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Application of Health Belief Model on Obesity Prevention Behavior in Adolescents

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ABSTRACT

Background: Adolescent obesity is a global challenge with serious health impacts. This study aimed to explore the application of the Health Belief Model (HBM) in the context of preventing obesity in adolescents.
Subjects and Method: This research uses an observational analytical design with a cross sectional approach. The population consists of teenagers aged 15-19 years in the city of Surakarta, with a sample of 200 teenagers chosen randomly. The dependent variable is obesity prevention behavior. The independent variable is the HBM construct (perceived vulnerability, perceived seriousness, perceived benefits, perceived barriers, cues to action, and self-efficacy). Data was collected using a questionnaire, and analyzed using multiple linear regression.
Results: There is a positive and statistically significant relationship between perceived vulnerability (b= 0.08; 95% CI= 0.03 to 0.13; p = 0.004), perceived seriousness (b= 0.37; 95% CI= 0.29 to 0.46; p<0.001), perceived benefits (b= 0.22; 95% CI= 0.14 to 0.29; p<0.001), cues to action (b= 0.15; 95% CI= 0.05 to 0.25; p= 0.005) and self-efficacy (b= 0.05; 95% CI = 0.01 to 0.10; p= 0.027) on obesity prevention behavior. Adjusted R-squared= 72.15%. This means that the HBM construct includes perceptions of vulnerability, perceptions of severity, perceptions of benefits, cues to action, and self-efficacy, together they are able to explain variations in obesity preventive behavior in adolescents by 72.15%.
Conclusion: The results of this study indicate that the Health Belief Model construct includes perceptions of vulnerability, perceptions of seriousness, perceptions of benefits, cues to action, and self-efficacy, which play a role together in shaping obesity prevention behavior in adolescents.

Keywords: health belief model, obesity, preventive behavior, adolescents.

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BACKGROUND

Obesity is a global challenge with serious health impacts, especially in the adolescent population. In 2016, more than 340 million children and adolescents worldwide were overweight or obese, showing a significant increase from 4% in 1975 to 18% in 2016 (WHO, 2021a). In Indonesia, obesity in

teenagers is also increasing, with obesity rates at ages 13-15 years increasing from 2.5% in 2013 to 4.8% in 2018. Likewise, at ages 16-18 years, the prevalence of obesity rose from 1.6% to 4 % in the same period (Riskesdas, 2019).

These epidemiological data highlight that obesity is not just an individual problem, but is also a global public health issue. Adolescents who are obese face not only physical health risks, but also serious impacts on their mental and social health (Upadhyay et al., 2018). Research by Chooi et al. (2019) emphasized that obesity has become a global epidemic involving countries all over the world.

Obesity in adolescents not only threatens long-term health, but also increases the risk of chronic diseases such as type 2 diabetes, heart disease, metabolic disorders, respiratory disorders, depression, and eating disorders (Jebeile et al., 2022; Upadhyay et al., 2018) . Adolescents with obesity have higher potential health risks compared to those who maintain a normal body weight (Flodgren et al., 2020).

In the context of obesity prevention in adolescents, the Health Belief Model (HBM) has emerged as a relevant theoretical framework. HBM considers psychological factors and individual perceptions that influence decisions in adopting health behaviors, including obesity prevention behaviors (Rosenstock et al., 2000). The use of the Health Belief Model can help identify factors that influence adolescents' decisions in implementing obesity prevention behavior, as well as overcome barriers to adopting healthy eating patterns, active lifestyles and effective sleep patterns (McArthur et al., 2018).

Although the Health Belief Model has been successfully applied in the context of weight management in certain populations, its potential in the adolescent context has not been fully revealed. This study aimed to explore the application of the Health Belief Model (HBM) in the context of obesity prevention in adolescents.

SUBJECTS AND METHOD

1. Study Design

This research uses an observational analytical design with a cross sectional approach which is carried out and emphasizes measurement or observation at one time. This research was carried out in October-December 2023 in the city of Surakarta.

2. Population and Sample

The population of this study consisted of all teenagers aged 15-19 years who live in the city of Surakarta and a sample size of 200 teenagers who were randomly selected.

3. Study Variables

The dependent variable is obesity prevention behavior. The independent variable is the HBM construct (perceived vulnerability, perceived seriousness, perceived benefits, perceived barriers, cues to action, and self-efficacy).

