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Obesity among students with disabilities attending primary and secondary special education schools: The role of teachers and special educational personnel (SEP) in special education school settings

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Abstract

Background. Obesity is a growing public health concern among students with disabilities, adversely affecting their physical health, psychosocial well-being, and educational participation. Teachers and Special Educational Personnel play a vital role in promoting healthy lifestyles, early identification of obesity, and the implementation of school-based preventive interventions.

Methods. This quantitative cross-sectional study employed a structured questionnaire to explore educators' knowledge regarding the prevalence of obesity in primary and secondary schools attended by students with disabilities.

Results. The study investigated the relationship between educational level, academic specialization, gender, and childhood obesity, with a focus on children with disabilities. Findings indicated that the level of education significantly influences the knowledge and attitudes of educators and Special Educational Personnel (SEP), particularly concerning the prevalence of obesity and students' dietary habits. Special Education Staff is more likely to intervene with parents to promote healthier food choices. Differences in obesity prevalence by gender and the impact of food insecurity were also observed. High-Intensity Interval Training (HIIT) is identified as beneficial for the physical and mental health of students with special educational needs.

Conclusions. The study reports no statistically significant differences in educators' perceptions and practices related to nutrition, physical activity, and bullying, regardless of gender, specialization, or educational level, with minimal exceptions. A notable difference was found in parental interventions for overweight/obese students, with SEP and primary education teachers intervening more frequently. Participants acknowledged the role of special schools in promoting healthy habits through both instructional and experiential activities.

Keywords: Nutrition; Obesity; Health; Children; Adolescents; BMI; Disability; Special education

1. Introduction

According to the Food and Agriculture Organization, access to adequate and nutritious food is a fundamental human right protected under international law. Human health and well-being largely depend on adopting a balanced diet that includes a variety of foods and sufficient amounts of protein, vitamins, minerals, and energy. The proper selection and combination of foods ensure that the body's nutritional requirements are met and help prevent deficiencies in essential nutrients. Nutritional science studies the composition of foods, their nutrients, and their effects on human health. At the

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same time, ongoing research in medicine, dietetics, and the food industry seeks to improve dietary standards and develop products that meet the needs of modern consumers. [1], [2]

Nevertheless, despite scientific and technological progress, significant inequalities in access to nutritious food persist. A large proportion of the global population lacks access to basic foods necessary to maintain health, leading to widespread malnutrition. Malnutrition refers not only to insufficient food intake but also to deficiencies in specific nutrients required for proper bodily functioning. Its consequences include reduced physical and cognitive performance, weakened immune function, and increased vulnerability to disease. Today, hundreds of millions of people suffer from hunger due to wars, climate change, and economic inequalities. At the same time, billions are unable to secure a healthy diet containing the nutrients their bodies require. Malnutrition occurs across all countries and socioeconomic groups and may be associated with weight loss, overweight, or obesity. [3-5]

2. Material and methods

The present study aimed to investigate the prevalence of obesity among students with disabilities attending public special education schools in primary and secondary education across regional units of Central Macedonia, Greece. To achieve this objective, a structured questionnaire consisting of fifteen items was developed and administered to the teachers and Special Educational Personnel (SEP) employed in public special education schools of primary and secondary education.

This study employed a quantitative cross-sectional research design using a questionnaire, one of the most widely used methods for data collection. The survey was conducted in schools located in the regional units of Central Macedonia. The research focused on the occurrence of obesity among students with disabilities attending public primary and secondary schools, including Special Education schools, as well as students enrolled in General Education settings receiving Parallel Support or attending Inclusion Classes.

The questionnaire comprised fifteen questions concerning obesity among students with disabilities. Most questions were answered using closed-ended response options (Yes/No/Do not know/Prefer not to answer). Specifically, the first question assessed participants' knowledge of the definition of obesity. The second examined their understanding of Body Mass Index (BMI) and its calculation, while the third assessed their knowledge of the BMI threshold used to classify an individual as obese. The fourth question investigated how frequently participants encountered students with disabilities who were obese, with response options ranging from "always" to "rarely." The fifth question examined whether obesity was observed predominantly among boys, girls, or equally among both sexes. The sixth question explored whether participants were able to recognize when a student should be considered obese, whereas the seventh assessed their knowledge of students' dietary habits.

