The Relationship Between Obesity and the Family Nutrition and Physical Activity Environment in Children Aged 5–14 Years

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Abstract

This study was conducted with a study group consisting of parents to define the relationship between obesity and the family environment related to nutrition and physical activity in school-aged children aged 5–14 years and to determine the relationship with the variables of school level, gender, and parental education level affecting this environment. The study was conducted online with 531 parents—289 male (father) and 242 female (mother)—who have children in preschool, primary, and secondary school during the fall semester of 2024. Data were collected with questions designed to determine sociodemographic characteristics, and the Family Nutrition and Physical Activity Screening Scale (FNPA-TR) was adapted into Turkish. The relationships between the scores obtained from the FNPA scale and children's body mass index (BMI), as well as some socio-demographic variables, were examined using the appropriate variance model and correlation analysis according to the structure and distribution of the data. When examining the results of this study, it was revealed that the higher education level of parents contributes to children having lower BMI values. In addition, it was observed that family and child activities play an important role in children's BMI, and children with lower BMI were more active. A healthy environment and family sleep patterns were also found to positively affect BMI. The gender of the children did not make a significant difference in BMI. It is clear that family dietary habits and physical activity levels are important factors influencing childhood obesity risk, but family eating patterns and dietary habits do not directly influence BMI in interaction with environmental factors.

Keywords: Childhood obesity, physical activity of parents and children, family dietary habits.

Introduction

One of the aims of the Turkish National Education System is not only to equip school-age children with knowledge but also to contribute to their physical and social skills (MEB, 1973). Likewise, it is one of the basic principles of preschool education to prepare educational environments that will support children's multidimensional development, such as physical, emotional, cognitive, social, cultural, language, and movement (Durualp & Aral, 2010). Childhood and adolescence are critical stages in which the individual lays the foundation for physical, mental, and social development. Physical and motor activities in this period positively affect not only the physical health of the child but also his/her mental development, social skills, and emotional state (Ihmels et al., 2009b; Memiş, 2006).

Motor development periods were analyzed by Gallahue and Ozmun (2002) in 4 sections as reflexive (in utero-1 year), primitive (0-2 years), basic (2-7 years), and sport-specific movement period (7-14 years and above). It also supports mental and social development by helping individuals to improve their movement performance. In order to prepare programs to increase movement capacities, it is important to know and follow normal motor development. Because there is a need for a structured program and experimentation in order to perform motor skills involving the activity of large muscles at the maturity level (Carley, 2010; Çoknaz, 2016, Langendorfer & Roberton, 2002).

It is known that children who do not do enough physical activity tend to gain weight, but parents' setting an example for children in this regard is an important factor in their adoption of healthy lifestyles (Güner & Bilkay, 2022). It is stated that children who participate in sports-related activities and maintain regular physical movements in primary school ages are successful in school and have positive changes in their physical and communication-related behaviors (Desticioğlu & Malas, 2006; Özyürek et al., 2015). Children are positively affected by movement education practices that can teach the rules of games in which they can use their own bodies. In addition, it is estimated that physical activities will also improve their mathematical abilities with games related to counting, measuring, and comparing (Stöckel & Hughes, 2015).

Childhood obesity has become a major public health problem worldwide and negatively affects both the physical and psychological health of children. Parents' health habits and awareness levels have important effects on children's weight status (Tzou & Chu 2012)

Obesity and other health problems caused by physical inactivity and digital addiction, such as being on the computer for long periods of time, are global public health problems of the 21st century (Oniz et al., 2023). Physical inactivity has been identified as one of the five key policy priorities of the World Health Organization (WHO, 2012). Complications arising from the global pandemic and triggered by physical inactivity form the basis of these priorities (Shah et al., 2019). Research by Golan and Crow (2004) reveals that parents' adoption of an active lifestyle helps their children to develop similar healthy habits. It is also emphasized that parents setting an example for their children is an important factor for them to adopt exercise habits.

