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ANTHROPOMETRIC GROWTH PATTERNS IN ALBANIAN CHILDREN: GENDER AND URBAN-RURAL DISPARITIES

ANTROPOMETRIČNI VZORCI RASTI PRI ALBANSKIH OTROCIH: SPOLNE IN MESTNO-PODEŽELSKE RAZLIKE

ABSTRACT

This study examines the anthropometric characteristics of Albanian children, analysing gender and urban-rural differences in body height, weight, BMI, and waist circumference across grades. A nationally representative sample of 1,073 children (grade 1-12) from 12 cities in Albania was assessed using standardized measurement protocols.

Findings reveal noTable gender disparities in growth patterns, particularly during adolescence. Boys tend to surpass girls in height, weight, BMI, and waist circumference, with these differences becoming more pronounced from grades 8 to 12. Urban boys generally exhibit higher weight, BMI, and waist circumference than their rural counterparts, suggesting the influence of environmental and lifestyle factors. In contrast, rural girls tend to have lower waist circumference and BMI, which may reflect variations in physical activity and body fat distribution.

These results underscore the importance of targeted health and nutrition interventions, particularly in adolescence, to address disparities in growth and body composition. Understanding regional and gender-related variations can help policymakers and educators design programs that promote healthy growth and development for all children in Albania.

Keywords: anthropometry, gender differences, BMI, waist circumference

IZVLEČEK

Ta študija preučuje antropometrične značilnosti albanskih otrok ter analizira spolne in mestno-podeželske razlike v telesni višini, teži, ITM-ju (indeks telesne mase) in obsegu pasu v različnih razredih. Nacionalno reprezentativni vzorec 1.073 otrok (od 1. do 12. razreda) iz 12 mest v Albaniji je bil ocenjen z uporabo standardiziranih merilnih protokolov.

Ugotovitve razkrivajo izrazite spolne razlike v vzorcih rasti, zlasti v obdobju adolescence. Fantje običajno presegajo dekleta v telesni višini, teži, ITM-ju in obsegu pasu, pri čemer se te razlike najbolj izrazito pokažejo med 8. in 12. razredom. Mestni fantje imajo na splošno višjo telesno težo, ITM in obseg pasu kot njihovi podeželski vrstniki, kar nakazuje vpliv okolijskih in življenjskih dejavnikov. Nasprotno pa imajo podeželska dekleta običajno manjši obseg pasu in nižji ITM, kar lahko odraža razlike v telesni dejavnosti in porazdelitvi telesne maščobe.

Ti rezultati poudarjajo pomen ciljnih zdravstvenih in prehranskih ukrepov, zlasti v obdobju adolescence za odpravljanje razlik v rasti in telesni sestavi. Razumevanje regionalnih in spolnih razlik lahko oblikovalcem politik in izobraževalcem pomaga pri zasnovi programov, ki spodbujajo zdravo rast in razvoj vseh otrok v Albaniji.

Ključne besede: antropometrija, spolne razlike, ITM, obseg pasu

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INTRODUCTION

According to scientific research, the frequency of overweight and obesity in children is rising dramatically. Gigante et al. (2012) found alarming increases in obesity, however their study concentrated more on family wealth than on the incidence of childhood obesity. According to Blüher et al. (2011), the prevalence of obesity in Germany has stabilized, indicating the need for focused public health initiatives to combat this expanding problem.
As children progress through different grade levels, the interaction of gender, puberty, and environmental factors greatly affects the growth patterns in anthropometric parameters. Gender inequalities in body height during childhood and adolescence are consistently trending, according to research. According to research done in a number of European nations, boys frequently have large growth spurts during puberty, which causes them to end up taller than girls. For example, a study by Tambalis et al. (2010) found that, in line with secular growth trends, boys tend to outgrow girls in height in the later grades of elementary and secondary school. A similar phenomenon was seen by Brisbois et al., (2011) who found that pubertal growth patterns had a significant influence on the tendency for gender differences in height to stabilize in adulthood. Furthermore, growth trajectories can be impacted by geographical and ethnic differences, as demonstrated by longitudinal research. For instance, a study by Neyzi et al. (2015) highlighted the significance of regional dietary patterns and health interventions by showing that Turkish children's heights varied when compared to WHO criteria.
One important metric for evaluating central obesity and associated health hazards is waist circumference. Significant gender differences were found in research by El-Sayed et al. (2011), with boys regularly showing larger waist circumferences as they mature, which is further linked to increased obesity rates. The authors pointed out that as boys and girls grow older, their nutritional preferences, levels of physical activity, and lifestyle choices tend to vary, leading to these variations in body composition and fat distribution. Furthermore, studies indicate that these inequalities are significantly shaped by metropolitan surroundings. Moraeus et al., (2012) for instance, examined the effects of lifestyle and sociocultural factors on childhood obesity, including variations in waist circumference that may be caused by sedentary lifestyles linked to urban living. Research indicates that body height differences between Albanian boys and girls emerge noticeably during adolescence, particularly in the later grades, echoing trends observed in various European populations. Jarani et al. (2020) identified that Albanian boys consistently exhibit greater height than girls across age groups, confirming a progressive increase in height as children transition from early to late adolescence. Also another study reported significant gender differences in body mass and BMI across age groups, stating that

boys exhibited statistically significant higher values, particularly in waist circumference measurements (Juel et al., 2021).