The eighth question focused on the types of snacks typically consumed by students with disabilities, including fruit, sandwiches, dairy products, sweets, pies, or pizza. The ninth question investigated whether participants believed that a student's disability influenced food choices. The tenth asked whether respondents had ever advised a parent to replace their child's snack with a healthier alternative. The eleventh question explored whether students regularly participated in physical activity during their leisure time. Questions twelve and thirteen examined participants' perceptions regarding the extent to which special schools promote healthy eating habits and physical activity through the educational process. The fourteenth question addressed bullying and asked participants whether they had ever observed a student with obesity being bullied because of their body size or physical appearance. Finally, the fifteenth question invited respondents to describe the ways in which their school encourages students to adopt a healthy lifestyle, including balanced nutrition and regular physical activity.

The questionnaires were distributed electronically to school staff via the official email addresses of all schools, including both special education schools and mainstream schools that support students with disabilities and learning difficulties. Specifically, following telephone communication with the school principals, the questionnaires were sent in electronic format to Special Kindergartens, Special Primary Schools, as well as mainstream kindergartens and primary schools in which Special Education Teachers and other educational staff provide support through Parallel Support Services (PSS) and Inclusion Classes (ICs), facilitating the educational progress of students with disabilities. Furthermore, the questionnaires were distributed using the same procedure to secondary education schools, including special education settings, as well as to mainstream lower and upper secondary schools where special education teachers, philologists, mathematicians, physicists, chemists, and biologists staff Inclusion Classes and provide Parallel Support Services for students with disabilities attending these schools.

According to the relevant literature, a sample size of approximately 100 participants is sufficient to yield dichotomous (Yes/No) responses with a reliability level of 95%, whereas sample sizes ranging from 400 to 2,000 participants can achieve reliability levels of 97% or 99%. [6] The content validity of the questionnaire was assessed by calculating the Content Validity Ratio (CVR) for each questionnaire item. A panel of five teachers and professors of academic institutions with expertise relevant to the study topic was selected to evaluate the items. The CVR values for the individual items ranged from 0.78 to 1.00, meeting or exceeding the minimum acceptable CVR threshold of 0.78 required for an item to be retained in the questionnaire. To assess the reliability of the questionnaire, a test-retest procedure was conducted by administering the instrument to a sample of 22 participants with a two-week interval between administrations. Test-retest reliability was evaluated using Cohen's kappa (κ) correlation coefficient, which yielded a value of 0.82, indicating good reliability. [7]

The study received ethical approval from the Research Ethics and Deontology Committee of the School of Health Sciences, University of the Peloponnese (Approval no. 3716/17-02-2025).

2.1. Statistical Analysis

Data were analyzed using IBM SPSS Statistics version 31.0 (IBM Corp., Armonk, NY, USA). In the univariate analysis, categorical variables were summarized as frequencies and percentages. The chi-square (χ^2) test was used to examine associations between categorical variables, and Fisher's exact test was performed when the chi-square (χ^2) test was not applicable. Correlations between quantitative variables were assessed using Spearman's rank correlation coefficient (Spearman's rho). Test-retest reliability of the questionnaire was evaluated using Cohen's kappa (κ) correlation coefficient. A two-tailed p-value of <0.05 was considered statistically significant for all analyses.

3. Results

3.1. Demographic characteristics of the sample

A total of 205 teachers and members of the Special Educational Personnel (SEP) working in Special Education settings at the primary and secondary levels participated in the present study. The majority of the sample consisted of women ($n = 164$, 80.0%), while most participants belonged to the 31–40 age group ($n = 71$, 34.6%). Regarding academic qualifications ($n = 204$), 106 participants (52.0%) were university graduates, while 31 (15.2%) had graduated from Technological Educational Institutions (TEIs). Additionally, 26 participants (12.7%) did not specify their institution of graduation. Concerning specialization in Special Education, 104 participants (51.0%) had completed a 400-hour training seminar, 125 (61.3%) held a postgraduate degree, 4 (2.0%) held a doctoral degree, and 29 participants (14.2%) reported possessing more than one certification or qualification in Special Education. In terms of years of professional teaching experience, the largest proportion of the sample had up to five years of experience ($n = 68$, 33.2%), followed by those with 6–10 years ($n = 45$, 22.0%) and 11–15 years ($n = 37$, 18.0%). Smaller proportions were observed in the higher experience categories, with 11 participants (5.4%) reporting more than 30 years of experience. Regarding the educational level of the school unit in which participants were employed ($n = 204$), 66 participants (32.4%) worked in primary education, 126 (61.8%) in secondary education, and 12 (5.9%) reported working across both educational levels. In relation to the type of Special Education school unit ($n = 202$), most participants were employed in Special Vocational Education and Training Schools ($n = 70$, 34.7%) and Special Education and Vocational Training Workshops ($n = 36$, 17.8%), while smaller proportions were recorded for Special Primary Schools, Inclusion Units, Parallel Support, and other structures. Additionally, 18 participants reported working simultaneously in structures across both educational levels. Finally, regarding position within the school unit ($n = 204$), 130 participants (63.7%) identified as teachers, 40 (19.6%) as members of the Special Educational Staff, 12 (5.9%) were seconded staff, while smaller proportions held positions as school principals, deputy principals, or other forms of employment. Table 1 presents the demographic data of the sample.