According to the World Health Organization (WHO) 2012 data, the prevalence of obesity can vary greatly from country to country and region to region. The latest data includes updates until 2022. Looking at Obesity in 5-14 Year Olds Worldwide, the WHO measures childhood obesity with “body mass index (BMI)”. Obesity is defined as children who are at the 95th percentile (i.e., much more overweight than normal) of the age- and sex-specific percentiles of BMI. Globally, the prevalence of obesity in children aged 5–19 years is around 7-8% by 2020. However, in some countries, such as the United States, Canada, Mexico, South Korea,

Australia, Kuwait, Qatar, and the United Arab Emirates, childhood obesity rates can be as high as 30%.

When the literature is examined, it is seen that there are different results in the prevalence of childhood obesity among countries; however, regardless of the level of development of countries, the gradual increase in ready-to-eat food consumption behaviors in families is a common finding for all countries in increasing the prevalence of obesity (WHO, 2000). In 2000, the International Obesity Task Force evaluated data from 60 countries and reported that childhood obesity has become a global problem in the last 40 years (Wang & Lobstein, 2006).

The Ministry of Health of the Republic of Turkey (2019) showed that approximately 20% of children between the ages of 5 and 18 are obese. However, more recent and comprehensive data are needed for exact rates for the 5-14 age group. Surveys conducted by the Ministry of Health and TurkStat provide such data. The COSI (Childhood Obesity Surveillance Initiative) reports published in 2021 are one of the most up-to-date pieces of information on this issue (Ekici et al., 2023; WHO, 2021).

In a study conducted by Ihmels et al. (2009a) using the Family Nutrition and Physical Activity (FNPA) Screening Tool, it was examined how the level of physical activity in the family has an impact on children's health behaviors, and it was observed that happy parents are easier to take responsibilities for the development of their children as the right role model. Therefore, it shows that there is a strong relationship between happy parents' family lifestyle, physical activity levels, happiness, and their level of taking personal responsibility for their families and their lives (Arslan et al., 2010). Personal responsibility contributes to individuals feeling more control over their lives, which in turn improves their overall quality of life (Topaloğlu et al., 2023). Adrian and Cooper (1995) stated that regular movement training programs starting in preschool and continuing until adolescence can positively improve children's hand-eye coordination. This type of training can help children strengthen hand-eye coordination by improving motor skills, balance, movement speed, and environmental adaptation. At the same time, this education initiated at an early age ensures that cognitive and physical development progress in harmony with each other.

In this study, it was aimed to define the relationship between obesity in children aged 5-14 years and family nutrition and physical activity environments and to determine the relationship with the variables of school level, gender, and parental education status that affect this environment. Within the scope of this aim, answers to the following research questions were sought.

1. Is there a significant difference between the gender variable and BMI scores of 5-year-old children?

2. Is there a significant difference between the type of school attended by 5–14-year-old children, parental education variables, and BMI scores?

3. What are the mean scores of the participants on the Family Nutrition and Physical Activity (FNPA) scale?

4. Is there a significant difference between the participants' BMI scores and the “family and child activity sub-dimensions” of the Family Nutrition and Physical Activity (FNPA) scale?

5. Is there a significant relationship between the mean scores of the participants' Family Nutrition and Physical Activity (FNPPA) scale and BMI?

Methodology

This research is a descriptive study based on a quantitative research method. A survey research design was used as the research design. Survey research focuses on describing and explaining the current state of a particular event, situation, or phenomenon. Survey studies are generally preferred to collect preliminary information about a problem or to understand the basic characteristics of a phenomenon. In terms of sampling, research is conducted with a larger sample group compared to other studies (Büyüköztürk et al., 2011; Creswell, 2014).

Sample

The study was conducted online with a total of 531 parents (289 male (fathers) and 242 female (mothers) who have children at preschool, primary, and secondary school levels in the fall semester of 2024. In this study, the convenience sampling method was used. This method enabled the researcher to collect data from easily accessible individuals, taking into account time and resource constraints. The sample from which data were collected consisted of individuals with various demographic characteristics. Descriptive findings about the sample are presented in Table 1.