This study addresses a critical gap in the understanding of anthropometric growth patterns among Albanian children by examining gender and urban-rural differences. While previous research has explored general trends in child growth, there has been limited attention on these variations in Albania. By focusing on gender and geographic differences, this study provides valuable insights into the role of these factors in shaping childhood growth patterns. This study aims to assess anthropometric characteristics of Albanian children by grade, gender, and urban-rural differences.

METHODS

A nationally representative sample (12 cities) of 1,073 children participated (grade 1-12), with 512 from urban areas and 561 from rural areas, ensuring proportional representation of boys and girls in each grade. Measurements included body height, body weight, BMI (calculation), and waist circumference, all recorded using standardized protocols for accuracy and reliability. The data are part of the European Fitness Monitoring System (EUFITMOS) project (2023-2024). Also this project was approved by the Ministry of Education and Sports (Republic of Albania) with prot number 1596/2 date 04.05.2022.

Statistical analysis

Descriptive statistics (mean, standard deviation) were used to summarize the body height, weight, BMI, and waist circumference for boys and girls across different grade levels, while independent t-tests compared gender differences and urban-rural variations. In addition to descriptive and inferential statistics, the study included a test for normality distribution using Kolmogorov-Smirnov test. The data for body height, weight, BMI, and waist circumference were normal distributed for both boys and girls, as well as for urban and rural children (p-values was greater than 0.05). The significance was determined by analyzing the p-values, with values less than 0.05 indicating a statistically significant difference. Statistical significance was set at $p < 0.05$, and all analyses were conducted using SPSS 20.00 software.

RESULTS

The total participation in this study (Table 1) consisted of 1,073 children, with a near equal distribution between boys (536) and girls (537), ensuring a balanced representation of both genders across all grade levels. Participation of children by location: 512 children participated from urban areas, while 561 children came from rural areas.

Table 1. Children participation to the study.

Grade	Gender	Total	Urban	Rural
		1073	512	561
1	Boy	47	34	13
	Girl	42	29	13
2	Boy	56	36	20
	Girl	45	30	15
3	Boy	38	15	23
	Girl	48	25	23
4	Boy	49	30	19
	Girl	39	18	21
5	Boy	44	25	19
	Girl	49	16	33
6	Boy	54	19	35
	Girl	57	15	42
7	Boy	68	33	35
	Girl	67	28	39
8	Boy	55	18	37
	Girl	56	19	37
9	Boy	64	34	30
	Girl	58	21	37
10	Boy	26	17	9
	Girl	31	14	17
11	Boy	25	12	13
	Girl	26	8	18
12	Boy	10	6	4
	Girl	19	10	9

The results presented in Table 2 provide an analysis of body height differences across grades, comparing gender and urban-rural variations. Overall, boys tend to be taller than girls in most grades, with statistically significant differences emerging from grade 7 onward ($p < 0.05$). In the early grades (1–6), height differences between boys and girls are minimal and statistically insignificant. When comparing urban and rural students, urban boys are generally taller than their rural counterparts up to grade 8, whereas rural boys surpass urban boys in grades 9–12. For girls, height differences between urban and rural areas are less pronounced, with only minor variations observed across grades. Statistically significant differences ($p < 0.05$) appear from grade 9 onward for boys, indicating a divergence in growth patterns during adolescence.

Table 2. Gender and urban- rural comparison analysis by grade for body height.

		Total			Urban			Rural		
Grade		**Mean**	**Std. Deviation**	**Sig. (2-tailed)**	**Mean**	**Std. Deviation**	**Sig. (2-tailed)**	**Mean**	**Std. Deviation**	**Sig. (2-tailed)**
1	Boy	1.25	0.05	0.39	1.26	0.05	0.66	1.23	0.04	0.41
	Girl	1.24	0.06		1.25	0.06		1.22	0.04	
2	Boy	1.26	0.05	0.07	1.27	0.05	0.06	1.25	0.06	0.75
	Girl	1.29	0.07		1.30	0.07		1.26	0.05	
3	Boy	1.33	0.06	0.88	1.32	0.07	0.59	1.33	0.05	0.21
	Girl	1.32	0.09		1.34	0.11		1.30	0.07	
4	Boy	1.41	0.06	0.67	1.41	0.06	0.14	1.40	0.06	0.68
	Girl	1.41	0.08		1.43	0.07		1.39	0.09	
5	Boy	1.51	0.45	0.52	1.56	0.60	0.59	1.45	0.08	0.55
	Girl	1.47	0.09		1.48	0.07		1.47	0.10	
6	Boy	1.50	0.09	0.24	1.50	0.07	0.32	1.51	0.10	0.43
	Girl	1.52	0.07		1.52	0.06		1.52	0.07	
7	Boy	1.60	0.10	0.00	1.59	0.09	0.16	1.61	0.11	0.01
	Girl	1.56	0.07		1.56	0.07		1.55	0.07	
8	Boy	1.65	0.11	0.00	1.67	0.09	0.02	1.64	0.12	0.05
	Girl	1.60	0.06		1.60	0.07		1.60	0.06	
9	Boy	1.70	0.08	0.00	1.70	0.08	0.00	1.71	0.08	0.00
	Girl	1.60	0.08		1.55	0.08		1.63	0.07	
10	Boy	1.72	0.06	0.00	1.71	0.06	0.00	1.75	0.06	0.00
	Girl	1.63	0.06		1.63	0.06		1.63	0.06	
11	Boy	1.74	0.06	0.00	1.74	0.05	0.00	1.74	0.07	0.00
	Girl	1.61	0.07		1.61	0.08		1.61	0.07	
12	Boy	1.75	0.05	0.00	1.75	0.06	0.00	1.75	0.04	0.00
	Girl	1.63	0.06		1.64	0.05		1.62	0.06	

