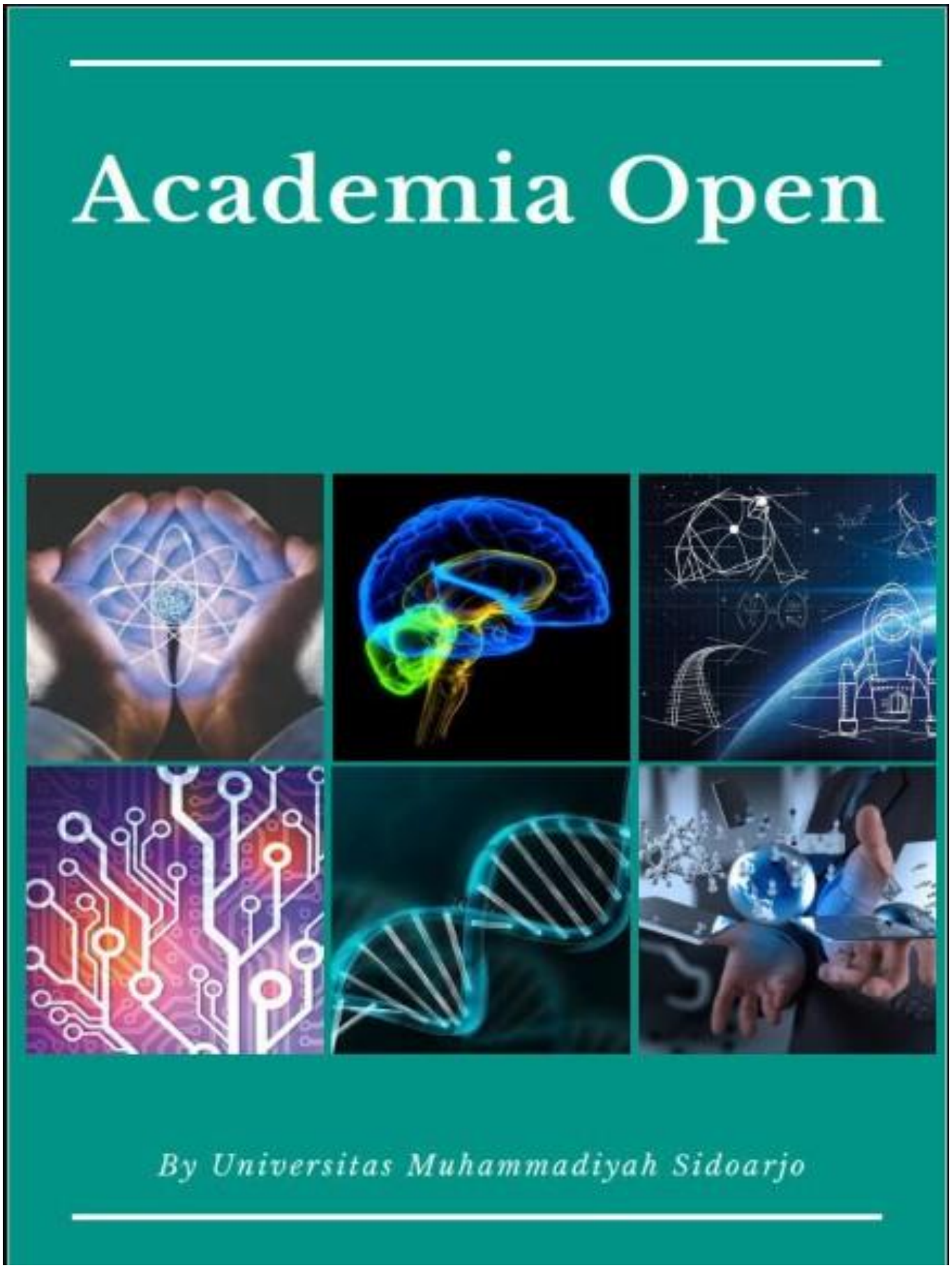
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Maternal Education and Nutritional Intake Drive Pediatric Obesity in Southern Iraq

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Abstract

General Background Childhood obesity presents a severe global public health challenge. **Specific Background** In Al-Nasiriyah Province, rising pediatric body measurements necessitate identifying local socioeconomic and nutritional risk factors. **Knowledge Gap** Localized data correlating literacy, economic status, and consumption patterns with pediatric weight gain remains insufficient. **Aims** This study identifies factors driving excessive weight gain among children aged 4–12 to promote sustainable healthcare. **Results** Analysis of 54 patients revealed significant correlations between elevated weight and higher maternal literacy, middle-income status, early birth sequence, frequent meals, and food stimulants, while residence showed no statistical correlation. **Novelty** Paradoxically, parental pampering of early-sequence children and average economic status act as primary drivers for excessive pediatric weight gain locally. **Implications** Healthcare professionals musttargetmiddle-income, literate families with nutritional education to curb food stimulant consumption and support sustainable pediatric health.