Table 1. Descriptive Findings Regarding the Sample

Variable	n	%
Gender		
Male	289	45.6
Female	242	54.4
School Level of Data Collection		
Preschool	132	24.9
Primary School	172	32.4
Middle School	227	42.7
Mother's Education		
Primary School Graduate	119	22.4
Middle School Graduate	207	39.0
High School Graduate	71	13.4
University Graduate	92	17.3

Master's/PhD Graduate	42	7.9
Father's Education		
Primary School Graduate	67	12.6
Middle School Graduate	182	34.3
High School Graduate	124	23.4
University Graduate	106	20.0
Master's/PhD Graduate	52	9.8
Body Mass Index		
Underweight (18.4 or below)	170	32.0
Normal Weight (18.5-24.9)	151	28.4
Overweight (25-29.9)	71	13.4
Obesity (30 and above)	139	26.2

In the study conducted with 531 parents in total, 54.4% were male students and 45.6% were female students.

Data collection instruments

The data in the study were collected online with a form consisting of two parts.

Part 1: It consists of questions including descriptive information (sociodemographic and individual variables) of the participants.

Part 2: The Family Nutrition and Physical Activity Screening Tool (FNPA), adapted into Turkish, was used to define the relationship between obesity and family nutrition and physical activity environments in children aged 5-14 years. The scale was developed by Michelle A. Ihmels in 2009. The Turkish validity and reliability study of the scale was conducted by Ekici et al. (2021). Ihmels et al. (2009b) found that the single-factor Cronbach's alpha value (0.72) of the Family Nutrition and Physical Activity (FNPA) scale had good internal consistency and was shown to be related to predicting the risk of children being overweight and obese. In the Turkish adaptation, the intermittent test-retest method was used for invariance in reliability analyses, and when the intraclass correlation coefficient (ICC) coefficients were examined, it was found that it ranged between 0.422 and 0.925 and had moderate to very high test-retest reliability. Cronbach's alpha coefficient for the internal consistency of the scale was found to be 0.72.

FNPA is an easy-to-use self-report scale designed to assess the family environment and behavioral factors that may cause the child to gain excess weight. The scale has 10 sub-dimensions, and each item consists of four Likert-type response options: 1 = never/almost never, 2 = sometimes, 3 = frequently, and 4 = very often/always. The total score that can be obtained from the scale is between 20 and 80 points. Each subgroup in the scale includes two questions. Seven items (3,4,5,7,10,13) were reverse coded. When calculating the total

score, the scores given to these items should be reverse-coded. The subgroups consist of “family meals," "family eating habits," "food choices," "beverage choices," "limitation/rewarding," "screen time," "healthy environment," "family activity," "child activity," and "family planning/sleeping patterns. The total score, which is formed by summing the scores obtained from each subgroup as a result of the answers given, is used to interpret the physical activity and nutritional environment status of the family. The scale does not have a cutoff point. High scores indicate less risky family practices and child behaviors for child obesity, while low scores indicate a high-risk family environment, practices, and child behaviors.