The line Figure 1 visually depicts height differences across grades, showing distinct growth patterns between urban and rural children. Initially, the curves for all groups follow a similar upward trend, but differences become more pronounced from grade 7 onward. The urban boys' curve starts higher but is later overtaken by the rural boys' curve after grade 8. For girls, the urban and rural curves remain closer together, with urban girls slightly taller in some grades. A noticeable steep rise in all curves between grades 5 and 9 reflects the puberty growth spurt, highlighting key developmental differences.

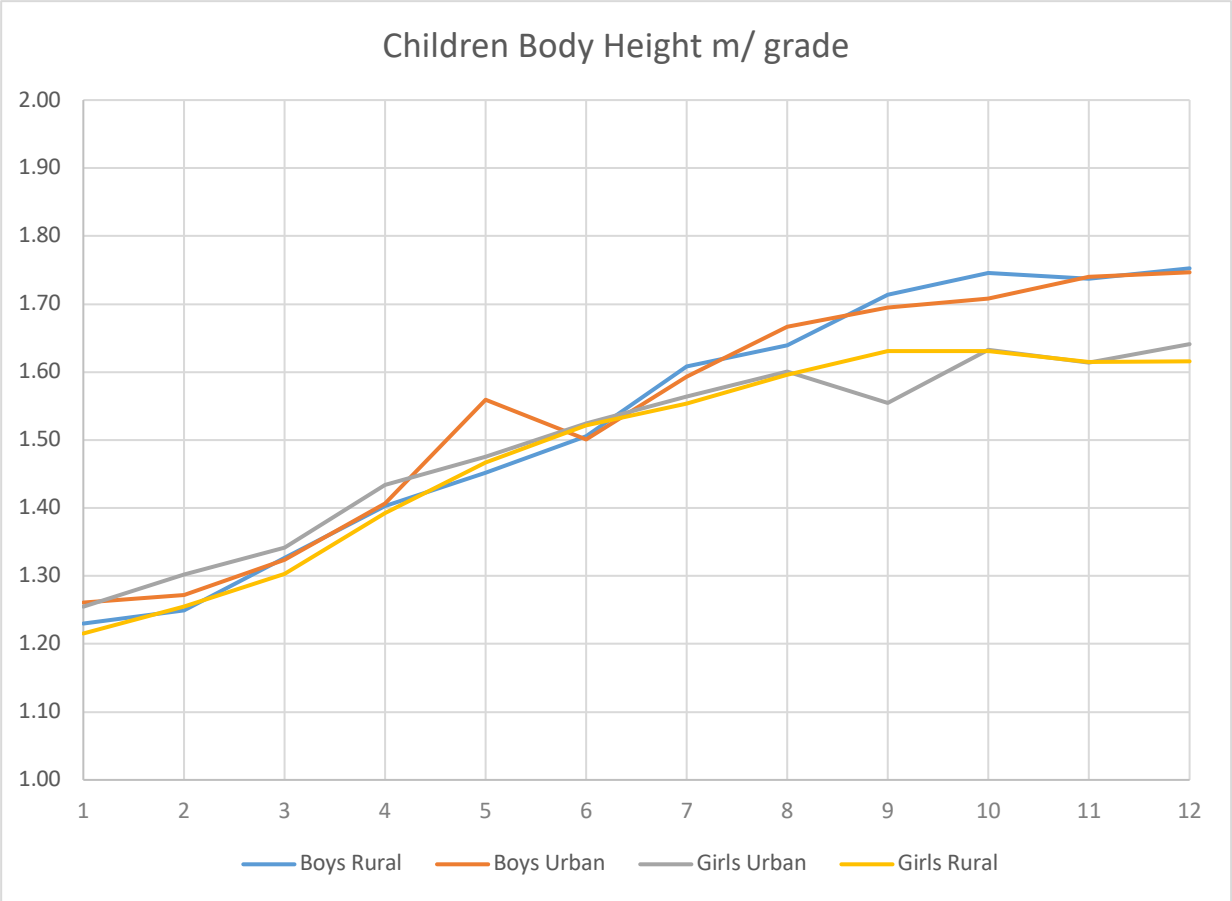

Figure 1. Trend of linear curve for children body height.

The Table 3 compares body weight by gender and between urban and rural areas for different school grades. At all school levels, boys typically weigh more than girls, with the difference widening in the upper grades (8 and above). These disparities range in significance, with statistically significant variations in body weight observed across multiple grades, especially for urban males. Generally speaking, urban males weigh more than rural boys, however this difference isn't always statistically significant. Although the disparities are not always substantial, girls in rural areas typically weigh less than their urban counterparts. Boys' body weight increases more than girls', particularly in the latter years, according to the Figure 1, which shows a tendency of rising body weight as pupils move through the grades. Furthermore, larger standard deviations suggest that girls have more varied body weight distributions than boys, indicating that there is more variety in body weight among girls.

Table 3. Gender and urban- rural comparison analysis by grade for body weight.

