"ANALYZE THE SELECTED FACTORS CONTRIBUTING FOR OVERWEIGHT / OBESITY AMONG SCHOOL CHILDREN AT SELECTED SCHOOLS IN NAVI MUMBAI-CASE CONTROL STUDY"

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ABSTRACT

Background& Aim of the study: Indian data regarding current trends in childhood obesity are emerging. Lifestyle changes and worldwide nutrition transition are important factors for the obesity epidemic. Current eating habits include the consumption of fast foods, sugary drinks, baked food, soft drinks, etc. These eating habits with decreased physical activity, lack of sleep, and lack of social leisure activities will lead to childhood obesity. The present study was aimed to determine the selected contributing factors associated with childhood overweight/obesity among school children aged between 13 to 16 years, in Navi Mumbai.**Material and Methods:** A case-control study was conducted among 300 school children in that 74 cases (overweight/obese) and 74 control (non -obese children) aged from 13 to 16 years were selected by using purposive sampling technique. For the present study, two different schools were selected in Navi Mumbai such as NMMC School and Swami Vivekanand School. The conceptual framework of the present study was based on web of causation theory. D. Y. Patil school of Nursing ethical committee approval was taken for this study. Observational tool (weighing machine & measuring tape) was used to measure the weight and height of the school children and interview tool of risk assessment tool was used to analyse the selected contributing factors such as food habits, physical activities, sleeping patterns, medical history & social leisure activities. The tool was modified based on validity and reliability. The collected data was tabulated, analyzed and interpreted by SPSS version. Frequency percentage distribution, odds ratio and chi-square test was used in this study. **Results:** Result revealed that out of 300 school children, 22% were overweight,3% school children were obese, 10% wereunderweight,and 65% were healthy. It was observed that nutritional factors like Bake food (OR=10.8, CI: 95%), Fast Food (OR=6, CI: 95%), Sugary drinks (OR=10.5, CI: 95%), soft drinks (OR=5, CI: 95%) were more likelihood of causing obesity & were significant factors. Physical factors like muscle & bone strengthening exercises (OR=0.092, CI: 95%), and aerobic activity (OR=0.11, CI: 95%) were less likelihood of causing overweight. In leisure factors, Students played outdoor games (OR=0.2, CI: 95%), and performed their hobbies (OR=0.15, CI: 95%) were less likelihood of causing obesity. **Conclusion:**Since school children obesity is rising at an alarming rate, the selected contributing factors determinants of obesity need to be addressed among school children. Eating fast food, soft drinks, baked food, and untimely meal were associated as risk factors for overweight/ obesity. While very less physical activity-exercise, lack of sleep & social leisure activities was also associated with overweight/ obesity. In order to prevent overweight

and obesity, it is necessary to create awareness among schoolchildren about healthy eating practices and desirable lifestyles.

Key Words: Childhood obesity, overweight, case, control, BMI, fast foods, soft drinks, baked food, physical activity, social leisure activities.

Introduction and need of the study

The obesity epidemic is one of the greatest public health, social, and economic challenges of the 21st century. Improving efforts to promote physical activity and healthy eating was entirely consistent with the fundamental mission of schools - educating young people to become healthy, productive citizens.

Obesity in children is a major public health issue in the United States and around the world. Obesity in children has become more common over the last few years. It was caused by a discrepancy between the number of calories consumed and the number of calories used. Obesity in children is caused by a combination of variables (genetic, behavioral, and environmental). Obesity in children has resulted in physical, psychological, and social health concerns. As a result, to prevent and control childhood obesity, effective intervention measures were adopted.[2]

Overweight and obesity are on the rise among schoolchildren worldwide, according to Gavin and Wang et al. They also claim that a large proportion of the global population is overweight or obese, with the United States accounting for 50%, Australia for 37%, Western Europe for 30%, and India for 17%. Being overweight and obese has been linked to an increased risk of cancer, cardiovascular disease, non-insulin-dependent diabetes, severe articular dysfunctions, and hypertension in people all over the world (WHO, 2005).[3]