Data analysis

Within the scope of the study, the differences between the participants' Body Mass Index (BMI) and their father's education level, mother's education level, degree of closeness, gender, and school type were examined in detail. A one-way ANOVA (analysis of variance) was applied to analyze these relationships and to determine the possible differences between the groups. ANOVA is a statistical method used to test mean differences between three or more groups. In this analysis, it was evaluated whether BMI showed a significant difference according to educational status, gender, and school type. Before proceeding to ANOVA analysis, normality of all variables was checked. Normality is one of the basic assumptions of ANOVA, and according to the results of the Shapiro-Wilk test used to determine whether the variables are normally distributed, a significant p-value ($p < .001$) indicates that the variables deviate from normal distribution. However, ANOVA is a robust test that tolerates these violations of normality quite well. When group sizes are sufficiently large (e.g., more than 30 participants per group) and distributions are not overly platykurtic (negatively skewed), ANOVA can yield reliable results. The fact that the number of participants in each of the groups in the study was greater than 30 and the distributions were not overly skewed means that ANOVA can be applied reliably. Application of One-Way ANOVA: In this context, One-Way ANOVA analyses were conducted to examine possible differences between BMI and educational level, gender, and school type. ANOVA is used to determine whether there are significant differences between groups, especially for variables with three or more categories. Therefore, categorical variables such as the father's education level, mother's education level, and school type were considered in the analysis. ANOVA on School Type: It was examined whether there was a significant difference between BMI levels of students of different school types (e.g., public school, private school, etc.). School type was considered an important factor that may affect students' eating habits, physical activity levels, and thus their BMI. ANOVA on Mother and Father Education Level: ANOVA analyses were conducted to determine whether the education level of the parents affected the BMI of the children. Since the level of education of the mother and father may affect whether children have healthy living habits, these variables were associated with BMI. According to the ANOVA results, it was determined whether there was

a significant difference between the groups, and if significant differences were found, a post-hoc Tukey test was performed to determine which groups these differences were between.

Findings

In this section, the main findings obtained during the research process are discussed in detail. The data collected from the participants within the scope of the research were processed through quantitative analysis and supported by tables and statistical analysis. Each table was organized in direct relation to the main questions of the research and allowed for a clearer interpretation of the results.

Regarding the first research question, the findings related to whether there is a significant difference between the gender variable and BMI of the children belonging to the data obtained within the scope of the research are given in Table 2.

Table 2. BMI findings for gender variable

Groups	N	Mean *(X)*	*SS*	*df*	*t*	*p*
Male	289	24.05	5.77	529	0.836	.404
Female	242	23.59	6.68			

According to Table 2, according to the results of the t-test for unrelated samples regarding the gender variable, there was no significant difference between the body mass index scores of girls and boys (p >.05).

For the second research question, the ANOVA findings of the data obtained within the scope of the research between the independent variables of the type of school children attend, mother's and father's education level, and BMI are presented in Table 3.

Table 3. One-Way ANOVA Results for BMI Scores of the Groups

Dimension	Sum of Squares Between Groups	Sum of Squares Within Groups	F	p	Significant Difference
School Type	204.178	20541.730	2.624	.073	-
Mother's Education	1354.316	19391.592	9.184	< .001	2-4, 2-5
Father's Education	1044.397	19701.510	6.971	< .001	1-5, 2-5, 3-5, 4-5

This table presents the ANOVA findings for the BMI scores across different groups. When Table 3 is examined, it is seen that there are significant differences between BMI scores and mother's education level [F(4, 526) = 9.184, p <.001] and father's education level [F(4, 526) = 6.971, p <.001]. However, no significant difference was found between school type and BMI scores (p >.05). Based on the significant ANOVA results, the Tukey test was applied, and as a result of this test, it was determined that children had lower BMI values as the education

levels of mothers and fathers increased. BMI findings related to gender variables are presented in Table 3.

For the third research question, the findings of the mean scores of the Family Nutrition and Physical Activity (FNPA) scale are presented in Table 4.

Table 4. Family Nutrition and Physical Activity (FNPA) scale, sub-dimensions, and total mean scores

Variable	Mean	SS	Min	Max
Family Meals	5.87	1.78	2	7
Family Eating Habits	6.55	1.77	5	9
Food Preferences	5.66	0.746	4	6
Beverage Preferences	5.33	0.964	4	7
Restriction/Rewarding	6.21	1.08	4	7
Monitoring Time	5.28	1.85	3	7
Healthy Environment	5.35	0.479	5	6
Family Activity	5.61	1.77	3	7
Child Activity	5.34	1.13	3	8
Family Program Sleep Routine	5.76	1.35	4	7
Total Score	57.0	5.93	46	64

This table provides the mean scores, standard deviation, and range (minimum and maximum) for various FNPA factors.