Table 1 Demographic data of the sample (N=205)

Variable	N	%
<u>Gender</u>		
Male	40	19.61
Female	164	80.39
<u>Age</u>		
22-30 years	26	12.68
31-40 years	71	34.63
41-50 years	61	29.76
51-60 years	38	18.54
>60 years	9	4.39
<u>Marital status</u>		
Single	47	22.93
Married	145	70.73
Divorced	11	5.37
No answer	2	0.98
<u>Professional specialization</u>		
Special Education teachers	137	66.83
Special Educational Personnel (SEP)*	35	17.07
Did not specify	33	16.10
<u>Employment status</u>		
Permanent teachers or SEP**	115	56.37
Substitute staff under fixed-term contracts	78	38.24
Other	11	5.39

*Including speech therapists, psychologists, nurses, physiotherapists, occupational therapists, and social workers

**Special Educational Personnel

3.2. Inferential Statistical Analysis

The examination of the relationships between participants' responses to the 15 questionnaire items and the three independent variables (gender, subject area/professional specialization, and educational level) was conducted using the chi-square (χ^2) test, and, where the assumptions were not met, Fisher's Exact Test was applied.

3.2.1. Knowledge of Obesity and Body Mass Index (Questions 1–3)

No statistically significant association was found between knowledge of the definition of obesity and gender (χ^2 , df = 2, p = 0.80), nor between knowledge of the definition and professional specialization (χ^2 , df = 2, p = 0.69). In contrast, knowledge of the definition of obesity was found to be statistically significantly associated with educational level (χ^2 , df = 4, p = 0.03), with higher percentages observed in secondary education (92.9%) and lower percentages in the combined primary and secondary education level (66.7%).

Concerning knowledge of Body Mass Index (BMI) and the method of its calculation, no statistically significant associations were identified with gender (Fisher's Exact Test, p = 0.783), professional specialization (Fisher's Exact Test, p = 0.770), or educational level (Fisher's Exact Test, p = 0.403). Similarly, correct identification of the diagnostic BMI threshold for obesity did not show a statistically significant association with gender (χ^2 = 1.072, df = 2, p = 0.59), professional specialization (χ^2 = 2.73, df = 2, p = 0.26), or educational level (Fisher's Exact Test, p = 0.218).

3.2.2. Frequency and Distribution of Obesity among Students with Disabilities (Questions 4–5)

The frequency with which obese students with disabilities were encountered in the school environment was not statistically significantly associated with gender (Fisher's Exact Test, p = 0.062) or professional specialization (Fisher's

Exact Test, $p = 0.142$). In contrast, a statistically significant association was observed with educational level (Fisher's Exact Test, $p = 0.044$), with higher proportions of "very often" responses reported in primary education.

Estimation of the distribution of obesity according to students' gender did not show a statistically significant association with participants' gender (Fisher's Exact Test, $p = 0.974$) or professional specialization (Fisher's Exact Test, $p = 0.876$). However, a statistically significant association was found with educational level (Fisher's Exact Test, $p = 0.013$), with higher percentages reporting an equal distribution between boys and girls in secondary education.