The home food environment plays a significant role in influencing children's eating habits and the rise of obesity. Several factors contribute to obesity, and the home food environment factors discussed here make up a significant portion of the overall contextual context in which a child develops, grows, eats, and behaves.[6]

India has the third-highest rate of obesity in the world in terms of absolute numbers. The Global Burden of Disease Study 2013 found that 5.2 percent of women and 5.3 percent of men under 20 in India were overweight, according to systematic analysis.[8]

Children in Puducherry are more likely to be overweight and obese than the state average. Obesity and overweight were most prevalent in the Mahe region (8.66%) and private schools (4.69%). Adolescents who bought lunch at school were at increased risk of being overweight and obese (95% CI: 1.441 and 1.19–1.64). The prevalence of overweight and obesity was significantly lower among adolescents who participated in household activities (≥ 2 h/day).[7]

According to the prior work, the investigator knows that juvenile obesity has recently gained popularity throughout numerous countries. The alarming tendency of young people to develop obesity in the modern period was concerning. The prevalence of this issue was rising in India among all socioeconomic groups, and its causes were unknown. As a result, the researcher was intrigued by the subject and motivated to conduct this study on the chosen issue.

Material and methods

Research approach chosen for the study was analytical epidemiology method and case-control design which included four basic steps in conducting a case controls study such as selection of cases and controls, matching, analysis, and interpretation. In the present study, school children who were overweight/obese considered as the case and those who were not overweight/obese considered as control (figure-1). The dependent variables in the present study were obesity/overweight among school children and causes of obesity/overweight among schoolchildren were chosen as independent variables in this study.The study was conducted in two different schools selected in Navi Mumbai such as NMMC School and Swami Vivekananda School. Both schools were government, co-educational type and the medium was Marathi and English. School children studying in 8th to 10th standard were included in this study and special school children and psychiatric ill children excluded from the study. Total population was 300. Data collection was done by checking anthropometricmeasurements. Children who had normal BMI considered as control and children who fall under BMI criteria were considered as overweight/obese or case. By using non probability purposive sampling technique sample size was estimated as 148(74 cases and 74 controls). Reliability of anthropometric measuring scale was checked by using Pearson product moment correlation (r=0.99) and Cronbach's alpha test used to check the reliability of the risk assessment tool (Likert scale) in a homogenous group. The value of Cronbach's alpha was 0.889, indicating overall good internal consistency (alpha value >0.8). Selected participants were given risk assessment tool which consisted questions regarding their background and selected contributing factorsrelating to school children's sleep, physical activity, nutrition, medical problem, and leisure activities. Based on their background information each case was matched with each control (figure-2).

Ethical aspects

The ethical committee of the nursing school at D.Y. Patil University gave ethical clearance before the suggested study could be carried out. The school principals of selected schools in Navi Mumbai were asked for their permission to proceed with the institution after receiving the ethical committee's permission. After that, the procedure was described to the participants, and their informed consent was obtained. They were also promised that confidentiality would be upheld during the investigation.
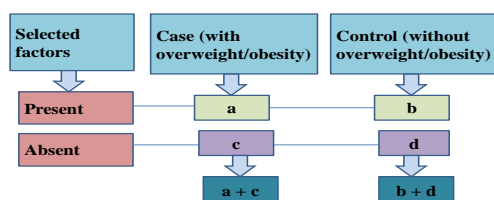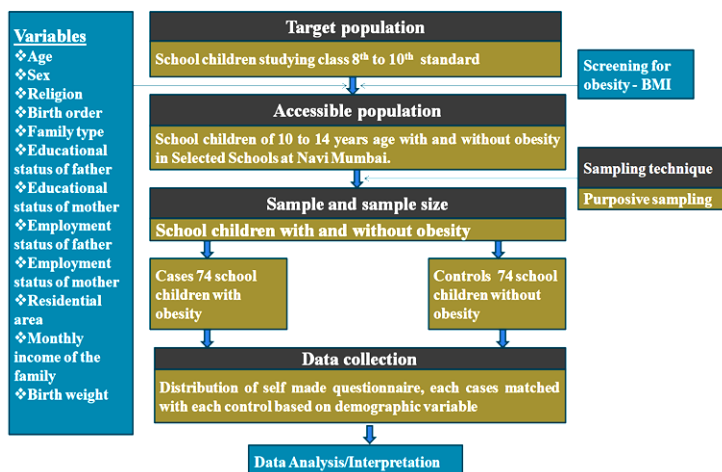