Highlights:

- Elevated weight strongly correlates with middle-income family status and early birth sequence.
- Frequent daily meals and the consumption of food stimulants significantly accelerate fat deposition.
- Urban or rural residential locations demonstrate no statistical correlation with excessive physical proportions.

Keywords: Economic Status, Food Stimulants, Sustainable Healthcare, Early Birth Sequence, Excessive Fat Deposition

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1. Introduction

Medical experts use the Body Mass Index (BMI) as a tool to determine an individual's body fat percentage based on their height and weight measurements [1]. Inaccurate body weight perceptions can significantly affect people's health-related behaviours, such as exercise, diet, and weight management. [2]. However, an indicator of impending mortality that may be more accurate is lean body mass or lean body mass index [3]. Also, nutrition and calorie intake are strongly correlated with the risk of diabetes mellitus, cardiovascular disease, and cerebrovascular sickness, as well as all-cause mortality [4]. BMI values can be obtained as early as childhood, and there is a link between them and health outcomes and cause-specific mortality. To categorize obesity and predict the risk of chronic disease, various metrics such as the waist-to-hip ratio and circumference may be selected. For this, BMI is not the most effective method. If BMI is still used for screening, it should be adjusted to take into consideration differences in muscle mass, age, and sex or it should be combined with other metrics to generate dietary recommendations and tailored care (5). Obesity is a reflection of excessive fat deposition. Health care professionals suggest that individuals who are at risk should consume fewer calories and engage in more physical activity. Limits on body mass index (BMI; weight/height2) are widely used to guide treatment and prognosis, as well as for screening purposes. Recent consensus evaluations state that while BMI is a valuable tool for demographic surveys and basic healthcare screening, it is not very successful at predicting the risk of chronic diseases or identifying extra fat. While BMI is not an adequate measure for accurate individual risk assessment, it helps drive food and exercise recommendations. It is necessary to reevaluate BMI cut-offs for populations with varying ages, ethnicities, and/or body types [6].

2. Methodology

Fifty four (54): The number and percentage of males was 32 (59.26%), and the number and percentage of females was 22 (40.74%) A group of children aged 4–12 years attending Al-Mossawey Children's Hospital in Thi-Qar Province between 19 August and 17 September 2025 were included in the study. Body Mass Index (BMI) was assessed and dietary information regarding food type and quantity was recorded [2].

2.1 Questionnaire

Has been prepared which included all the essential information by followed:

1. Patient Name:
2. Age: year.
3. Sex: male female
4. Length: cm.
5. Weight: kg.
7. Residence: Rural Urban
8. Having disease:
9. Having worms:
10. Body Mass Index (BMI) = Weight in Kg / (Height in meter)^2 [2]
11. Number of daily meals:
12. Type and quantity of food:
13. Parity of child in his family:
14. Social state:
15. Economic state:

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16. Taking appetizers: 

2.2 Materials

1. Balance (local): a sensitive scale was used to measure the weight of the children in Kilograms [2].

2. Scale (local): A tape measure was used to measure the children's height in centimetres [2].

2.3 Statistical Analysis

Statistical analyses were performed using the Statistical Analysis System (SAS, 2010) [7] to evaluate the effects of different factors on the studied parameters. The Chi-square test was used to compare the significance of percentage differences in this study.

3. Results and Discussion

3.1 The Relationship between BMI and the mother's Education

We note from Table No. 1 that there is a highly significant relationship at a probability level of less than 0.01 (P<0.01) between the mother's education, whether she is educated or uneducated, and the body mass index (BMI). We note from these results that the number of educated mothers is 32, at a rate of 59.26%, and the number of uneducated mothers is 22, at a rate of 4047%, out of a total of 54 children. The results of this study are not consistent with the study of each of Al-Hussaini et al.[8], when they reached that children in Jeddah, Saudi Arabia who are overweight or obese do not have a correlation with their parents' educational attainment; however, there is a correlation between overweight and obesity and working fathers and unemployed mothers. But the results of that study are strongly consistent with the results of Mesawa et al. (2020) [9], when they found one major issue for public health is obesity. The incidence of obesity exhibits significant variation among nations with disparate socioeconomic backgrounds. Population-based social and environmental strategies should be taken into consideration in order to combat obesity successfully. The purpose of the study was to evaluate the relationship between childhood obesity and parental socioeconomic status, occupation, and educational attainment. Compared to non-Saudis, a greater proportion of Saudi youngsters were overweight or obese. Increased family income, both parents' high educational attainment, and the presence of employed dads in the kid population were associated with increased rates of overweight and obesity.