		Total			Urban			Rural		
Grade		**Mean**	**Std. Deviation**	**Sig. (2-tailed)**	**Mean**	**Std. Deviation**	**Sig. (2-tailed)**	**Mean**	**Std. Deviation**	**Sig. (2-tailed)**
1	Boy	27.6	5.9	0.26	28.2	5.8	0.60	26.0	5.8	0.20
	Girl	26.2	5.5		27.4	6.0		23.6	3.3	
2	Boy	27.9	6.6	0.68	29.0	7.3	0.57	25.9	4.7	0.67
	Girl	28.4	6.4		30.0	7.0		25.3	3.2	
3	Boy	32.5	9.3	0.24	35.1	11.7	0.32	30.8	7.1	0.28
	Girl	30.3	7.8		32.0	8.2		28.5	7.1	
4	Boy	36.2	8.5	0.23	37.5	9.0	0.62	34.2	7.2	0.31
	Girl	43.0	38.5		38.8	8.0		46.6	52.3	
5	Boy	41.9	10.9	0.92	42.3	10.9	0.62	41.5	11.2	0.77
	Girl	41.7	9.5		43.9	9.6		40.7	9.4	
6	Boy	42.3	9.3	0.45	40.4	9.0	0.15	43.2	9.5	0.96
	Girl	43.6	9.3		45.1	9.2		43.1	9.4	
7	Boy	50.7	13.0	0.35	49.2	10.5	0.73	52.0	15.1	0.14
	Girl	48.8	9.6		50.1	10.8		47.9	8.7	
8	Boy	53.9	13.6	0.01	56.5	14.3	0.01	52.7	13.3	0.21
	Girl	48.5	7.8		46.6	7.9		49.5	7.7	
9	Boy	62.2	14.4	0.04	65.3	16.1	0.31	58.7	11.3	0.16
	Girl	57.4	10.5		61.1	13.2		55.3	8.2	
10	Boy	67.8	10.0	0.00	68.7	11.0	0.03	66.1	8.1	0.00
	Girl	56.8	9.7		59.9	10.9		54.2	7.9	
11	Boy	66.9	14.3	0.00	72.9	17.1	0.06	61.4	8.6	0.04
	Girl	56.6	7.8		59.4	9.3		55.4	6.9	
12	Boy	67.4	14.6	0.08	72.9	16.0	0.07	59.2	7.5	0.78
	Girl	59.0	10.2		60.6	9.1		57.3	11.6	

The Figure 2 graphically illustrates the variations in children's body weight across grades. All groups show a distinct growth tendency as kids move from first to twelfth grade, although there are differences between urban and rural settings. Urban boys are always the heaviest in terms of body weight, especially after grade 7, when they grow faster than their rural counterparts. Up until middle school, the weight patterns of urban girls and rural boys are comparable; nevertheless, in later grades, urban females typically outperform rural boys. Across all grade levels, rural girls have the lowest body weight, and the difference between them and urban kids gets bigger over time. Around grades 4–5 and 8–9, there are noticeable growth spurts, with gains being more noticeable among urban children. These patterns imply that environmental elements including diet, exercise, and lifestyle variations might influence how body weight develops in both urban and rural areas.

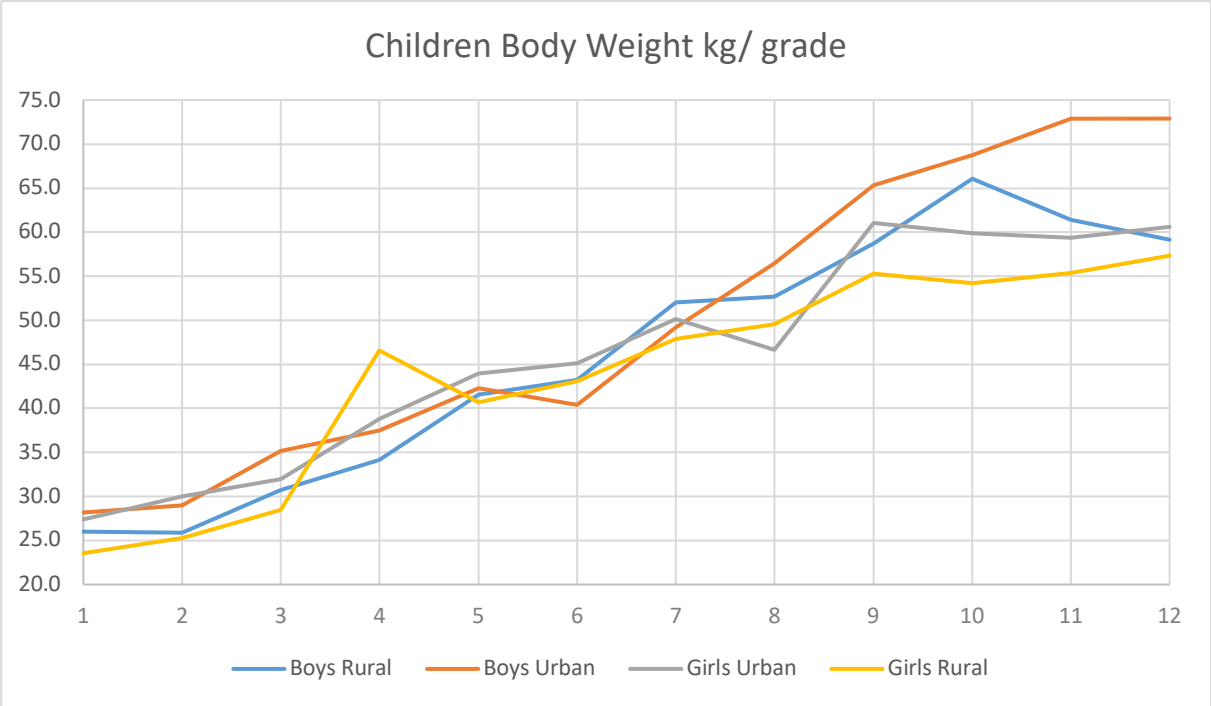

Figure 2. Trend of linear curve for children body weight.