Figure-1 Research design

Figure-2 Schematic representation of data gathering process

Results

The data were created using descriptive statistics, which included frequency (n) and percentage (%) for categorical data. The chi-square test was used to compare the frequency of categories of variables with groups, and the odds ratio was determined for a 2 x 2 table.

Section A: Demographic data of the school children

300, 110 (36.67%) children were 14 years old,176 (59%) children were female and 124 (41%) children were male, 234 (78%) children were Hindu,157 (52.33%) children belonged to the nuclear family,159 (53%) fathers 'were employed,201 (67%) children's mothers were employed,9 (3%) children were having a birth weight of more than 3.9, 53 (17.67%) children had a birth weight between 3.5-3.9, 86 (28.67%) children had birth weight of 3-3.5, 131 (43.67%) children had weight between 2.5-3, 20 (6.7%) children had weight between 2-2.5 kg.

Section B: Assess the overweight/obesity among school children based on BMI.

Out of 300, 194 (65%) children were healthy, 65 (22%) children were overweight, and 32 (10%) children were underweight, 9 (3%) children were obese (figure 3)

Out of 124 males, 30 (24.1%) are overweight/obese, 80 (64.5%) are healthy, 14 (11.3%) were underweight. Out of 176 female 44(25%) were overweight/obese, 114(64.8%) were healthy, 18(10.2%) were underweight (figure-4)
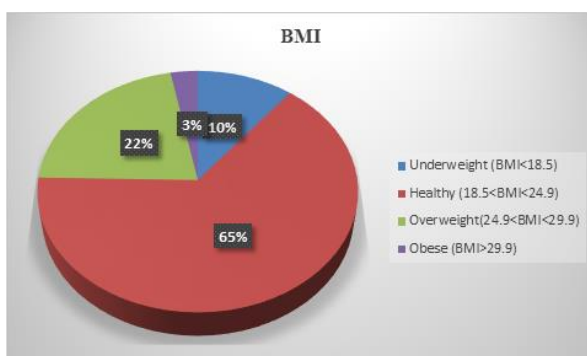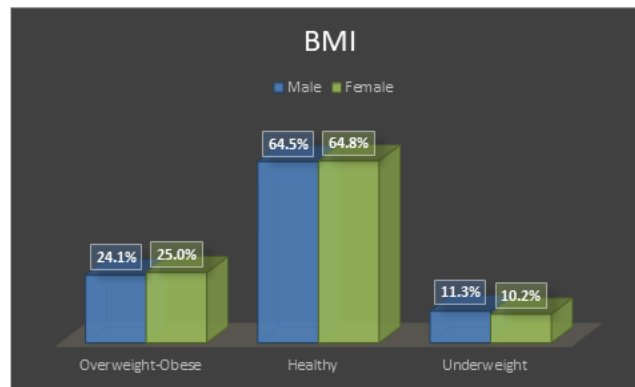
Figure-4 Gender based BMI.

Section C: Association between the selected factors and development of overweight/ obesity among the school children in case and control groups.