Table 1. The Relationship between BMI and the mother's Education.

Education Characters	No. of Samples	Percentage %
Yes	32	59.26
No	22	40.47
Total	54	100
Chi-square value	----------	7.255**

(P< 0.01)**

3.2 The Relationship between BMI and the mother's Education Levels

We note from Table No. 2 that there is a highly significant relationship at a probability level of less than 0.01 (P<0.01) between the mother's education levels, whether she is literate or illiterate, and the body mass index (BMI). We note from these results that the number of educated mothers level literate are 53, at a rate of 98.15%, and the number of uneducated mothers level illiterate is 1, at a rate of 1.85%, out of a total of 54 children.

The results of this study do not agree with the researchers' study Al-Raddadi et al. (2019) [10]; when they noticed there is an association between being overweight or obese and working fathers and jobless mothers in Jeddah, Saudi Arabia, but not between these factors and the educational achievement of their parents. But the results of that study are consistent with the results of the study Ziol-Guest et. al. (2012) [11], Previous research from several countries has reported a positive association between parental employment and children's Body Mass Index (BMI). However, studies focusing specifically on paternal employment remain limited. Moreover, there is still a lack of empirical evidence explaining the mechanisms that may link parental employment with children's BMI outcomes. Therefore, the present study explores the relationship between BMI statuses—including overweight and obesity—among children aged 13–14 years and the total employment history of both the mother and her spouse during the child's lifetime. In addition, several potential explanatory pathways underlying this association were examined. The analysis was based on data derived from cohorts of children born during a period characterized by substantial increases in both childhood obesity and maternal employment. These data were obtained from the National Longitudinal Survey of Youth (NLSY79) mother–child linked dataset in the United States.

Also the results of that study are strongly consistent with the other results which was previous studies have reported that socioeconomic factors, including parental education, occupation, and family income, play an important role in the prevalence of childhood obesity such as Mesawa et al. (2020) [9], Obesity has become a major public health issue worldwide. The prevalence of obesity varies considerably among countries with different socioeconomic conditions. Addressing this

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problem requires consideration of population-level social and environmental determinants. This study aimed to examine the relationship between childhood obesity and several parental factors, including occupation, educational level, and socioeconomic status. The findings indicated that the proportion of overweight or obese children was higher among Saudi nationals compared with non-Saudis. In addition, a greater prevalence of overweight and obesity was observed among children whose fathers were employed, as well as among families with higher income levels and parents with higher educational attainment.

Table 2. The Relationship between BMI and mother's Education Levels.

Characters		
Literate	53 1	98.15
Illiterate	54	1.85
Total	----------	100
Chi-square value		14.093**

(P< 0.01)**

3.3 The Relationship between BMI and Family's Economic States

As shown in Table 3, there is a highly significant relationship at a probability level of P < 0.01 between family economic status and children's body mass index (BMI). In this study, 16 families (29.63%) were classified as having good economic status, 28 families (51.85%) were in the middle economic category, and 10 families (18.52%) were in the low economic category, out of a total of 54 children.

This results for this study are consistent with Mohamed et al. (2023) [12], found the higher academic achievement was correlated with being male, younger age, higher family income, being in the second year of school, and having educated parents. Good sleeping, eating, and weight management habits were also associated with successful academic outcomes.

Furthermore, the findings align with Slighting et al. (2024) [13], who reported that childhood obesity rates are rising globally, posing serious public health concerns and placing a burden on healthcare systems. While most policy interventions focus on macro-level strategies, their study examined how family structure stability may provide opportunities for micro-level interventions. Using eight expanded family structure categories that account for biological relationships and instability, along with potential explanatory variables such as resource access, family stressors, family structure selectivity factors, and obesogenic correlates, they investigated the relationship between family structure trajectories and childhood overweight and obesity across three Anglophone countries. Their analysis employed three datasets representing cohorts of eleven-year-old children born in the year 2000.

Table 3. The Relationship between BMI and the Family's Economic State.

