good attitude group, compared to 43 and 12, respectively, in the poor attitude group. Table 5 demonstrates the relationship between preventive efforts and BMI, indicating that children whose parents reported preventive actions included 99 underweight–normal and 42 overweight–obese, while in the non-preventive group, 35 were underweight–normal and 14 overweight–obese.

Table 4. Analysis Results of the Relationship Between Attitude and BMI

	BMI		
	Underweight – Normal	Overweight – Obese	Total
Attitude			
Good	91	44	135
Not Good	43	12	55
Total	134	56	190

Table 5. Analysis Results of the Relationship Between Preventive Efforts and BMI

	BMI		
	Underweight – Normal	Overweight – Obese	Total
Preventive Effort			
Practicing Prevention	99	42	141
Not Practicing Prevention	35	14	49
Total	134	56	190

The results of chi-square testing are presented in Tables 6–8. Table 6 details the chi-square analysis between knowledge and risk of diabetes mellitus in overweight and obese children, with Pearson Chi-Square value of 0.012 (p = 0.911). Table 7 shows the analysis of attitude toward diabetes risk, with Pearson Chi-Square value of 2.182 (p = 0.140). Table 8 reports the results for preventive efforts, with Pearson Chi-Square value of 0.026 (p = 0.872). Each table includes further statistical indices such as continuity correction, likelihood ratio, Fisher's exact test, and linear-by-linear association, with a total of 190 valid cases analyzed in all tests.

Table 6. Chi-Square Test Results of Knowledge Variable on the Risk of Diabetes Mellitus in Overweight and Obese Children

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	.012[a]	1	.911		
Continuity Correction[b]	.000	1	1.000		
Likelihood Ratio	.012	1	.911		
Fisher's Exact Test				1.000	.524
Linear-by-Linear Association	.012	1	.911		
N of Valid Cases	190				

Table 7. Chi-Square Test Results of Attitude Variable on the Risk of Diabetes Mellitus in Overweight and Obese Children

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	2.182[a]	1	.140		
Continuity Correction[b]	1.695	1	.193		
Likelihood Ratio	2.264	1	.132		
Fisher's Exact Test				.163	.095
Linear-by-Linear Association	2.171	1	.141		
N of Valid Cases	190				

Table 8. Chi-Square Test Results of Preventive Effort Variable on the Risk of Diabetes Mellitus in Overweight and Obese Children

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	.026a	1	.872		
Continuity Correction[b]	.000	1	1.000		
Likelihood Ratio	.026	1	.872		
Fisher's Exact Test				1.000	.513
Linear-by-Linear Association	.026	1	.873		
N of Valid Cases	190				

Discussion

In this study, the relationship between parental knowledge, attitudes, and preventive measures toward the risk of diabetes mellitus in elementary school children with obesity or overnutrition was investigated. The results showed that most respondents were female, totaling 100 (52.2%), while male respondents numbered 90 (47.4%). The prevalence of obesity based on Body Mass Index (BMI) was higher in females compared to males, which may be attributed to the tendency of females to develop central obesity. Differences in fat metabolism between sexes may explain why the prevalence of obesity is higher in females than in males.

These findings are consistent with the results of Septiyanti & Seniwati (2020), which showed that in general, females have a higher percentage of body fat compared to males. In addition, females tend to accumulate adipose tissue in the gluteofemoral region, while males are more likely to experience central obesity characterized by abdominal fat deposition. This highlights the complexity of gender-based differences in obesity patterns and their implications for the risk of diabetes mellitus in children with obesity or overnutrition.[10]

In this study, it was found that most respondents with obesity and at risk of diabetes were female. This result is consistent with previous studies showing that women's metabolism tends to be slower compared to men, thereby increasing their risk of developing type 2 diabetes mellitus.[11] According to Widiyoga et al. (2020), type 2 diabetes mellitus occurs more frequently in women than in men.[27] Women are more vulnerable to type 2 diabetes mellitus due to differences in sex chromosomes, autosomal gene expression, and sex hormones. Men generally have lower levels of Low-Density Lipoprotein (LDL) compared to women. During the peri-menopausal and menopausal periods, the decline in estrogen levels in women may increase LDL levels in the body, which contributes to a higher risk of elevated cholesterol transport.[12]

Relationship between Knowledge, Attitudes, and Preventive Efforts toward the Risk of Diabetes Mellitus in Obese and Overnourished Children

Based on this study, the majority of respondents (63.7%) were aware of the risk of diabetes mellitus in children with obesity or overnutrition. This indicates a relatively good level of knowledge among respondents. However, statistical analysis showed that there was no significant relationship between respondents' knowledge about the risk of diabetes mellitus and the incidence of obesity in children from grades 1–6 at SDN Jelambar 08 ($p = 0.911$).

In terms of knowledge, 85 respondents were aware of cases of children who were not obese (Underweight–Normal), while 36 respondents were aware of cases of children who were obese (Overweight–Obese). Conversely, 49 respondents were not aware of cases of Underweight–Normal, and 20 respondents were not aware of cases of obesity.