Nutritonal Factors	Level of factor	Case (with obese/overweight)		Control (without obese/overweight)		Chi-square test
		F	%	F	%	
Soft drink	Everyday	42	57%	0	0%	Chi square-60.663a.
	Never	8	11%	28	38%	
	Rarely	16	22%	35	47%	
	Sometimes	8	11%	11	15%	Df=3 p=.000**
Fruit juices	Everyday	35	47%	0	0%	Chi square-79.857a
	Never	5	7%	50	68%	
	Rarely	14	19%	18	24%	
	Sometimes	20	27%	6	8%	Df=3, p=.000**
Sugary drinks	Everyday	23	31%	0	0%	Chi square-52.359a
	Never	11	15%	48	65%	
	Rarely	14	19%	15	20%	
	Sometimes	26	35%	11	15%	Df=3, p=.000**
Energy drinks	Never	50	68%	55	74%	Chi square-2.223a
	Rarely	18	24%	11	15%	
	Sometimes	6	8%	8	11%	Df=2, p=.331
Bake food	Everyday	30	41%	0	0%	Chi square-52.796a
	Never	8	11%	42	57%	
	Rarely	14	19%	15	20%	
	Sometimes	22	30%	17	23%	Df=3, p=.000**
Fast food	Everyday	28	38%	0	0%	Chi square-45.963a
	Never	8	11%	48	65%	
	Rarely	4	5%	21	28%	
	Sometimes	34	46%	5	7%	Df=1, p=.000**
Do you skip breakfast?	No	28	38%	60	81%	Chi square-28.703a
	Yes	46	62%	14	19%	
			0%		0%	
Do you had meal on time?	No	25	34%	17	23%	Chi square-2.128a
	Yes	49	66%	57	77%	

Table 1 a: Association between the nutritional factors and development of

overweight/ obesity among the school children in case and control groups.

In the case group 56% of children had taken soft drinks daily,47% of children had taken fruit juices every day,31% of children had taken sugary drinks every day,68% of children had never taken energy drinks,41% of children had taken bake food every day,38% of children had taken fast food every day,66% of children had taken meals on time. In the control, 41% of children had sometimes time out leisure more than 3 hours,24% of children had taken fruit juices rarely,65% of children had never taken sugary drinks,15% had taken energy drink rarely,57% of children had never taken bake food,65%of children had never taken fast food,77% of children had taken meals on time. There was a statistically significant association between nutritional factors such as Soft Drinks, Fast Food, Bake Food, Fruit Juices, Sugary Drinks & Skipping breakfast and development of obesity (Table 1 A).

Physical Factors

Physical factors	Level of factor	Case (with obese/overweight)		Control (without obese/overweight)		Chi-square test
		F	%	F	%	
Any moderate to vigorous-intensity physical activity, mostly aerobic at least 60minutes per day	Everyday	6	8%	27	36%	Chi square- 47.57a
	Never	7	9%	28	38%	
	Rarely	35	47%	7	9%	
	Sometimes	26	35%	12	16%	Df=3, p=.000**
Any vigorous activity on at least 3 days per week	Everyday	12	16%	36	49%	Chi-square- 72.126a
	Never	8	11%	33	45%	
	Rarely	42	57%	0	0%	
	Sometimes	12	16%	5	7%	Df=3, p=.000**
Muscle and bone strengthen	Always	7	9%	22	30%	Chi-square- 40.635a
	Mostly	9	12%	28	38%	
	Never	42	57%	8	11%	
	Sometimes	16	22%	16	22%	Df=3, p=.000**
Light intensity activity for more than 3hours	Always	0	0%	35	47%	Chi square- 66.686a
	Mostly	12	16%	20	27%	
	Never	44	59%	6	8%	
	Sometimes	18	24%	13	18%	Df=3, p=.000**

Table 1 b: Association between the physical factors and development of

overweight/ obesity among the school children in case and control groups.

In case group 47% children never performed any moderate to vigorous-intensity physical activity, mostly aerobic at least 60 minutes per day, 57% of children never performed, vigorous activity at least 3 days per week, 57% of children had never done, muscle and bone-strengthening exercises, 60% of children never performed, light-intensity activity for more than 3 hours. 36% of children always performed aerobics at least 60 minutes per day,50% of children always performed vigorous activity at least 3 days per week,30% of children always performed muscle and bone-strengthening exercises,47% of children always performed light-intensity activity for more than 3 hours. There was a statistically significant association between all physical factors and development of obesity(Table 1 b).