The mean total score of the FNPA scale was 57.00±5.93. Families had the lowest mean scores in the Monitoring Time subscale (5.28±1.85) and the highest mean scores in the Family Eating Habits (6.55±1.77), Restriction/Rewarding (6.21±1.08), and Family Meals (5.87±1.78) subscales. One-way ANOVA is a robust test that tolerates violations of the normality assumption quite well, but it can be highly affected when group sizes are small and the distribution is platykurtic (negatively skewed). In this context, since none of the data were overly negatively skewed, all met the normality assumption, and the number of participants in the groups was greater than 30, ANOVA was conducted for the family activity and child activity parts of the scale. The ANOVA findings are presented in Table 5.

For the fourth research question, the findings of the mean scores of the Family Nutrition and Physical Activity (FNPA) scale for the data obtained within the scope of the research are given in Table 5.

Table 5. ANOVA Findings for Family Activity and Child Activity

Body Mass Index (BMI)	*N*	Mean	Sum of Squares	Sum of Squares	*F*	*p*	Tukey

			Between Groups	Within Groups			
Family Activity							
Obesity (30 and above) [4]	139	3.46	943.673	716.184	231.465	.000	1-3, 1-4, 2-3, 2-4, 3-4
Overweight (25-29.9) [3]	71	5.48					
Normal Weight (18.5-24.9) [2]	151	6.62					
Underweight (18.4 and below) [1]	170	6.54					
Child Activity							
Obesity (30 and above) [4]	139	5.05	41.494	632.837	11.518	.000	1-2, 1-3, 2-4, 3-4
Overweight (25-29.9) [3]	71	5.63					
Normal Weight (18.5-24.9) [2]	151	5.68					
Underweight (18.4 and below) [1]	170	5.14					

Table 5 shows that there are significant differences in the dimensions of family activity [F(3, 527) = 231.465, p < .001] and child activity [F(3, 527) = 11.518, p < .001]. According to the ANOVA analysis results, the Tukey test was conducted to determine which group or groups were responsible for the differentiation in family activity and child activity dimensions. According to the results of Tukey analysis, a significant difference in the family activity sub-dimension was found between the groups with lower BMI values. This difference was observed between the obesity (30 and above) and overweight (25-29.9) groups and normal weight (18.5-24.9) and underweight (18.4 and below) groups. In particular, significant differences were found between obesity (group 4) and overweight (group 3) groups and normal weight (group 2) and underweight (group 1) groups in terms of family activity. Similarly, a significant difference was also found in the dimension of child activity. According to Tukey test findings, obesity (30 and over) and overweight (25-29.9) groups had lower levels of child activity than normal weight and underweight groups. Again, significant differences in child activity were observed between obesity and overweight groups compared to normal weight and underweight groups.

The results from the Tukey test show that the groups with lower BMI (normal weight and underweight) have higher levels of family and child activity.

Regarding the fifth research question, multiple regression analysis was conducted to test whether the subscales of the Family Nutrition and Physical Activity (FNPA) scale significantly predicted BMI. The results of the regression analysis for BMI are presented in Table 6.

Table 6. Regression Analysis Findings for BMI

Variable	B	Standard Error	*β*	*t*	*p*
Constant	57.485	49.487	-	1.162	.246
Family Meals	-1.109	1.620	-0.316	-0.685	.494
Family Eating Habits	-0.569	3.640	-0.161	-0.156	.876
Food Preferences	-6.665	2.646	-0.795	-2.519	.012
Beverage Preferences	7.263	1.877	1.120	3.869	.000
Restriction/Rewarding	-1.263	1.877	0.217	0.673	.501
Healthy Environment	-6.402	1.865	-0.490	-3.433	.001
Family Activity	-4.739	3.665	-1.340	-1.293	.197
Child Activity	-0.311	0.191	-0.056	-1.632	.103
Family Program Sleep Routine	5.263	1.695	1.139	3.106	.002
$R = .820$, $R^2 = .673$, $F(9, 521)$					
$F(7, 523) = 119.015$, $p < .001$					