3.2.3. Recognition of Obesity and Knowledge of Dietary Habits (Questions 6–9)

The ability to recognize obesity in students was not statistically significantly associated with gender (Fisher's Exact Test, $p = 0.509$), professional specialization (Fisher's Exact Test, $p = 0.887$), or educational level (Fisher's Exact Test, $p = 0.754$). Knowledge of students' dietary habits did not show a statistically significant association with gender ($\chi^2 = 1.131$, $df = 2$, $p = 0.57$) or professional specialization ($\chi^2 = 5.81$, $df = 2$, $p = 0.055$); however, a statistically significant association was identified with educational level (Fisher's Exact Test, $p = 0.007$), with higher levels of reported knowledge in primary education.

Finally, the perception that disability influences students' dietary preferences was not statistically significantly associated with gender ($\chi^2 = 0.212$, $df = 2$, $p = 0.900$), professional specialization ($\chi^2 = 0.71$, $df = 2$, $p = 0.70$), or educational level ($\chi^2 = 3.785$, $df = 4$, $p = 0.436$).

3.2.4. Interventions, Physical Activity, and the Role of the School (Questions 10–14)

Intervention directed toward the parents of overweight or obese students did not show a statistically significant association with gender (Fisher's Exact Test, $p = 0.540$); however, it was found to be statistically significantly associated with professional specialization (Fisher's Exact Test, $p = 0.021$) and educational level (Fisher's Exact Test, $p = 0.023$). Knowledge regarding students' engagement in regular physical activity was not statistically significantly associated with gender ($\chi^2 = 2.213$, $df = 2$, $p = 0.331$), professional specialization ($\chi^2 = 2.72$, $df = 2$, $p = 0.26$), or educational level (Fisher's Exact Test, $p = 0.891$).

The perception that special schools promote healthy dietary habits and physical activity through the educational process did not present statistically significant associations with any of the examined independent variables ($p > 0.05$). Similarly, experience or awareness of incidents of bullying related to body shape or physical appearance was not statistically significantly associated with gender ($\chi^2 = 0.459$, $df = 2$, $p = 0.795$), professional specialization ($\chi^2 = 0.08$, $df = 2$, $p = 0.96$), or educational level (Fisher's Exact Test, $p = 0.616$).

3.2.5. Strategies for Promoting a Healthy Lifestyle (Questions 15.1–15.5)

Perceptions regarding the contribution of experiential activities, exercise through play, the use of educational videos or films, and participation in sports events for people with disabilities did not demonstrate statistically significant associations with gender, professional specialization, or educational level in any of the individual analyses ($p > 0.05$). Table 2 summarizes the results of the chi-square (χ^2) statistical tests for the 15 questionnaire items in relation to gender, subject area/professional specialization, and educational level.

Table 2 Summary of the results of the chi-square (χ^2) statistical tests for the 15 questionnaire items in relation to gender, subject area/professional specialization, and educational level

Question	Gender		Specialization		Educational level	
	χ^2	p	χ^2	p	χ^2	p
Question 1	0.592	0.80*	0.737	0.69*	9.930	0.03*
Question 2	0.833	0.78*	0.756	0.77*	3.749	0.40*
Question 3	1.072	0.59	2.73	0.26	5.379	0.22*
Question 4	8.416	0.06*	6.469	0.14*	14.549	0.04*
Question 5	0.626	0.97*	1.273	0.88*	17.815	0.01*
Question 6	1.617	0.51*	0.407	0.89*	1.776	0.75*

Question 7	1.131	0.57	5.81	0.06	12.954	0.01*
Question 8	7.773	0.14*	6.141	0.27*	13.533	0.15*
Question 9	0.212	0.90	0.71	0.70	3.785	0.44
Question 10	1.259	0.54*	7.601	0.02*	10.556	0.02*
Question 11	2.213	0.33	2.72	0.26	1.220	0.89*
Question 12	2.237	0.35*	0.376	0.88*	5.891	0.17*
Question 13	0.735	0.73*	0.107	1.000*	3.016	0.50*
Question 14	0.459	0.80	0.08	0.96	2.588	0.62*
Question 15.1	0.029	0.86	1.17	0.28	2.608	0.27
Question 15.2	0.861	0.35	0.88	0.35	2.892	0.24
Question 15.3	0.585	0.44	0.17	0.68	1.370	0.50
Question 15.4	1.633	0.20	0.021	0.88	2.328	0.31
Question 15.5	0.644	0.42	0.628	0.43	0.443	0.80

*Fisher's Exact Test applied where assumptions of the chi-square test were not met

4. Discussion

The present study examined the relationship between participants' knowledge and perceptions of obesity based on three independent variables: gender, subject area/specialization, and educational level. The results indicate that participants' gender and specialization are not statistically significantly associated with the majority of the variables examined. Specifically, knowledge regarding obesity and Body Mass Index (BMI), the ability to recognize obesity, and perceptions of students' dietary habits were not influenced by either gender or specialization.