Family's Economic States Characters	No. of Samples	Percentage %
Good	16	29.63
Middle	28	51.85
Low	10	18.52
Total	54	100
Chi-square value	----------	9.148**

(P< 0.01)**

3.4 The Relationship between BMI and parity (Child Sequence in Family)

As shown in Table 4, there is a highly significant relationship at a probability level of P < 0.01 between parity (child sequence in the family) and children's body mass index (BMI). In this study, 13 children (24.07%) were first-born, 12 children (22.22%) were second-born, 12 children (22.22%) were third-born, 3 children (5.56%) were fourth-born, 8 children (14.81%) were fifth-born, 2 children (3.70%) were sixth-born, 2 children (3.70%) were seventh-born, 1 child (1.85%) was eighth-born, and 1 child (1.85%) was eleventh-born. No children in the ninth or tenth sequence were included; representing 0% for each, out of a total of 54 children.

The results of this study are in line with those of Halliday et al. (2013) [14], who found that childhood obesity and overweight are increasingly associated with family functioning, which in turn influences children's and adolescents' health-related behaviors and health outcomes. Between 1990 and 2011, their study thoroughly analyzed peer-reviewed literature from PsycINFO, PubMed, and Scopus, including reference lists of particular studies. Twenty-one studies satisfied the requirements for inclusion. Of them, twelve out of seventeen cross-sectional and longitudinal studies found a significant association between youth obesity and overweight and family functioning. Negative family functioning was consistently linked to an increased risk of childhood overweight and obesity; however the criteria employed to evaluate family functioning varied throughout studies.

Table 4. The Relationship between BMI and the parity (Child Sequence in Family).

Parity Characters	*No. of Samples*	Percentage %

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First	13	24.07
Second	12	22.22
Third	12	22.22
Forth	3	5.56
Fifth	8	14.81
Sixth	2	3.70
Seventh	2	3.70
Eighth	1	1.85
Ninth	0	0.00
Tenth	0	0.00
Eleventh	1	1.85
Total	54	100
Chi-square value	----------	9.148**

(P< 0.01)**

3.5 The Relationship between BMI and Number of Meals Consumed per Day

As shown in Table 5, there is a highly significant relationship at a probability level of P < 0.01 between the number of meals consumed per day and children's body mass index (BMI). In this study, 2 children (3.70%) consumed one meal per day, 15 children (27.78%) consumed two meals per day, 30 children (55.56%) consumed three meals per day, and 7 children (12.96%) consumed four meals per day, out of a total of 54 children.

The findings of this study do not align with those of Makri et al. (2022) [15], who reported that consuming four meals per day was significantly associated with being overweight, even after adjusting for potential confounding factors.

The findings, however, are in line with Mahdi et al. (2023) [16], who showed that meal timing can affect body weight management. They looked at the relationship between children's BMI and daily energy consumption patterns in a sample of 6,281 children between the ages of 4 and 18 using data from the UK National Diet and Nutrition Survey (2008–2019). Children aged 4–10 who consumed more energy after 20:00 had substantially higher BMIs than those who consumed less energy, according to logistic and linear regression models (boys: β = 0.166; 95% CI: 0.028–0.304; P = 0.02; girls: β = 0.159; 95% CI: 0.003–0.315; P = 0.05). Boys between the ages of 11 and 18 showed similar patterns (β = 0.091; 95% CI).

Table 5. The Relationship between BMI and the Numbers of Meals That Eating in One Day.

Numbers of Meals Eating in One Day	*No. of Samples*	Percentage %
1	2	3.70
2	15	27.78
3	30	55.56
4	7	12.96
Total	54	100
Chi-square value	----------	9.055**

(P< 0.01)**

3.6 The Relationship Between BMI and Appetizer (Snack) Consumption

As shown in Table 6, there is a highly significant relationship at a probability level of P < 0.01 between the consumption of food stimulants (appetizers/snacks) and children's body mass index (BMI). In this study, 38 children (70.37%) consumed snacks; while 16 children (29.63%) did not, out of a total of 54 children.

The findings are consistent with Saelens et al. (2022) [17], who reported that even after controlling for early appetitive drive, children with obesity who exhibited higher levels of initial impulsivity showed greater weight outcomes during therapy. Improved results were also associated with enhancements in task-based inhibition and food-related discounting during treatment. Obese children performed worse than non-obese children on some—but not all—tests of impulsivity and inhibition. Greater improvements in weight status were independently correlated with lower baseline general inhibition and higher parent-reported impulsivity, although these associations were slightly attenuated after adjusting for appetitive drive. During treatment, children's task-based general inhibition improved, and better weight outcomes were linked to increases in general inhibition and snack-related discounting, albeit the associations were reduced when baseline values were considered. The study emphasized the need for innovative interventions targeting inhibition and impulsivity in children's weight management.