The gender comparison (Table 4) for BMI among Albanian children by grade level shows no statistically significant differences across most grades. For total children, the p-values remain above 0.05 throughout, indicating no meaningful gender differences in BMI at any grade level. In urban areas, although BMI appears slightly higher in some grades for either boys or girls, no significant differences are observed. Similarly, in rural areas, the p-values do not indicate any significant gender differences in BMI at any grade level.

Table 4. Gender and urban-rural comparison analysis by grade for BMI.

		Total			Urban			Rural		
Grade		**Mean**	**Std. Deviation**	**Sig. (2-tailed)**	**Mean**	**Std. Deviation**	**Sig. (2-tailed)**	**Mean**	**Std. Deviation**	**Sig. (2-tailed)**
1	Boy	17.5	3.0	0.22	17.6	3.0	0.52	17.1	3.3	0.24
	Girl	16.8	2.1		17.2	2.2		15.9	1.6	
2	Boy	17.4	3.7	0.58	17.9	4.2	0.72	16.5	2.4	0.44
	Girl	17.0	2.6		17.6	3.0		16.0	1.1	
3	Boy	18.3	3.9	0.14	19.7	4.5	0.09	17.4	3.3	0.45
	Girl	17.1	3.3		17.6	3.3		16.6	3.2	
4	Boy	18.2	3.5	0.26	18.8	3.8	0.97	17.3	2.9	0.30
	Girl	21.5	19.9		18.8	3.2		23.8	27.1	
5	Boy	19.4	4.7	0.76	19.4	5.5	0.69	19.4	3.5	0.48
	Girl	19.2	3.1		20.0	3.1		18.8	3.1	
6	Boy	18.6	3.7	0.85	17.7	3.0	0.15	19.1	4.0	0.51
	Girl	18.7	3.3		19.3	3.3		18.5	3.3	
7	Boy	19.6	4.0	0.57	19.3	3.6	0.25	19.9	4.4	0.78
	Girl	20.0	2.9		20.4	3.4		19.7	2.5	

8	Boy	19.7	4.1	0.27	20.3	4.6	0.10	19.5	3.9	0.95
	Girl	19.0	2.8		18.2	2.9		19.4	2.7	
9	Boy	21.4	4.6	0.21	22.7	5.2	0.08	19.9	3.5	0.27
	Girl	22.4	4.5		25.3	5.3		20.8	2.9	
10	Boy	22.9	2.8	0.07	23.5	2.9	0.30	21.7	2.4	0.35
	Girl	21.3	3.4		22.4	3.1		20.5	3.4	
11	Boy	22.1	4.4	0.75	24.0	5.2	0.57	20.3	2.6	0.34
	Girl	21.8	3.0		22.8	3.0		21.3	2.9	
12	Boy	21.9	3.6	0.82	23.7	3.6	0.59	19.2	1.6	0.15
	Girl	22.2	3.5		22.6	4.0		21.8	3.1	

BMI across grades shows (figure 3) a clear linear trend of increasing BMI with grade level for both boys and girls. In the early grades (1–6), BMI increases gradually, with minimal differences between genders. However, from grade 7 onward, boys show a more pronounced increase in BMI compared to girls, suggesting differences in growth spurts and muscle development. Urban students consistently have higher BMI than rural students, and this gap remains relatively sTable across grades, indicating a persistent difference in lifestyle or nutrition. Additionally, urban students exhibit greater variability in BMI, while rural students tend to have more consistent values. Despite these observable trends, statistical significance tests suggest that many of these differences are not consistently significant, meaning that while there is a general upward trend, variations between gender and location may not always be substantial.