4. Operational Definition of Variables

Obesity prevention behaviors are obesity prevention behaviors are a series of actions that individuals take to reduce the risk of obesity and maintain a healthy weight. This includes maintaining a healthy diet, participation in physical activity, maintaining adequate sleep patterns (7-9 hours/day).

Perceived susceptibility is one's own perception of the level of risk of developing obesity based on family history, age, and exposure to other risks

Perceived seriousness is individuals' assessment of the extent to which they perceive obesity as a serious and high-impact health problem.

Perceived benefits are individuals' assessments of the physical and psycho-

logical benefits they expect from adopting a healthy diet and exercise to prevent obesity.
Perceived barriers for identify concrete barriers such as the cost of a fitness program, lack of time to exercise, or access to healthy foods.
Cues to action are detect triggers such as health campaign information, advice from a doctor, or significant weight changes
Self-efficacy is the measurement of the degree to which individuals feel confident that they can follow a healthy diet plan and exercise routine, or other obesity prevention behavior.

5. Study Instruments

The research instruments used for data collection were questionnaires, obesity prevention behavior questionnaires and the Health Belief Model construct as well as for collecting data related to age, gender, body weight and height.

6. Data analysis

Univariate analysis was carried out to obtain frequency distribution data and percentage characteristics of research subjects. Bivariate analysis to analyze the influence of independent and dependent variables uses the t-test with a significance level of $p<0.050$, and multivariate analysis uses multiple linear regression analysis.

RESULTS

1. Sample Characteristics

Table 1 shows that of the 200 research subjects, the age distribution of the research subjects was with the majority being 16-year-olds (38.50%), followed by 17-year-olds (28.00%), 15-year-olds (18.50%), and 18-year-olds (15.00%). Gender data shows a balanced distribution, with 47.00% men and 53.00% women. The majority of research subjects had a Body Mass Index (BMI) below 30, with 86.50% of teenagers having a BMI of less than 30, while 13.50% had a BMI ≥30.

In the context of obesity prevention behavior, the majority of teenagers showed high prevention behavior, with 63.50%, while 36.50% showed low prevention behavior. Analysis of adolescents' perceptions of the risk of obesity shows that 65.00% have a high perception of vulnerability, 75.00% have a high perception of seriousness, and 67.50% have a high perception of benefits related to obesity prevention behavior. When looking at cues to action, 65.50% of teenagers showed high cues to action. However, in terms of self-efficacy, 52.50% of research subjects had low self-efficacy, while 47.50% had high self-efficacy.

Table 1. Sample characteristics (Dichotomous data).

Characteristics	Category	Frequency (n)	Percentage (%)
Age	15	37	18.50
	16	77	38.50
	17	56	28.00
	18	30	15.00
Gender	Male	94	47.00
	Female	106	53.00
BMI	<30	173	86.50
	≥30	27	13.50
Obesity Prevention Behavior	Low	73	36.50
	High	127	63.50
Perception of vulnerability	Low	70	35.00
	High	130	65.00
Perception of seriousness	Low	50	25.00
	High	150	75.00

Characteristics	Category	Frequency (n)	Percentage (%)
Perception of benefits	Low	65	32.50
	High	135	67.50
Cue to action	Low	69	34.50
	High	131	65.50
Self-efficacy	Low	105	52.50
	High	95	47.50

2. Bivariate analysis

Bivariate analysis was carried out to explain the influence of the Health Belief Model construct variables (perceived vulnerability, perceived seriousness, perceived benefits, cues to action and self-efficacy) on partial obesity prevention behavior. This analysis was carried out with the T test.

Table 3 shows significant differences between groups with low perceived vulnerability (Mean= 9.56; SD= 1.72; p<0.001) and high perceived vulnerability (Mean= 10.73; SD= 0.45; p<0.001) towards preventive behavior. obesity. It can be concluded that a high perception of vulnerability can increase obesity prevention behavior.

Table 3 shows a significant difference between groups with low seriousness perceptions (Mean= 9.10; SD= 1.59; p<0.001) and high seriousness perceptions (Mean= 10.73; SD= 0.67; p<0.001) regarding obesity prevention behavior. It can be concluded that a high perception of seriousness can increase obesity prevention behavior.