The results are also consistent with Semagn et al. (2023) [18], who found that the majority of children consumed proteins during the day, and approximately two-thirds consumed foods rich in iron and zinc. The largest proportions of children, according to BMI measurements, were classified as obese. Unfortunately, every child who consumed food also ingested food coloring or preservatives, and 75% of them consumed candy. Semagn et al. recommended that children with ADHD undergo regular nutritional screening to detect dietary issues early and monitor the development of related health outcomes.

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Table 6. The Relationship between BMI and the Appetizers Administration.

Appetizers Administration	*No. of Samples*	Percentage %
Yes	38	70.37
No	16	29.63
Total	54	100
Chi-square value	----------	9.055**

(P< 0.01)**

3.7 The Relationship Between BMI and Type of Food Consumed

As shown in Table 7, there is a highly significant relationship at a probability level of P < 0.01 between the type of food consumed and children's body mass index (BMI). In this study, 25 children (46.30%) consumed small amounts of high-quality food, while 29 children (53.70%) consumed large quantities of low-quality food, out of a total of 54 children.

The findings are consistent with Mustafa et al. (2021) [19], who reported that obesity was more prevalent among children in the study group, with approximately one-third being overweight or obese. The prevalence of obesity was higher among older children who regularly consumed unhealthy foods. The study emphasized that improving children's eating habits and lifestyle behaviors is essential to prevent excessive weight gain.

Similarly, the results align with Jakobsen and Brader (2023) [20], who highlighted the challenges of maintaining a balanced diet and the importance of preventing childhood obesity. Their study conducted a thorough literature review examining the relationships between various food and beverage consumption patterns and overweight/obesity in children and adolescents. Observational studies were collected from four databases, and a random-effects meta-analysis was applied. Among the 60 studies that met the inclusion criteria, 14 distinct food and beverage categories were identified. The analysis revealed that the odds of being overweight or obese increased by 1.20 ($p < 0.05$) for children consuming higher amounts of sugar-sweetened beverages (n = 26) and by 1.17 ($p < 0.05$) for those consuming more fast food (n = 24). Additionally, higher meat consumption was associated with an increased risk of overweight and obesity.

Table 7. The Relationship between BMI and the type of Food.

type of Food	*No. of Samples*	Percentage %
Few Quantitative or More Quantitative	25	46.30
Qualitative	29	53.70
Total	54	100%
Chi-square value	----------	9.055**

(P< 0.01)**

3.8 The Relationship between BMI and Place of Residence

As shown in Table 8, there is no significant relationship between children's body mass index (BMI) and their place of residence for children aged 4 to 12 years. In this study, 39 children lived in urban areas (0.00154%) and 15 children lived in rural areas (0.00151%).

Doberti et al. (2024) [21] suggested that segregation indices can be informative even when individual-level factors fail to adequately explain variations among people living in the same city. However, in certain cases, the correlation between BMI and segregation indices deviates from previous research findings, indicating the need to consider additional contextual factors. Further investigation into the conditions that contribute to obesity in segregated areas may provide valuable insights.

Similarly, the findings of this study are consistent with Anza-Ramirez et al. (2022) [22], who examined the impact of urbanization in Latin America on chronic diseases. They assessed the relationships between BMI, obesity, and type 2 diabetes (T2D) and built environment features at sub-city and city levels, including intersection density, greenness, population density, fragmentation, and isolation. Data from ten countries covering 93,280 individuals (BMI and obesity) and 122,211 individuals (T2D) were analyzed. Their results showed that living in more dispersed and greener areas was negatively associated with BMI and obesity, while higher intersection density was positively correlated. T2D exhibited a negative correlation with population density and greenness but a positive correlation with intersection density. The study concluded that Latin America's rapid urbanization provides unique insights and expands the potential for population-level urban health interventions.

Table 8. The Relationship between the Body Mass Index (BMI) and Residence.

Residence	No. of Samples	Mean ± SE
Urban	39	0.00154
Rural	15	0.00151
Total	54	---------
T- test	----------	NS 0.00023

NS: Non- significant

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4. Conclusions

This study reached a set of conclusions, which are as follows:-

1- We conclude from this study that there is a close relationship between the child's body mass index and the educated, cultured mother who holds higher academic degrees.

2- We conclude from this study that there is a close relationship between the child's body mass index and the average economic status of the family; that is, the child's weight increases when families have an average economic income.

3- The body mass index increases for the first and second children in the family, because the Iraqi family pampers the first and second children.

4- Body mass index increases in children who eat three meals a day, and body mass index increases when those meals are of high nutritional value. It is worth noting that body mass index in this study showed a highly significant increase when children were taking food stimulants or nutritional supplements.

5- The results of this study showed that the body mass index was not related to the place where children lived, whether the children lived in the countryside or the city.

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