This multiple linear regression analysis examines the effect of Family Nutrition and Physical Activity Scale (FNPA) sub-dimensions on Body Mass Index (BMI). As a result of the multiple linear regression analysis conducted to reveal how the sub-dimensions of the FNPA which were thought to affect BMI, predicted BMI, a significant relationship (R = .820, R2 = .673) emerged with the food preferences, beverage preferences, healthy environment, and family program sleep patterns sub-dimensions of the scale (F (9, 521) = 119.015, p <.001). Together, these nine variables explained 67% of BMI. This suggests that these factors have a strong influence on BMI. According to the standardized regression coefficients, each sub-dimension had a different degree of influence on BMI. Beverage preferences are the strongest predictor (β = 7.263), meaning that beverage preferences are a factor that increases BMI. Food preferences, on the other hand, have a negative effect, decreasing BMI (β = -6.665). However, a healthy environment (β = -6.402) and family program sleep patterns (β = 5.263) also have a significant effect on BMI. According to the regression coefficients, the effect of some variables seems to be weaker, especially the factors family activity (β = -4.739), restriction/reward (β = -1.263), family meals (β = -1.109), family eating habits (β = -0.569) and child activity (β = -0.311) show lower effects on BMI. In addition, the significance of some variables was tested, and considering the significance tests of the regression coefficients, it was stated that the p

values of the first, second, fifth, seventh and eighth (family activity, family meals, family eating habits and child activity) factors among the predictor variables were greater than 0.05, so there was no significant effect on BMI ($p > .05$). In the analysis, the 'Monitoring time variable' was excluded from the model because of the high correlation between the independent variables. This was a step to prevent multicollinearity."

According to the regression analysis results, the regression equation predicting BMI is as follows; BMI˙= 57.485 + [(-1.109) * first factor] + [(-0.569) * second factor] + [(-6.665 * third factor)] + [(7.263 * fourth factor)] + [(-1. 263) * fifthfactor] + [(-6.402) * sixthfactor] + [(-4.739) * seventhfactor] + [(-0.311) * eighthfactor] + [(5.263) * ninthfactor]

Conclusion and Discussion

The socio-economic status, education level, and family structure of parents are among the important factors in the development of childhood obesity. The nutritional preferences and education level of the family, food culture, and eating habits at home play a decisive role in the formation of obesity in school-age children. In addition, it has been reported that there is a significant relationship between the child's adequate physical activity status, screen time, and obesity (Deleş, 2019; Ekici et al., 2023; İnal & Canbulat, 2013). No significant difference was found between the BMI values of children according to the gender variable. In many studies in the literature, no significant difference was found between children's gender and BMI values. These findings suggest that gender is not a determinant of BMI (Freedman et al., 2004; Janssen et al., 2004; Maffeis et al., 1998; Ogden et al., 2012).

When the findings of this study were examined, the effects of parental education level on the body mass index (BMI) of school-age children were analyzed, and significant differences were found between mothers' and fathers' education levels. It was determined that children had lower BMI values as the education levels of mothers and fathers increased. These findings suggest that parents may be better equipped to raise health awareness and healthy habits in their children. As parental education levels increase, parents tend to make more informed health decisions (Lynch et al., 2004). This may contribute to children having lower BMI values. Increasing parental education levels may enable them to access health information about their children more easily and make more informed health decisions. Similar relationships have been found in the literature between education level and the obesity risks of children (Larsen et al., 2015).

In the study conducted by Gubbels et al. (2014), it was found that parents' health behaviors directly affect children's daily physical activity levels and dietary choices. More educated parents tend to better guide their children's diet quality and physical activity. As a result, these children tend to have lower BMI values. Moreover, a stronger motivation toward a healthy lifestyle was observed in families where parents had higher levels of education (De Coen et al., 2012). However, the lack of a significant difference between school type and children's BMI supports the idea that children's eating habits are related to parental

education, suggesting that children's eating and physical activity habits are largely family-based.