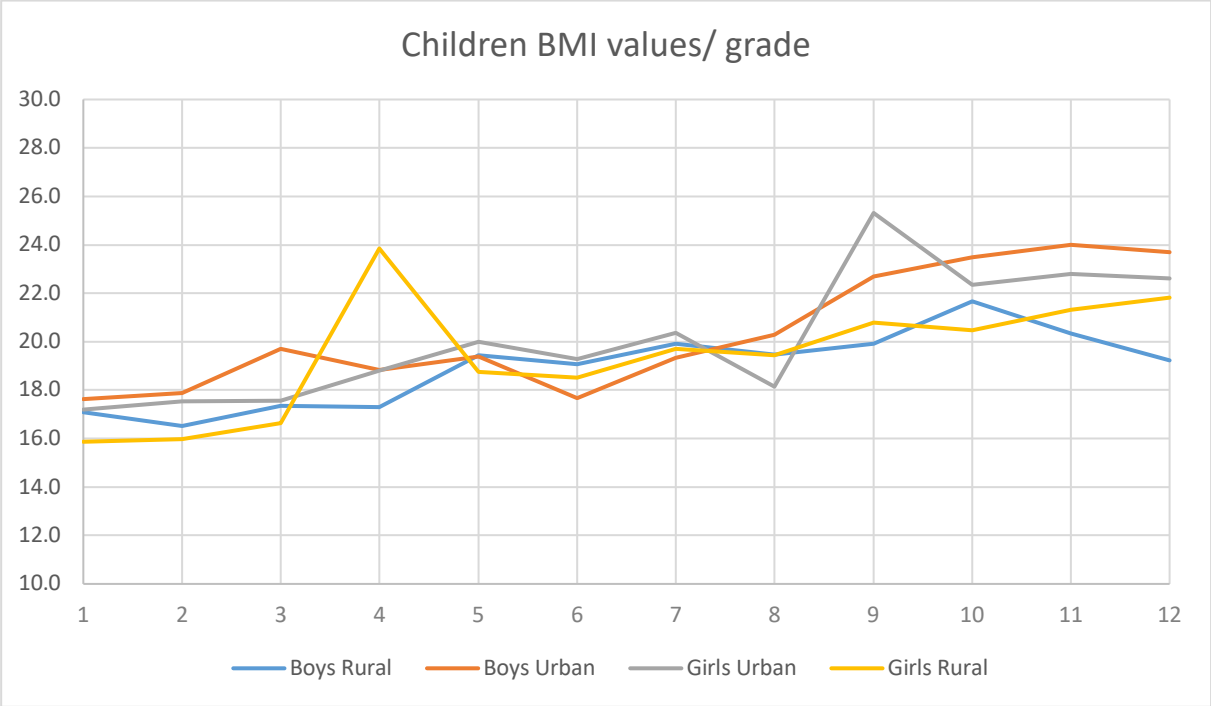

Figure 3. Trend of linear curve for children BMI.

Waist circumference analysis (Table 5) show that, in general, boys tend to have larger waist circumferences than girls across most grades, with this difference becoming statistically significant in higher grades. Specifically, from Grade 3 onwards, boys in urban areas consistently have larger waist circumferences than their rural counterparts, with significant differences observed in Grades 3, 4, 5, 7, 8, 9, and 11. In contrast, girls exhibit less variation between urban and rural areas, with only a few grades (such as Grade 3 and Grade 5) showing slight differences. Additionally, the gap in waist circumference between urban and rural areas tends to widen as students progress through higher grades, particularly for boys. Overall, gender and urban-rural disparities in waist circumference are more pronounced in the older grades, indicating that environmental and lifestyle factors may play a more significant role as children age.

Table 5. Gender and urban- rural comparison analysis by grade for waist circumference.

		Total			Urban			Rural		
Grade		**Mean**	**Std. Deviation**	**Sig. (2-tailed)**	**Mean**	**Std. Deviation**	**Sig. (2-tailed)**	**Mean**	**Std. Deviation**	**Sig. (2-tailed)**
1	Boy	58.1	8.8	0.85	58.1	9.3	0.82	58.0	7.4	0.39
	Girl	57.8	7.2		58.6	7.9		55.9	4.9	
2	Boy	59.0	9.1	0.76	61.0	9.7	0.34	55.3	6.4	0.15
	Girl	58.4	9.6		58.5	11.4		58.2	4.8	
3	Boy	65.4	10.6	0.85	71.4	10.9	0.02	61.5	8.4	0.19
	Girl	64.9	12.9		63.5	9.9		66.5	15.7	
4	Boy	67.5	9.9	0.03	69.0	10.3	0.09	65.1	8.9	0.35
	Girl	63.2	8.4		64.1	8.0		62.4	8.8	
5	Boy	71.8	11.7	0.01	72.9	12.8	0.00	70.4	10.2	0.36
	Girl	65.7	9.1		61.3	6.1		67.8	9.7	
6	Boy	66.6	9.3	0.58	68.6	9.4	0.14	65.5	9.2	0.76
	Girl	65.6	8.9		64.2	7.3		66.1	9.4	
7	Boy	73.6	12.0	0.00	72.9	11.6	0.01	74.2	12.4	0.01
	Girl	67.0	7.4		66.1	8.2		67.5	6.9	
8	Boy	72.8	10.6	0.00	73.0	9.6	0.03	72.8	11.1	0.02
	Girl	67.0	7.8		66.4	7.7		67.3	8.0	
9	Boy	77.5	12.4	0.04	80.4	12.8	0.87	74.2	11.2	0.03
	Girl	73.0	11.9		79.8	14.5		69.1	7.9	
10	Boy	74.4	11.6	0.12	77.9	11.7	0.06	67.7	8.5	0.40
	Girl	70.4	7.3		70.6	8.6		70.2	6.2	
11	Boy	78.7	8.8	0.00	80.1	11.7	0.09	77.4	5.0	0.00
	Girl	68.3	9.6		71.3	9.2		66.9	9.7	
12	Boy	76.1	9.7	0.38	80.8	10.0	0.39	69.0	1.2	0.94
	Girl	72.8	9.5		76.5	9.0		68.7	8.8	

The Figure 4 shows a general increase in waist circumference as children progress through higher grades. Urban children, both boys and girls, tend to have larger waist circumferences compared to their rural counterparts, with urban boys consistently having the highest

measurements. In contrast, rural girls maintain the lowest waist circumference across most grades. Gender differences become more apparent from grade 5 onwards, with boys generally surpassing girls in waist size, particularly in urban areas. Around grade 9, urban girls experience a noticeable increase, briefly surpassing rural boys. The graph effectively highlights growth patterns, urban-rural differences, and gender-related trends in children's body measurements over time.