In contrast, educational level emerged as a significant factor in certain items. Statistically significant differences were observed with regard to knowledge of the definition of obesity, the frequency of encountering obese students with disabilities in the school environment, perceptions of the distribution of obesity by gender among students, and knowledge of students' dietary habits. In these cases, primary education more frequently exhibited higher levels of knowledge or observation compared to other educational levels. Overall, the findings suggest that educational level is at times associated with participants' knowledge and experiences related to childhood obesity, whereas gender and specialization do not appear to play a substantial role. This differentiation underscores the need to tailor educational interventions according to educational level, in order to enhance staff awareness and sensitivity regarding issues related to obesity and students' dietary habits.

4.1. Hypothesis Concerning Educational Level

In the first question, which addressed the definition of obesity, participants' responses indicated that the variable "educational level" is statistically significant in relation to knowledge of the definition of obesity. According to the study by Sztainer et al. (1999), particular concern is raised by the rapid increase in childhood obesity, which has long-term consequences for health and quality of life. The article evaluates the beliefs of teachers and school health personnel regarding obesity and examines how these beliefs may influence the effectiveness of interventions during adolescence. [8]

The main findings of the study suggest that obesity is attributed to individual dietary choices, lifestyle, and personal responsibility, while body weight is not associated with the personal circumstances and lived experiences of individuals with obesity. Furthermore, some participants expressed negative biases toward individuals with obesity, perceiving them as more emotional, clumsier, and less likely to achieve professional advancement or maintain stable family lives compared to individuals without obesity. The school community is therefore called upon to function as a catalyst for change in addressing both childhood obesity and the stigma that often accompanies excessive body weight. School staff play a pivotal role in health-related interventions and must leverage their influence, given their ongoing and sustained contact with students. According to the findings of the present quantitative study and concerning the frequency of obese students with disabilities attending special primary and secondary schools (Question 4), educational level is statistically significantly associated with particularly high percentages in the response option "very often." Specifically, this

response was selected by 46.2% of participants in primary education, a considerably lower percentage in secondary education (32.5%), while the combined percentage across both educational levels reached 41.7%.

More specifically, the majority of participants, including teachers and members of the Special Educational Staff, reported encountering “very often” or “quite often” obese students who tend to consume unhealthy foods during school breaks as snacks (Question 8), such as pies, pizza, bagels, and toast. Childhood obesity constitutes one of the most serious and rapidly increasing public health challenges worldwide, particularly among children with disabilities, with a marked prevalence in both developed and developing countries.

The study by Pelt (2021) supports this finding, arguing that childhood obesity represents a major public health challenge, especially among children with disabilities, due to a combination of biological, environmental, and social factors. In particular, children with intellectual and developmental disabilities (IDDs), such as autism spectrum disorder (ASD) and Down syndrome, exhibit higher rates of overweight and obesity compared to the general pediatric population. [9] Furthermore, Sammels (2022), in a systematic review and meta-analysis, reports that the prevalence of obesity appears to be elevated among children with ASD, with contributing factors including selective eating behaviors, preferences for energy-dense foods, and adverse effects of psychotropic medications, such as risperidone, which is prescribed to reduce disruptive behaviors but is associated with significant weight gain. [10]

Regarding Question 5, which concerned the gender distribution of obese students with disabilities attending special education settings, the variable of educational level was found to be statistically significantly associated with the observed prevalence of obesity by gender. Specifically, particularly high observation rates were recorded for the response option “equal proportion.” Obese boys and girls were reported at a rate of 49.6% in secondary education, while the corresponding percentage in primary education was substantially lower (34.8%). When the two educational levels were considered jointly, the percentage reached 41.7%.