The current study also examined the effects of family and child activities on children's body mass index (BMI). One-way ANOVA analyses of family activity and child activity dimensions showed that there were significant differences in both dimensions. Tukey test results for family activity and child activity revealed that groups with lower BMI had higher scores in family and child activities. These findings suggest that family and child activities play an important role in children's BMI. In particular, children with low BMI were more active in family and child activities. These results suggest that increasing the physical activity levels of families and children may be an important strategy in the prevention and treatment of childhood obesity. In the literature, there are many studies in which families' eating habits and physical activity levels affect children's obesity risk (Pearson et al., 2009).

Obesity develops with the interaction of genetic and environmental factors. Families' eating habits and education levels play a critical role in the development of obesity in school-age children (Reilly & Kelly, 2011). Gupta et al. (2012) examined the prevalence of childhood obesity in developing countries and its relationship with the family environment. Families' eating habits are among the important environmental factors influencing the development of obesity in children. In addition, families' eating habits and education levels can lead to widespread health problems not only at the individual but also at the societal level (Hammond & Levine, 2010).

This study also presents the results of multiple linear regression analysis examining the effect of Family Nutrition and Physical Activity (FNPA) scale subscales on Body Mass Index (BMI). The findings show that FNPA subscales have a strong effect in explaining BMI. The overall model was found to be statistically significant, and the nine variables analyzed explained 67% of BMI. This suggests that FNPA factors play an important role in determining BMI. Beverage preferences and food preferences stand out as factors with significant and strong effects on BMI. In particular, beverage preferences increase BMI, while food preferences have a negative effect on BMI. These findings support that individuals' beverage choices and dietary habits play an important role in body weight and health.

In particular, it is consistent with previous studies on the effect of sugary and caloric beverages on BMI (Malik et al., 2010). In addition, healthy eating habits appear to have a stabilizing effect on BMI. Healthy food and beverage preferences are important factors that directly affect individuals' daily eating habits and thus their body mass. In particular, it is known that sugary drinks may lead to an increase in BMI due to their high-calorie content. On the other hand, healthy food preferences reveal that adopting balanced eating habits helps individuals maintain a healthy weight (Malik et al., 2010).

In this study, the effect of beverage preferences and food choices on BMI is consistent with this literature, and healthy eating habits seem to positively affect BMI. In addition,

environmental factors such as a healthy environment and family program sleep patterns were also observed to have a significant effect on BMI. This is in line with the findings in the literature on the long-term effects of environmental factors and sleep patterns on individuals' physical health (Vargas et al., 2018). A healthy environment suggests that the physical and social environment within the family plays a critical role in promoting healthy living habits. The impact of environmental factors on individuals' physical health has been emphasized in many recent studies (Laddu et al., 2021).

In particular, healthy environments provide an environment that encourages individuals to exercise regularly, make healthy food choices, and get enough sleep. In the study, the healthy environment factor was found to have a negative effect on BMI, indicating that a healthy environment is an important factor that supports body health. Family sleep patterns reveal how the sleep habits of family members affect health. Adequate and quality sleep plays an important role in maintaining a healthy body mass index (Taheri et al., 2004). Lack of sleep can lead to metabolic disorders and an increased risk of obesity. Healthy sleep patterns within the family can help children and adults manage a healthy weight (Cappuccio et al., 2010). If the family environment helps to ensure regular sleep, it may support school-age children and adolescents in maintaining a healthy weight.