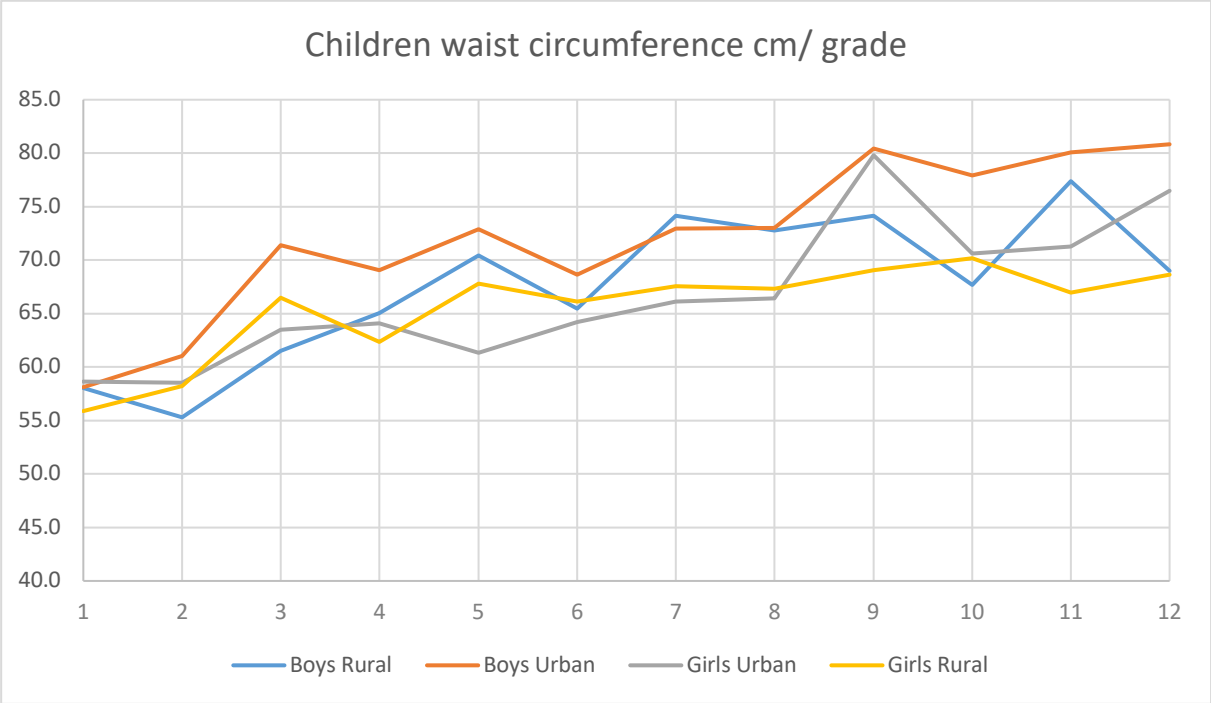

Figure 4. Trend of linear curve for children waist circumference.

DISCUSSION

The examination of Albanian children's body height, weight, BMI, and waist circumference across grades shows noTable gender disparities. These disparities get more noticeable with increasing age, particularly in adolescence. In the early grades, boys and girls grow at roughly the same rates in terms of body height. However, in accordance with normal pubertal growth patterns, boys typically outgrow girls in height during adolescence, especially in grades 9–12. Boys in urban regions show a larger gain in height than their counterparts in rural areas, making this disparity more noticeable. Given that females often attain their final height earlier than boys, the earlier development plateau in girls is consistent with biological growth disparities. This trend aligns with established biological growth trajectories, where boys experience a more pronounced growth spurt attributed to increasing testosterone levels during puberty, enhancing

both height and bone density (Mumm et al., 2018). Furthermore, urban schoolboys tend to demonstrate a greater increase in height compared to their rural counterparts, suggesting regional environmental influences on growth patterns (Paciorek et al., 2013). In the early grades (1–4), the body weights of boys and girls were comparable, with only slight variations that were not statistically significant. But starting in grade 5, boys are always heavier than girls, and by classes 8–12, especially in cities, there are noticeable disparities. Gender disparities in weight manifest later and become more apparent in grades 10–12 in rural areas.

The pronounced differences in body weight between genders are particularly evident in grades 8 to 12, indicating that urban environments, which may offer greater accessibility to diverse diets and exercise options, contribute to higher weight gain among boys compared to rural peers (Argawu et al., 2024). By contrast, in rural contexts, gender differences in weight appear later, highlighted in grades 10 to 12, which may suggest that dietary and lifestyle factors are less influential in these settings compared to urban environments (Sila et al., 2018).
Height and weight differences among children reflect nutritional status and health. Research has shown that adequate nutrition directly contributes to better physical growth trajectories, influencing physical activity levels (Frongillo et al., 2019). For instance, in environments where food scarcity is prevalent, children often experience growth stunting, leading to lower energy levels and less engagement in physical activity (Spencer et al., 2017; Spencer et al., 2016).