Sleep Factors

Sleep factors	Level of factor	Case(with obese/overweight)		Control(without obese/overweight)		Chi-square test
		F	%	F	%	
My sleep hours were enough(at least 8 to 10 hours in a day	Almost always	6	8%	30	41%	Chi-square-62.610[a]
	Often	12	16%	27	36%	
	Rarely	27	36%	8	11%	
	Sometimes	29	39%	9	12%	Df=4, p=.000**
			0%		0%	
I fall into a deep sleep	Almost always	15	20%	26	35%	Chi-square-27.783a
	Often	14	19%	34	46%	
	Rarely	22	30%	8	11%	
	Sometimes	23	31%	6	8%	Df=3, p=.000**
			0%		0%	
I feel refreshed after sleep	Almost always	7	9%	29	39%	Chi-square-72.777[a]
	Often	6	8%	27	36%	
	Rarely	33	45%	10	14%	
	Sometimes	28	38%	8	11%	Df=4, p=.000**
			0%		0%	
Poor sleep makes me irritated and give headache	Almost always	30	41%	5	7%	Chi-square-29.520a
	Often	21	28%	20	27%	
	Rarely	8	11%	27	36%	
	Sometimes	15	20%	22	30%	Df=3, p=.000**

Table 1 c: Association between the sleep factors and development of

overweight/ obesity among the school children in case and control

groups.

In case group36% children never had 8 to 10 hours of sleep, 30% children never had deep sleep,41% of children had almost always poor sleep which makes them irritated and induces headaches. In Control group 41% of children had almost always had enough sleep of 8-10 hours,46% of children had often deep sleep,39% of children almost always felt refreshed after sleep,7% of children had almost always poor sleep which makes them irritated and induces headaches. There was a statistically significant association between all sleeping factors and development of obesity(Table 1 c).

Leisure factors	Level of factor	Case (with obese/overweight)		Control (without obese/overweight)		Chi-square test
		F	%	F	%	
Achievement leisure -Hobbies	Always	12	16%	33	45%	Chi-square-31.538a
	Mostly	10	14%	22	30%	
	Never	30	41%	7	9%	
	Sometimes	22	30%	12	16%	Df=3, p=.000**
Playing sports indoor games	Always	22	30%	8	11%	Chi-square-18.599a
	Mostly	16	22%	9	12%	
	Never	23	31%	22	30%	
	Sometimes	13	18%	35	47%	Df=3, p=.000**
Playing sports out door games	Always	3	4%	29	39%	Chi square-34.538a
	Mostly	16	22%	20	27%	
	Never	22	30%	6	8%	
	Sometimes	33	45%	19	26%	Df=3, p=.000**
Social leisure	Always	10	14%	37	50%	Chi square-31.379a
	Mostly	17	23%	20	27%	
	Never	26	35%	6	8%	
	Sometimes	21	28%	11	15%	Df=3, p=.000**
Time out leisure(more than 3hours)	Always	14	19%	36	49%	Chi square-36.170a
	Mostly	9	12%	23	31%	
	Never	21	28%	4	5%	
	Sometimes	30	41%	11	15%	Df=3, p=.000**

Table 1 d: Association between the leisure factors and development of

overweight/ obesity among the school children in case and control groups.

In Case group 40% of children never used their hobbies for achievement leisure,30% of children always played indoor games,44% of children sometimes played outdoor games, 35% of children had never been involved in social leisure,41% of children had sometimes time out leisure more than 3 hours. In Control Group 45% of children always used their hobbies for achievement leisure,47% of children sometimes played indoor games,39% of children always played outdoor games,50% of children had always been involved in social leisure,49% of children had always time out leisure more than 3 hours. There was a statistically significant association between all Leisure activitiesand development of obesity (Table 1 d).

Section D: Measure the strength of the association between selected factors and overweight/ obesity among the school children in case and control.

In Nutritional factors cases consumed 10.9 times (OR:10.9, CI:95%) morebaked food than the controls; they also consumed10 times (OR:10, CI:95%) more sugary drink, 7 times (OR:7.4, CI:95%) more fruit juices,6 times (OR:6, CI:95%) more of fast food, 5 times (OR:5, CI:95%) more of soft drinks, 1.38 times (OR:1.38, CI:95%) more of energy drink, than the control. they also 7 times (OR:7.04, CI:95%) skippedtheir breakfast more than the control.