The study by Bae and Choi (2021) investigated the relationship between obesity and food insecurity among Korean students, examining gender differences in dietary intake and lifestyle behaviors. The findings indicated that obese boys ate out less frequently and did not engage in regular physical activity, whereas obese girls were associated with the absence of a caregiver and consumed a higher proportion of energy from protein. Additionally, food insecurity was associated with a lower risk of obesity among boys, while the risk of obesity among girls was nearly three times higher. The authors argue that dietary and physical activity behaviors differ between boys and girls with obesity. These findings confirm that lifestyle and dietary patterns related to obesity vary by gender, a factor that is particularly critical for the development of intervention strategies and the implementation of individualized approaches. Moreover, the gender-specific relationship between food insecurity and obesity highlights the need for gender-sensitive intervention frameworks. [3]

In Question 7, which examined the extent to which teachers and members of the Special Educational Staff are aware of students’ dietary habits and preferences, educational level was found to be statistically significantly associated with knowledge of students’ dietary habits. High percentages were observed in primary education (84.8%), whereas the corresponding percentage in secondary education was substantially lower (61.1%). When both educational levels were considered jointly, the recorded percentage reached 75.0%.

According to the systematic review by Jia et al. (2021), which investigated access to fast-food restaurants (FFRs), dietary habits, and obesity among children and adolescents, increased availability of FFRs is associated with higher rates of overweight and obesity and is considered a risk factor for childhood obesity. It is widely accepted that certain neighborhood environmental factors interact with individual characteristics and influence body weight status. Fast-food outlets constitute one such environmental factor, as they offer relatively inexpensive food and facilitate easy access to meals that are typically high in calories, saturated fats, sugars, simple carbohydrates, and sodium, thereby encouraging unhealthy dietary choices among children and the general population. [11]

Furthermore, according to the study by Mahmood et al. (2022), the impact of unhealthy dietary preferences, particularly in emerging countries such as Egypt, is associated with the development of dental caries and excessive body weight among school-aged children, two major pediatric health conditions. The findings of this study suggest that childhood obesity is linked to caries in the primary dentition, mainly due to increased consumption of sugar-sweetened beverages and desserts, whereas regular consumption of fruits and vegetables appears to play a protective role. [12]

Moreover, according to the findings of the present quantitative study, the majority of staff members—both teachers and Special Educational Staff—working in classes attended by students with disabilities reported that the learning process in special schools promotes healthy dietary habits (Question 12) aimed at preventing obesity or maintaining a normal

body weight, as well as physical activity (Question 13). This finding is substantiated by the review study of Kumari et al. (2022), which addresses childhood obesity in contemporary society. Overweight children often experience difficulties engaging in physical exercise; therefore, encouraging the inclusion of some form of physical activity in their daily routine is considered beneficial. [13]

According to the systematic review by Poon (2023), physical inactivity constitutes a global public health issue and is associated with chronic diseases such as cardiovascular disorders, obesity, and type 2 diabetes mellitus. The findings indicated that high-intensity interval training (HIIT) in children and adolescents with special educational needs (SEN) yields significant benefits across a range of physical and mental health indicators, comparable to those observed in typically developing populations. In addition, physical fitness demonstrated marked improvements, including increases in cardiorespiratory endurance, anaerobic power, and functional capacity. More specifically, the regular implementation of HIIT resulted in reductions in BMI, waist circumference, and body fat percentage—outcomes that are particularly critical for individuals with SEN, who are at increased risk of developing obesity. [14]

Moreover, substantial improvements were observed in mental health, quality of life, behavior, and cognitive functioning among children and adolescents with SEN. HIIT was characterized as a safe and feasible intervention, associated with high adherence rates and the absence of serious adverse events, and was identified as an effective strategy for enhancing the health and functional capacity of children and adolescents with SEN. Prevention emerges as a central pillar in addressing childhood obesity, given the difficulty of reversing obesity at advanced stages. Preventive strategies include the adoption of a balanced diet, the promotion of physical activity, adequate sleep, reduced screen time, and effective stress management. The active involvement of families, educators, and the state is considered crucial for the establishment of healthy patterns and behaviors from early childhood. [13]

4.2. Hypothesis Concerning Subject Area

In Question 10, which examined whether teachers and members of the Special Educational Staff intervened with parents or guardians of overweight or obese students by encouraging them to replace their child's school snack with healthier dietary options, both subject area/specialization and educational level were found to be statistically significantly associated with such interventions. Specifically, the rate of intervention was higher among Special Educational Staff (65.7%) compared to teachers (40.5%). Concerning educational level, the intervention rate reached 66.7% in the combined educational level, 57.6% in primary education, and only 38.9% in secondary education.