In this study, 71.1% of respondents showed a positive attitude toward the risk of diabetes mellitus in children with obesity or overnutrition. Although not reaching 100%, this positive attitude can be considered an important factor in prevention. Nevertheless, statistical testing revealed no significant relationship between respondents' attitudes toward the risk of diabetes mellitus and the incidence of obesity among children in grades 1–6 at SDN Jelambar 08 ($p = 0.140$).

Parents with a positive attitude toward children with obesity were relatively fewer,

while those with a negative attitude were more common. According to the researchers, this may be due to parents' awareness of the dangers of childhood obesity, which motivates them to take more proactive preventive measures. Parents who understand the risks and preventive actions regarding obesity tend to adopt healthy lifestyles for their children. This includes controlling their child's diet by monitoring daily intake, encouraging regular physical exercise, reducing excessive sedentary behavior, and limiting fast food consumption.

By contrast, parents with negative attitudes were more likely to allow their children to consume food without close supervision. They may pay less attention to their child's weight because of the belief that a "chubby child" is a healthy child. However, not all overweight children are obese, and this approach may increase the risk of obesity due to excessive food consumption. Overall, parental attitudes toward childhood obesity have a significant impact on children's daily behaviors regarding diet and physical activity, which in turn can influence their risk of obesity.

Based on this study, 74.2% of respondents reported taking preventive measures against the risk of diabetes mellitus in children with obesity or overnutrition. These efforts included dietary control and increased physical activity, both of which are known to reduce the risk of obesity. However, statistical analysis showed no significant relationship between respondents' preventive efforts and the incidence of obesity in children in grades 1–6 at SDN Jelambar 08 ($p = 0.872$).

Relationship between Knowledge, Attitudes, and Preventive Efforts toward BMI among Parents and Children in Grades 1–6

This study found no significant relationship between respondents' knowledge of Body Mass Index (BMI) and the incidence of obesity in children. This was supported by statistical results showing a significance value (p) greater than 0.05.

The study also revealed no significant relationship between respondents' attitudes toward BMI and the incidence of obesity in children. Statistical analysis showed a p-value greater than 0.05, indicating that the result was not statistically significant. Thus, this study did not demonstrate any correlation between parental attitudes and obesity incidence in children in grades 1–6 at SDN Jelambar 08 Pagi.

However, these findings differ from the theory proposed by Suiraoka (2012), who stated that technological and global information developments have changed lifestyles in several major cities in Indonesia, including parental attitudes toward children's eating patterns and physical activities.

According to Festy (2012), parents, as the primary guardians of their children's health, tend to provide food that they believe fulfills their children's nutritional needs. However, parents with higher incomes are more likely to choose food based on practicality (such as fast food) without considering health aspects. This may result in excessive calorie intake not balanced with children's physical activity, leading to obesity.

In the context of childhood obesity prevention, the importance of parental attitudes is strongly emphasized. Supervision and regulation of children's daily habits and lifestyles should include both physical and psychological health aspects. This aligns with the study by Hasdianah et al. (2014), which highlighted the importance of monitoring activity

patterns and food intake to prevent various diseases caused by childhood obesity.

Nevertheless, this study also found no significant relationship between respondents' preventive measures regarding BMI and the incidence of obesity in children. This suggests that, although parents may take preventive steps such as supervising children's diet and physical activity, these efforts have not been sufficient to significantly reduce obesity incidence among children.

Research Limitations

Chi-Square statistical tests on the variables of parental knowledge, attitudes, and preventive measures toward type 2 diabetes mellitus in obese and overnourished children showed no significant relationship between these variables and the incidence of obesity among children in grades 1–6 at SDN Jelambar 08. Childhood obesity in this group may be influenced by environmental, genetic, dietary, physical activity, and stress-related factors that were not adequately controlled or measured in this study.

Conclusion

The conclusion is intended to help the reader understand why your research should matter to them after they have finished reading the paper. A conclusion is not merely a summary of the main topics covered or a re-statement of your research problem, but a synthesis of key points. It is important that the conclusion does not leave the questions unanswered.
Tips:

- State your conclusions clearly and concisely. Be brief and stick to the point;
- Explain why your study is important to the reader. You should instill in the reader a sense of relevance;
- Prove to the reader, and the scientific community, that your findings are worthy of note. This means setting your paper in the context of previous work. The implications of your findings should be discussed within a realistic framework;

For most essays, one well-developed paragraph is sufficient for a conclusion, although in some cases, a two or three paragraph conclusion may be required. Another important things about this section is (1) do not rewrite the abstract; (2) statements with "investigated" or "studied" are not conclusions; (3) do not introduce new arguments, evidence, new ideas, or information unrelated to the topic; (4) do not include evidence (quotations, statistics, etc.) that should be in the body of the paper.

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(Afifah Priyantika)