Timely meal: 0.5 (OR: 0.58, CI: 95%) times of taking meal on time had shown lower likelihood in the development of overweight/obesity as an odds ratio <1 indicates a lower likelihood of having the outcome with the control factor.

In Physical factors cases performed physical activity 0.3 times (OR:0.30, CI:95%) morevigorous activity at least 3 days per week than the controls; they also performed 0.11 times (OR:0.11, CI:95%) more moderate to vigorous physical activity or one aerobic at least 60 minutes per day, 0.092 times (OR:0.092, CI:95%) more of muscle and bone-strengthening exercise, 0.06 times (OR:0.06, CI:95%) more of light intensity activity for more than 3 hours, than the control. The physical factors reveal less likelihood of developing overweight/obesity, as an odds ratio <1 indicates a lower likelihood of having the outcome with the control factor.

In Sleep Factors students in cases slept(8-10 hours) 0.21 times (OR:0.21, CI:95%) , had deep sleep0.28 times(OR:0.28, CI:95%) they also felt refreshed after sleep0.19 times (OR:0.19, CI:95%), Poor sleep make them irritated and give headache 3.79 times (OR:3.79, CI:95%) than the control.The Sleep factor reveals that proper sleep will have less likelihood of developing overweight/obesity, as an odds ratio <1 indicates a lower likelihood of having the outcome with the control factor.

In Leisure factors cases performed leisure activity 0.938 times (OR:0.938, CI:95%) more of indoor gamesthan the controls; they also played sports 0.2 times (OR:0.209, CI:95%) more of outdoor games, 0.16 times (OR:0.163, CI:95%) more involved in social leisure,0.15 times (OR:0.153, CI:95%) more performed hobbies, 0.1 times (OR:0.144, CI:95%) had time out leisure(more than 3hours), than the control. The leisure factor reveals less likelihood of developing overweight/obesity, as an odds ratio <1 indicates a lower likelihood of having the outcome with the control factor.

Discussion

The obesity epidemic is one of the greatest public health, social, and economic challenges of the 21st century. Improving efforts to promote physical activity and healthy eating is entirely consistent with the fundamental mission of schools - educating young people to become healthy, productive citizens. The case control study was conducted the two selected schools in Navi Mumbai. A Purposive sampling technique was used to collect the data. Total sample size was 148. Based on BMI category children were classified as case(74) and control(74). To analyze the selected factors anthropometric measurement taken for all the children and risk assessment tool was used. The present study was aimed to determine the selected contributing factors associated with childhood overweight/obesity.

In the present study, out of 300 school children 22% were overweight, 3% were obese. Among females 25% were overweight/obesity and 24.1% were overweight/obesity, among boys. This study was supported by Kumari, D. J., &Shilpa P. Khot et. al., who conducted a study on the prevalence and risk factors for adolescents (13–17 years, 2018): overweight and obesity. The result reveals that the out of 500 participantsoverall prevalence of overweight/obesity among adolescents was 18.4% among girls and 16.9% among boys. The researcher concluded that unlike boys fastest rate of growth occurs early in puberty. They gain more fat than boys in preparation for their menstrual cycle thus the prevalence of overweight/obesity is more common in females.

In the present study students in cases consumed 10.9 times (OR: 10.9, CI:95%) more baked food 5 times (OR: 5, CI:95%) more soft drinks, 6 times (OR:6, CI:95%) more fast foodand they are prone to develop obesity.This study was supported by Rajat Vohra et alin Lucknow city(2017) who observed the risk of overweight/obesity was significantly higher in children who consumed more junk food, bake food, and fast foods (OR=9.17,95%CI=1.28-1.86).

The researcher concluded that due to low nutritional value, cheap cost, and large portion size, fast food and consequent consumption habits has been considered one of the factors contributing to the obesity.