Childhood obesity is associated with an increased risk of developing non-communicable diseases (NCDs), such as type 2 diabetes mellitus, cardiovascular diseases, chronic obstructive pulmonary disease, and certain types of cancer. Notably, the prevalence of obesity among children with disabilities is nearly twice that observed among children without disabilities. In particular, children with intellectual and developmental disabilities (IDDs), such as autism spectrum disorder (ASD), appear to be at equal or even greater risk of obesity compared to children with physical disabilities and the general pediatric population.

According to the systematic review and meta-analysis by Jacob (2021), school-based interventions incorporating health education for the prevention of adolescent obesity were associated with statistically significant, albeit modest, reductions in adolescents' BMI. Interventions of at least six months' duration that combined physical activity and nutritional education demonstrated stronger effects. Interventions yielding notable outcomes were characterized by face-to-face delivery, prior training of teachers, and, in many cases, active parental involvement. School-based interventions that integrate health education can therefore contribute to reductions in BMI. [15]

4.3. Hypothesis Concerning Gender

The findings of the present study indicate that, across all 15 items of the questionnaire completed by teachers and Special Educational Staff, no statistically significant effects were identified with respect to the gender of the participants.

4.4. Overall Evaluation of the Three Hypotheses

The present study examined the relationship between educational level, subject area/professional specialization, gender, and childhood obesity, with particular emphasis on children with disabilities. The results demonstrated that educational level significantly influences teachers' and Special Educational Staff's knowledge regarding the definition of obesity, the frequency of occurrence of obese students, and students' dietary habits. Participants in primary education reported a higher frequency of observing obese students and greater awareness of students' dietary preferences compared to staff in secondary education.

The consumption of unhealthy snacks during school breaks was frequently reported, while childhood obesity among children with disabilities was considered particularly prevalent due to biological, social, and environmental factors. Educational level was also associated with observations of obesity by gender, with higher rates of equal gender distribution reported in secondary education. Furthermore, food insecurity was found to affect boys and girls differently with respect to obesity risk.

In parallel, subject area/professional specialization influenced the extent of parental intervention aimed at promoting healthier snack choices, with Special Educational Staff intervening more frequently than teachers. The majority of participants perceived special schools as promoting healthy eating and physical activity. Interventions such as high-intensity interval training (HIIT) appear to exert positive effects on both the physical and mental health of children with SEN. Finally, no statistically significant effect of participants' gender was identified in any of the questionnaire items.

5. Conclusions

The main conclusions of the present study indicate the absence of statistically significant differences in teachers' perceptions and practices regarding students' nutrition, physical activity, and bullying, in relation to the variables of gender, subject specialization, and educational level, with only minor exceptions. Specifically, no statistically significant effect of gender was found on teachers' knowledge or intervention concerning issues related to the dietary preferences of students with disabilities, leisure-time physical activity, the promotion of healthy habits, or the perception of bullying based on body shape. Similarly, no significant differences were observed in the above variables with respect to subject area/professional specialization and educational level, with the exception of two cases. A notable differentiation was identified only concerning specialization and educational level in interventions targeting overweight or obese students through parental recommendations to modify school snacks. Special Educational Staff and teachers working in primary or combined educational levels were found to intervene more frequently compared to their counterparts in secondary education.

Furthermore, the majority of participants, regardless of demographic characteristics, believe that special schools contribute to the promotion of healthy dietary habits and physical activity, both through the instructional process and through experiential actions and play-based activities. Overall, the findings highlight a convergent stance among educators toward the promotion of healthy living in special education settings, while emphasizing the need to strengthen interventions addressing childhood obesity, particularly within specific educational levels and professional groups.

Compliance with ethical standards

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Disclosure of conflict of interest

No conflict of interest to be declared.

Statement of ethical approval

Approved by the Research Ethics and Deontology Committee of the School of Health Sciences, University of the Peloponnese (Approval no. 3716/17-02-2025).

Statement of informed consent

Written informed consent was obtained from all individual participants included in the study.