There is a noticeable gender difference in waist circumference, a key measure of abdominal fat, especially starting in grade 4, where boys routinely have greater values than girls. Significant differences in grades 3, 5, 7, 8, 9, and 11 are found in metropolitan regions, where the gender gap is more noticeable. Boys also typically have larger waist circumferences in rural locations, although the disparities are most noticeable in grades 7, 8, 9, and 11. This implies that metropolitan males might be more likely to be centrally adipose, perhaps as a result of altered lifestyle and exercise habits.

Urban boys consistently show higher waist circumference values than girls, particularly in grades 7 and 9, signaling a trend toward central adiposity in boys that correlates with their greater body mass gains (Hassapidou et al., 2017). While rural boys also display higher waist circumferences, significant disparities emerge later, specifically in grades 7, 8, and 11 Pacheco et al. (2024). The results indicate a concerning correlation where lifestyle changes associated

with urban living may predispose boys to higher waist circumference and the associated health risks of abdominal obesity (Kim et al., 2012).

Waist circumference, a key indicator of abdominal fat accumulation, also reveals pronounced gender differences, particularly as children transition from early grades to the late ones. Studies substantiate that boys consistently show higher waist circumference values than girls beginning in grade 4, with a noTable emphasis on urban populations, where the tendency toward central adiposity is more significant (Nyati et al., 2023). The fact that boys are encountering more significant obesity risks in urban settings points to an intersection of genetic and environmental influences (Cunha et al., 2017). Such findings parallel research suggesting that urban settings introduce lifestyle risks associated with higher waist circumference, thereby amplifying the gender disparities observed (Stevanović et al., 2022).

Waist circumference, a vital indicator of obesity and metabolic health, provides additional insights into children's health profiles and activity levels. Studies have indicated that a higher waist circumference may be more closely linked to adverse lipid profiles and metabolic syndrome than body mass index (BMI) alone (Leung et al., 2011). Hence, monitoring waist size in conjunction with weight and height offers a more comprehensive view of health risks, especially in identifying children who may require targeted physical activity programs to mitigate obesity risks (Wang et al., 2015).

The findings contribute to the existing body of knowledge by offering a nationally representative dataset, which can inform public health interventions, educational programs, and policies designed to promote healthy development across diverse population groups.

This study is important for a number of reasons. First, it offers a thorough grasp of Albanian children's health, physical development, and general well-being, especially with regard to body height, weight, BMI, and waist circumference. The study assists in identifying possible differences in growth and development by examining these factors across grades, genders, and geographical areas (rural vs. urban), allowing educators and policymakers to modify interventions and health programs appropriately.

Second, it emphasizes how gender and geography have a significant impact on children's physical development. To make sure that all children, regardless of gender or whether they reside in urban or rural areas, have access to proper nutrition, exercise, and healthcare services, it is especially important to comprehend any regional or gender-related variations. Lastly, this study aids in monitoring the success of current projects or programs, guaranteeing

that kids receive the physical and social assistance they need to grow and develop in a way that promotes their long-term health and wellbeing.

The study doesn't account for other influential factors such as socioeconomic status, diet, and physical activity, which could affect development. Although this study offers a thorough examination of growth trends, there are a number of constraints to take into account. It is more difficult to evaluate the potential effects of parental education, income, and access to health resources on body composition when socioeconomic factors are excluded. Furthermore, the study only includes children ages 6 to 18; younger children and post-adolescents are not included, which may limit how broadly the results may be applied. For a more comprehensive understanding of growth discrepancies, future studies should include socioeconomic factors and a wider age range. Furthermore, geographical variations between urban and rural environments were not investigated, which might have offered more information about the specific environmental effects on children's health.

These results highlight the necessity of focused interventions, especially in metropolitan areas where boys are more likely to have a larger waist circumference. Policies that support healthier settings, greater physical activity initiatives, and school-based nutrition programs can all help reduce these risks. Developing successful public health initiatives to promote children's long-term health and well-being would require a comprehensive approach that addresses socioeconomic and lifestyle determinants.

CONCLUSION

Current research revealed that boys have higher body height, weight, BMI, and waist circumference than girls, and these differences become more noticeable as puberty progresses. Compared to their rural counterparts, urban boys typically had higher body weight, BMI, and waist circumference, suggesting potential lifestyle-related impacts. Particularly in rural areas, girls typically have lower waist circumferences and BMIs, which may be a result of variations in the distribution of body fat and levels of physical activity. Boys are taller than girls after puberty, which is consistent with natural growth rates.

In order to address possible concerns associated with weight, body composition, and growth patterns, our findings emphasize the significance of focused health and nutrition interventions, especially throughout adolescence. Children and adolescents may grow and develop more

healthily if environmental and lifestyle issues are addressed in both urban and rural regions. The results of this research paper highlight the necessity of focused efforts to reduce the rising incidence of abdominal obesity, especially in urban boys. Future interventions should place a higher priority on school-based nutrition programs, more chances for physical activity, and family involvement because central adiposity is a powerful predictor of metabolic and cardiovascular risks. These inequities can be addressed through policies that encourage better school meals, limit access to high-sugar foods, and integrate scheduled physical activity into everyday routines. In order to combat inactive lifestyles, safe play areas and active transportation options should also be given top priority in urban development. By addressing these issues comprehensively, we can promote healthier growth trajectories for children and slow the rising trend of central obesity.

Declaration of Conflicting Interests

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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