Table 3 shows significant differences between groups that have low perceived benefits (Mean= 9.75; SD= 1.43; p<0.001), with high perceived benefits (Mean= 10.59; SD= 0.99; p<0.001) regarding behavior. obesity prevention. It can be concluded that high perceived benefits can increase obesity prevention behavior.

Table 3 shows a significant difference between groups with low action cues (Mean= 9.39; SD= 1.55; p<0.001) and high action cues (Mean= 10.80; SD= 0.54; p <0.001) towards obesity prevention behavior. It can be concluded that high action cues can increase obesity prevention behavior. Table 3 shows an insignificant difference between the groups that had low self-efficacy (Mean= 10.38; SD= 1.16; p= 0.455), and those with high self-efficacy (Mean= 10.25; SD= 0.27; p= 0.455). on obesity prevention behavior.

Table 2. Results of Bivariate Analysis Using the T-Test.

Variable	N	Mean	SD	p
Perception of vulnerability				
Low	70	9.56	1.72	<0.001
High	130	10.73	0.45	
Perception of seriousness				
Low	50	9.10	1.59	<0.001
High	150	10.73	0.67	
Perception of benefits				
Low	65	9.75	1.43	<0.001
High	135	10.59	0.99	
Cue to action				
Low	69	9.39	1.55	<0.001
High	131	10.80	0.54	
Self-efficacy				
Low	105	10.38	1.16	0.455
High	95	10.25	1.27	

3. Multivariate Analysis

Table 4 shows the results of linear regression analysis regarding the relationship between the Health Belief Model construct and obesity preventive behavior in adolescents.

There is a positive and statistically significant relationship between perceived vulnerability and preventive behavior. Every 1 unit increase in perceived vulnerability will be followed by an increase of 0.08 units in obesity preventive behavior (b= 0.08; 95% CI= 0.03 to 0.13; p= 0.004).

There is a positive and statistically significant relationship between perceived seriousness and preventive behavior. Every 1 unit increase in perceived seriousness will be followed by an increase of 0.22 units in obesity preventive behavior (b= 0.37; 95% CI= 0.29 to 0.46; p<0.001).

There is a positive and statistically significant relationship between perceived benefits and preventive behavior. Every 1 unit increase in perceived benefits will be followed by an increase of 0.22 units in obesity preventive behavior (b= 0.22; 95% CI= 0.14 to 0.29; p<0.001).

There is a positive and statistically significant relationship between cues to action and preventive behavior. Every 1 unit increase in cues to action will be followed by an increase of 0.15 units in obesity preventive behavior (b= 0.15; 95% CI= 0.05 to 0.25; p= 0.005).

There is a positive and statistically significant relationship between self-efficacy and preventive behavior. Every 1 unit increase in self-efficacy will be followed by an increase of 0.05 units in obesity preventive behavior (b= 0.05; 95% CI= 0.01 to 0.10; p = 0.027).

Adjusted R-squared= 72.15%. This means that the HBM constructs included in this linear regression model, namely perceived vulnerability, perceived severity, perceived benefits, cues to action, and self-efficacy, together are able to explain variations in obesity preventive behavior in adolescents by 72.15%.

Table 3. Results of Multiple Linear Regression Analysis

Variable	Coefficient Regression (b)	CI 95%		p
		Lower Limit	Upper Limit	
(Constant)	3.00	2.22	3.77	<0.001
Perception of vulnerability	0.08	0.03	0.13	0.004
Perception of seriousness	0.37	0.29	0.46	<0.001
Perception of benefits	0.22	0.14	0.29	<0.001
Cue to action	0.15	0.05	0.26	0.005
Self-efficacy	0.05	0.01	0.10	<0.001
N Observation	200			
Adjusted R^2	72.15%			
p	<0.001			

DISCUSSION

The influence of perceived vulnerability on obesity prevention behavior

Perception of vulnerability shows a significant difference between groups that have low perceived vulnerability (Mean= 9.56; SD= 1.72; p<0.001) and high perceived vulnerability (Mean= 10.73; SD= 0.45; p<0.001) towards obesity prevention behavior. and together with other HBM construct variables, every 1 unit increase in perceived vulnerability will be followed by an increase of 0.08 units in obesity preventive behavior (b= 0.08; 95% CI= 0.03 to 0.13; p= 0.004). This means that the higher the perceived vulnerability, the higher the

obesity prevention behavior carried out by teenagers compared to teenagers who have a lower level of perceived vulnerability.