In the present study students performing any moderate to vigorous physical activity aerobic at least 60 minutes per day had lower risk of obesity 0.11 times (OR:0.11, CI=0.95%, where OR<1 indicates less likelihood of developing risk in the first group**.**). Joanna Baran(2020) et al supported this findings who conducted his study in Poland conducted among 12-15 years children by, students who are are performing atleast 60 mins a day exercise had lower risk of obesity (OR = 0.7, 95% CI: 0.97–1.89. p = 0.033). The researcher concluded that sedentary behaviors during adolescence are negatively associated with adolescents' health outcomes, such as obesity and metabolic diseases.

In the present study students having sleep for 8-10 hours are less likelihood of having obesity (OR=0.21, CI=0.95, where OR<1 indicates less likelihood of developing risk in the first group).This study was supported by Leonard Baatiema et al; who conducted a study in Ghana(2019) that students who were sleeping for more than 8 h per day had lower obesity risks (OR = 0.38; 95% CI = 0.19–0.79). The researcher concluded that children who had adequate sleep, they are having less likelihood of development of overweight/obesity.

In present study, students playing indoor games are having less likelihood of having obesity (OR= 0.95, 95%, where OR<1 indicates less likelihood of developing risk in the first group). This study is contradictory to the study conducted by Xiaoqing Yi et al; in China (2013) on

the Prevalence and risk factors of obesity among school-aged children, reported that In general, TV viewing and playing video games are accused for weight gain because they are sedentary (as opposed to more active recreational activities), and the key impact of TV viewing and video gaming on body weight may well lie in their effect on food intake. Watching television, playing video games, and using computers were associated with higher obesity risk (OR 1.564, 95 percent CI 1.133-2.159). John Kuumuori Ganle et al conducted study in Ghana(2019) reported that students who were engaged in outside sports activity 3 times per week were at lowered obesity risks (OR = 0.56; 95% CI = 0.33–0.96;).The researcher concluded that outdoor games burns more calories and having more energy increases strength, focus, and stamina, too, all qualities that can help shed pounds faster and more successfully.

Implications

The following is the researcher's perspective, which was influenced by the research on nursing practice, nursing administration, nursing education, and nursing research.

Implications in nursing practice

- The report inspires nursing staff to learn more about the causes of overweight and obesity in school children.
- For the well-being of schoolchildren, it is necessary to decrease the causative factors.
- The health professional can make use of the technique for evaluating specific children's susceptibility to obesity.
- Nurses who care for obese children in hospitals might learn a lot from these studies by using them as examples.

Implications in nursing research

- The child health nurse can learn several methods of assessing the causes of obesity in educational institutions.
- Further research studies may be enabled by the tool, technique, and literature review.
- It could be used as a guide in the future.

Implications in nursing administration

- The outcome of the research study could be applied to in-service training for nurses to improve their capacity for case effectiveness self-evaluation.
- The study's conclusions can support the hospital's nurse administrator in making appropriate decisions regarding the problem of obese children.

Limitations

- Randomization was not used in this study; it may lead to bias in selecting the case and control.
- This study relied on children to recall such things as levels of nutritional factors, medical factors, physical factors, sleep factors, and leisure factors this may have resulted in recall error.
- Children's data was self-recorded rather than data taken from a medical file such as birth weight.

Recommendations

- A greater sample size and different settings are both possible for the study.
- Obesity among students at private and public schools can be compared.
- An analysis of obesity in high- and low-income groups can be conducted.
- The randomization technique and a double-blinded study are also possible.
- Blind study, double blinded study, and cohort study can be done.

Conclusion

According to the study's findings, the majority of children are at a high risk of becoming overweight or obese. Significant associations were found between the risk factors for the development of overweight/obesity.Implications and recommendations were made by the researcher because of the overall experience of this particular study. The researcher had an enriching experience throughout the entire process of the research study.

Author's contributions
Miss Sakshi Singh, Prof. Deepa Reddy, Prof. Dr. Rita Lakhaniare the responsible of the research concepts, design, data collection, and analysis.

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