References

- [1] Ali A, Al-Ani O, Al-Ani F. Children's behaviour and childhood obesity. *Pediatric Endocrinology Diabetes and Metabolism* [Internet]. 2024 Jan 1;30(3):148–58. Available from: <https://doi.org/10.5114/pedm.2024.142586>
- [2] Smith JD, Fu E, Kobayashi MA. Prevention and management of childhood obesity and its psychological and health comorbidities. *Annual Review of Clinical Psychology* [Internet]. 2020 Feb 25;16(1):351–78. Available from: <https://doi.org/10.1146/annurev-clinpsy-100219-060201>
- [3] Bae JH, Choi JH. Gender disparities in childhood obesity and household food insecurity. *Nutrition* [Internet]. 2021 Feb 9;87–88:111190. Available from: <https://doi.org/10.1016/j.nut.2021.111190>
- [4] Shi L, Jiang Z, Zhang L. Childhood obesity and central precocious puberty. *Frontiers in Endocrinology* [Internet]. 2022 Nov 18;13:1056871. Available from: <https://doi.org/10.3389/fendo.2022.1056871>
- [5] Sarni ROS, Kochi C, Suano-Souza FI. Childhood obesity: an ecological perspective. *Jornal De Pediatria* [Internet]. 2021 Nov 12;98:S38–46. Available from: <https://doi.org/10.1016/j.jped.2021.10.002>
- [6] Clark T, Foster L, Bryman A, Sloan L. *Bryman's social research methods*. Oxford University Press; 2021.
- [7] Galanis P. Validity and reliability of questionnaires in epidemiological studies. *Archives of Hellenic Medicine* 2013;30(1):97-110.
- [8] Neumark-Sztainer D, Story M, Harris T. Beliefs and Attitudes about Obesity among Teachers and School Health Care Providers Working with Adolescents. *Journal of Nutrition Education* [Internet]. 1999 Jan 1;31(1):3–9. Available from: [https://doi.org/10.1016/s0022-3182\(99\)70378-x](https://doi.org/10.1016/s0022-3182(99)70378-x)
- [9] Pelt JV. Children with disabilities and obesity: A review of the factors increasing obesity risk and successful nutrition and physical activity interventions. *Today's Dietitian*. 2021;23(5):22.
- [10] Sammels O, Karjalainen L, Dahlgren J, Wentz E. Autism Spectrum Disorder and Obesity in Children: A Systematic Review and Meta-Analysis. *Obesity Facts* [Internet]. 2022 Jan 1;15(3):305–20. Available from: <https://pubmed.ncbi.nlm.nih.gov/35263756/>
- [11] Jia P, Luo M, Li Y, Zheng J, Xiao Q, Luo J. Fast-food restaurant, unhealthy eating, and childhood obesity: A systematic review and meta-analysis. *Obesity Reviews* [Internet]. 2019 Sep 10;22(S1):e12944. Available from: <https://pubmed.ncbi.nlm.nih.gov/31507064/>
- [12] Mahmoud SA, Moshay SE, Rady D, Radwan IA, Abbass MMS, Jawaldeh AA. The effect of unhealthy dietary habits on the incidence of dental caries and overweight/obesity among Egyptian school children (A cross-sectional study). *Frontiers in Public Health* [Internet]. 2022 Aug 16;10:953545. Available from: <https://doi.org/10.3389/fpubh.2022.953545>
- [13] Kumari S, Shukla S, Acharya S. Childhood Obesity: Prevalence and Prevention in Modern Society. *Cureus* [Internet]. 2022 Nov 18;14(11):e31640. Available from: <https://pubmed.ncbi.nlm.nih.gov/36540483/>
- [14] Poon ETC, Wongpipit W, Sun F, Tse ACY, Sit CHP. High-intensity interval training in children and adolescents with special educational needs: a systematic review and narrative synthesis. *International Journal of Behavioral Nutrition and Physical Activity* [Internet]. 2023 Feb 9;20(1):13. Available from: <https://pubmed.ncbi.nlm.nih.gov/36759853/>
- [15] Jacob CM, Hardy-Johnson PL, Inskip HM, Morris T, Parsons CM, Barrett M, et al. A systematic review and meta-analysis of school-based interventions with health education to reduce body mass index in adolescents aged 10 to 19 years. *International Journal of Behavioral Nutrition and Physical Activity* [Internet]. 2021 Jan 4;18(1):1. Available from: <https://pubmed.ncbi.nlm.nih.gov/33397403/>