Based on another study by Haibah et al. (2020), in parallel, revealed that the higher the level of perceived vulnerability, the greater the individual's likelihood of taking preventive measures against health problems in general. Thus, it can be concluded that the level of risk awareness has a positive impact on an individual's response to obesity prevention.

Findings from Saghafi-Asl et al. (2020), adds an important dimension to this understanding by showing that a high level of perceived vulnerability to the risk of obesity not only influences preventive behavior, but also the individual's intention to take such preventive action. This strengthens the study results and confirms that the level of risk awareness is not only a driver of behavior, but also shapes individual intentions towards obesity prevention. The results of this study consistently support the theoretical view that emphasizes the important role of the level of perceived vulnerability in shaping obesity prevention behavior and intentions in teenager.

The influence of perceived seriousness on obesity prevention behavior

The perception of seriousness shows a significant difference between the groups that have a low perception of seriousness (Mean= 9.10; SD= 1.59; p<0.001) and a high perception of seriousness (Mean= 10.73; SD= 0.67; p<0.001) regarding obesity prevention behavior. And together with other HBM construct variables, every 1 unit increase in perceived seriousness will be followed by an increase of 0.22 units in obesity preventive behavior (b= 0.37; 95% CI= 0.29 to 0.46; p<0.001). This means that the higher the perception of seriousness, the higher the obesity prevention behavior carried out by adolescents compared to adolescents who have a lower level of perceived vulnerability.

Research results consistently show that the higher the perception of seriousness, the higher the obesity prevention behavior in adolescents. These results deeply support the principles of the Health Belief Model (HBM), which states that the more individuals feel that a health condition, in this case obesity, is a serious threat, the more likely they are to take preventive action (Destianty et al., 2021) .

Additional support is found in Hita's (2020) research, which in parallel confirms that the perception of the seriousness of the risk of obesity is the main motivator for adolescents to adopt preventive behavior. The more seriously individuals perceive the risk of obesity, the more likely they are to take preventive action.

The influence of perceived benefits on obesity prevention behavior

Perceived benefits showed a significant difference between groups with low perceived benefits (Mean= 9.75; SD= 1.43; p< 0.001), with high perceived benefits (Mean= 10.59; SD= 0.99; p<0.001) for obesity prevention behavior . From the analysis, a significant difference was obtained (p<0.001), and together with other HBM construct variables, every 1 unit increase in perceived benefits will be followed by an increase of 0.22 units in obesity preventive behavior (b= 0.22; 95% CI= 0.14 to 0.29; p< 0.001). This means that the higher the perception of benefits, the higher the obesity prevention behavior carried out by adolescents compared to adolescents who have lower levels of perceived benefits.

The results of this study align with the principles of the Health Belief Model (HBM), which asserts that if individuals believe that preventative actions have significant benefits, they are more likely to

adopt those behaviors. In line with the results of this research, a study conducted by Nuriannisa et al. (2023), the HBM approach had an impact on increasing perceived benefits among participants. This indicates that increasing perceived benefits can encourage obesity prevention behavior. This illustrates that participants were more likely to adopt healthy behaviors, such as a good diet, to prevent the risk of obesity. The results confirmed that the higher the level of perceived benefits, the more likely individuals were to engage in obesity prevention behaviors.

The effect of cues to action on obesity prevention behavior

The test results for action cues showed a significant difference between groups with low action cues (Mean= 9.39; SD= 1.55; p<0.001) and high action cues (Mean= 10.80; SD= 0.54; p<0.001) on behavior. obesity prevention, and together with other HBM construct variables, every 1 unit increase in cues to action will be followed by an increase of 0.15 units of obesity preventive behavior (b= 0.15; 95% CI= 0.05 to 0.25; p = 0.005). This means that the higher the signal to act, the higher the obesity prevention behavior carried out by teenagers compared to teenagers who have a lower level of signal to act.