However, the effect of these factors was lower compared to other variables. Variables such as family activity, restriction/reward, family meals, family eating habits, and child activity did not have a significant effect on BMI. These findings differ from previous studies in the literature and suggest that these factors are less influential on BMI compared to some other variables with stronger effects. In particular, the limited effect of factors such as child activity and family meal patterns suggest that family physical activity and meal patterns may be important in influencing BMI only under certain conditions. These results are in line with the literature indicating that children's physical activity levels are shaped by a broader set of lifestyle and environmental interactions, rather than being an important factor in isolation (Berry et al., 2004).

One possible reason for this may be that family physical activity interacts with other lifestyle factors (e.g., dietary habits and environmental factors). The effect of physical activity on BMI is shaped not only by the amount of activity but also by the type, frequency, and intensity of activities (Hills et al., 2011). It was also found that the restriction/reward factor did not have the expected effect on BMI. Shaping dietary patterns and physical activity with rewards and restrictions is generally used as a method to influence individuals' eating behaviors. However, the short-term effects of restriction and reward strategies are not sustainable in the long term, which may have limited the effect of this factor on BMI.

It is frequently emphasized in the literature that excessive restrictions and rewards can lead to undesirable consequences in eating habits, especially for children and young people. Lazarevich et al. (2016), who examined the relationship between obesity, depression, and

emotional eating in young adults, Willem et al. (2020), emphasized that emotional dysregulation, depression, and anxiety affect different ways of emotional eating in moderate and severe obesity, and Braden et al. (2018), stated that emotional eating types are associated with different psychological and physical health outcomes (Lazarevich et al., 2016; Willem et al., 2020; Braden et al., 2018). Similarly, family meals and eating habits are other factors that do not directly affect BMI. Family meal patterns and eating habits can shape individuals' long-term dietary habits, but the influence of these habits may be moderated by stronger exogenous factors (e.g., environment and health policies) (Tzou & Chu, 2012).

The weak effect of these factors on BMI suggests that intra-family dynamics and individual preferences are shaped in interaction with environmental and social factors. In conclusion, this study provides important findings in explaining the effects of FNPA subscales on BMI. Factors such as drinking habits and a healthy environment have a significant effect on BMI, while family habits and physical activity levels have a more limited effect. These findings emphasize the importance of health policies and individual lifestyle changes in managing BMI.

Recommendations

Based on the findings regarding the relationship between obesity and family nutrition and physical activity in children aged 5-14 years, the following education-centered recommendations have been developed. Both schools and families play a crucial role in helping children develop and sustain healthy habits.

1. Healthy Nutrition Education in Schools: Comprehensive, healthy nutrition education should be provided to students in schools. Students should be informed about the importance of a balanced diet, healthy snacks, and the potential dangers of fast-food consumption. Additionally, school cafeterias should offer healthy food options, and children should be encouraged to choose these options.
2. Regular Physical Activity Programs: Daily physical activity opportunities should be increased in schools. In addition to physical education classes, activities that encourage movement during breaks can be organized. Moreover, fun sports clubs and extracurricular activities can be offered to help students develop a lasting habit of physical activity.
3. Health Education Programs: Schools can organize seminars and activities on topics such as nutrition, exercise, and sleep patterns as part of broader health education programs. These educational efforts can raise children's awareness not only about obesity but also about other health-related issues.
4. Engaging Families in Promoting Healthy Habits: The educational process should extend beyond schools to actively involve families. Educational programs for parents can encourage them to instill healthy eating habits in their children. Families should be advised to stock more fresh fruits, vegetables, and whole-grain foods at home while

limiting processed and fast foods. Additionally, involving children in meal preparation can spark their interest in healthy eating.

5. Collaboration with Families and Role Modeling: Families should be encouraged to motivate their children to engage in regular physical activity. Activities such as outdoor play, walking, or cycling can be supported. Furthermore, family members adopting an active lifestyle can serve as positive role models for children, fostering a culture of physical activity at home.

In conclusion, a collaborative effort between schools and families to promote healthy living habits is an effective approach to preventing childhood obesity. Education-based interventions can help establish lasting habits by raising awareness about healthy eating, physical activity, and overall health consciousness.

Conflict of interests

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