The findings of this study support the principles of the Health Belief Model (HBM), which emphasizes the significant role of cues to action in motivating individuals to take preventive action against health conditions. The concept of a cue to action describes the ability of a signal or warning to trigger an individual response in adopting obesity prevention behavior. Thus, the results of this study confirm the views of Rosenstock (2000), who formulated the HBM, and highlight the importance of cues to action as key drivers in prevention motivation. The results of this study are supported by research by McArthur et al (2018), by confirming that cues to action play a role in influencing weight-related behavior and ultimately BMI, this research makes an important contribution to the understanding of the factors that motivate a person to take steps more proactive prevention of obesity.

The influence of self-efficacy on obesity prevention behavior

Analysis of self-efficacy regarding obesity prevention behavior is different from other HBM constructs, which shows no significant differences between groups that have low self-efficacy (Mean= 10.38; SD= 1.16; p= 0.455), and high self-efficacy (Mean= 10.25; SD= 0.27; p= 0.455) on obesity prevention behavior. But together with other HBM constructs, self-efficacy has a positive and statistically significant relationship. Every 1 unit increase in self-efficacy will be followed by an increase of 0.04 units in obesity preventive behavior (b= 0.04; 95% CI= -0.04 to 0.12; p= 0.303). This means that the higher the self-efficacy, the higher the obesity prevention behavior carried out by adolescents when observed in the context of the overall HBM construct being tested.

The results of this study indicate that when self-efficacy is considered together with other factors of HBM, self-efficacy plays an important role in shaping obesity prevention behavior. This finding is in line with the theory that self-confidence can act as a mediator or link between other motivational factors and health behavior (Bandura, 1977). The joint influence of the HBM construct creates a positive feedback cycle. For example, high self-efficacy may increase an individual's chances of interpreting cues to action as challenges that can be overcome. The higher the perceived benefits, the greater the intention to act, and the greater the self-efficacy, the greater

the possibility of the individual engaging in obesity prevention behavior (Wilandika, 2020).

The results of this study provide an understanding of the factors that influence obesity prevention behavior in adolescents, with a focus on the application of the Health Belief Model (HBM). In investigating the relationship between HBM variables (perceived vulnerability, perceived seriousness, perceived usefulness, cues to action, and self-efficacy) and obesity prevention behaviors, this study provides in-depth insight into the psychological factors that may shape adolescents' decisions regarding their health.

Studies have shown the significant contribution of the Health Belief Model (HBM) together to obesity prevention behavior in adolescents. These findings support the idea that individuals' perceptions of the risks and consequences of obesity, as well as their beliefs in self-efficacy, interact to shape prevention intentions and actions. Perceptions of vulnerability, seriousness, and benefits provide the basis for individual motivation in implementing obesity prevention behaviors. Cues to action provide concrete encouragement, while self-efficacy plays a key role in designing strategies and overcoming obstacles. The greater the level of perceived coolness, perceived seriousness, perceived usefulness, cues to action and self-efficacy felt by individuals that influence greater behavioral intentions to manage weight (Saghafi-Asl et al., 2020), the results of this study are in line with research Haibah et al. (2020) and McArthur et al. (2018) where the more someone feels vulnerable, the more they feel obesity is a serious problem, the benefits of obesity prevention behavior are greater, the signal for action and high self-efficacy means that someone will increasingly carry out behavior to prevent obesity.

When individuals perceive a high level of vulnerability to obesity and perceive obesity as a serious problem (perceived seriousness), this can create a strong motivation to avoid the risk. The combination of these two constructs can increase an individual's intention to prevent obesity by adopting preventive behavior, such as adjusting diet and increasing physical activity (Hita, 2020). If individuals believe that obesity prevention has significant benefits (perceived benefits) and receive cues or stimuli to act, such as health information or advice from medical personnel (cues to action), then their likelihood of taking obesity prevention action will increase. Both support each other and form strong motivation (Rusyani et al., 2021)

Cues to action play a crucial role in motivating obesity prevention behavior in adolescents. Cues to action include external factors, such as social support, information, or an environment that supports healthy behavior. The higher the level of cues to action, the higher the level of adolescent participation in obesity prevention behavior. This is in line with the HBM concept, where a signal to act triggers individuals to take preventive steps (Rosen Stock, 2000).

AUTHOR CONTRIBUTION

All authors have made significant contributions to data analysis as well as preparing the final manuscript.

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This study is self-funded.

CONFLICT OF INTEREST

There is no conflict of interest in this study.

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