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Authors:	Mirela Lisičić-Konaković [1*], Nurka Pranjić [2], Senka Mesihović-Dinarević [3], Melika Melunović [4], Adisa Čengić [1], Velma Selmanović [1], Selma Azabagić[5]
Affiliations:	[1]Paediatric Clinic, Clinical Centre of the University of Sarajevo; [2]Department of Occupational and Environmental Health, Faculty of Medicine, University of Tuzla; [3]Department of Medical Sciences, Academy of Sciences and Arts of Bosnia and Herzegovina, Sarajevo; [4]Paediatrics Department, Public Institution Health Centre of Sarajevo Canton, Sarajevo; [5]Institute of Public Health of Tuzla Canton, Tuzla; Bosnia and Herzegovina
Corresponding author:	Mirela Lisičić-Konaković; Paediatric Clinic, Clinical Centre of the University of Sarajevo, Patriotske lige 81, 71000, Sarajevo, Bosnia and Herzegovina; E-mail: m.konakovic@gmail.com
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ORIGINAL RESEARCH

Parents' perception of their own and their child's weight in relation to objectively measured body mass index

Mirela Lisičić-Konaković [1,*], Nurka Pranjić [2], Senka Mesihović-Dinarević [3], Melika Melunović [4], Adisa Čengić [1], Velma Selmanović [1], Selma Azabagić[5]

[1]Paediatric Clinic, Clinical Centre of the University of Sarajevo, Sarajevo; [2]Department of Occupational and Environmental Health, Faculty of Medicine, University of Tuzla, Tuzla; [3]Department of Medical Sciences, Academy of Sciences and Arts of Bosnia and Herzegovina, Sarajevo; [4]Paediatrics Department, Public Institution Health Centre of Sarajevo Canton, Sarajevo; [5]Institute of Public Health of Tuzla Canton, Tuzla; Bosnia and Herzegovina

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*** Correspondence:**

Mirela Lisičić-Konaković

Paediatric Clinic, Clinical Centre of the University of Sarajevo, Patriotske lige 81, 71000, Sarajevo, Bosnia and Herzegovina

Phone: +387 33 566 501

E-mail: m.konakovic@gmail.com

ORCID ID 0000-0002-0112-6030

ABSTRACT

Aim: To examine the association between parental and child body mass index (BMI), and parental perceptions of their own and their child's weight in relation to measured BMI.

Methods: This cross-sectional study included 1,343 children aged 3–6 years and 1,343 parents from primary healthcare centres and preschool institutions in Sarajevo. Data on sociodemographic characteristics, parental weight perceptions, and anthropometric parameters were collected using a questionnaire. BMI was calculated according to the National Centre for Chronic Disease Prevention and Health Promotion recommendations.

Results: The mean parental BMI was 25.1±3.8. Overall, 460 (34.25%) parents were overweight and 140 (10.43%) were obese. Among children, 171 (12.7%) were underweight, 790 (58.8%) had normal weight, 159 (11.9%) were overweight, and 223 (16.6%) were obese. Higher parental BMI was associated with lower relative risk of underweight (RRR=0.94; 95%CI = 0.89–0.99; p=0.021), slightly higher risk of overweight (RRR=1.04; 95%CI = 1.00–1.09; p = 0.047), and higher risk of obesity (RRR=1.09; 95% CI = 1.04–1.13; p<0.001). Parental perception of child weight status differed significantly from measured BMI (p<0.001), with very low sensitivity for child overweight and obesity of 10.5% (95%CI 7.8–13.9) and specificity of 99.2% (95%CI 98.4–99.6). Among parents, 100 overweight and 105 obese individuals perceived themselves as normal weight.

Conclusion: Parental BMI was positively associated with child BMI. Misperception of parent and child weight was common, supporting improved awareness and targeted prevention.

Keywords: body weight; childhood obesity; nutrition

INTRODUCTION

Obesity is a major public health challenge. Over the past three decades, adult obesity prevalence has more than doubled and childhood obesity has increased fourfold (1, 2). In children and adolescents, obesity rose from 8% in 1990 to 20% in 2022 (1). Obesity has a multifactorial aetiology, driven by biological, behavioural, environmental, and socioeconomic factors, with the latter three largely modifiable; unhealthy diets and sedentary lifestyles remain key drivers of the global increase (3-5).

Early childhood is a critical period for the development of nutritional needs, appetite regulation, taste preferences, and motives underlying food choices, and parents can contribute by modelling healthy eating habits (6).

Many studies show an association between parental and child overweight and obesity. Meta-analyses indicate that parental weight strongly influences children's obesity risk and underline the preventive role of parents (5,7). Research suggests that children who are obese before puberty often remain obese into adulthood. Body mass index (BMI) is a significant predictor of later overweight and obesity (7,8). Inadequate parental perception of children's body weight is frequently reported worldwide and may represent an additional factor contributing to the global rise in obesity (4, 9-11).

In Bosnia and Herzegovina (B&H), several studies have examined the aetiology of obesity in children (12, 13). However, this is the first study to investigate the association between parents' BMI and their children's BMI, as well as the difference between objectively measured and perceived BMI in parent–child dyads.

The aim of this study was to examine the association between parental and child BMI, and parents' perception of their own and their child's weight status in relation to objectively measured BMI.

MATERIAL AND METHODS

Subjects and study design

This cross-sectional study was conducted from May 2024 to July 2025. Data were collected in primary healthcare centres and preschool institutions in the Sarajevo Canton. The study included 1,343 parent–child dyads (1,343 children aged 3–6 years and their parents). The sample represented 10.3% of the city's target population in this age group (1343/13817). The inclusion criteria comprised healthy children aged 3–6 years. Children with chronic diseases and congenital or acquired physical deformities were excluded from the study. Recruitment was based on voluntary parental participation, with anonymity ensured for both children and parents. Of the initial 2,000 parent–child dyads approached, 1,343 were included in the final analysis after exclusion of incomplete questionnaires and participants not meeting inclusion criteria.

The study was approved by the Ethics Committee of the Health Centre of Sarajevo Canton and the cantonal Ministry of Education (28 May 2024, No. 01-06-33-2-2043-2/24, and 28 August 2024, No. 11-04/01-34-31677-1.1/24), and was conducted in accordance with the Declaration of Helsinki. Written informed consent was obtained from parents.

Methods

We used a specially designed questionnaire, "Questionnaire for Assessing Obesity in Children" which consisted of several sections: sociodemographic characteristics, parental weight perceptions, and anthropometric parameters. The questionnaire had been previously validated, with confidentiality and comprehensibility assessed in a previous study on eating habits and obesity among children aged 3–10 years (13). In preschool institutions, educators distributed the questionnaire, explained the purpose, collected completed forms, and forwarded them to the designated correspondence person. The principal investigator collected questionnaires within 7–10 days and arranged anthropometric assessment. In primary

healthcare centres, parents completed questionnaires in the presence of a trained medical technician/nurse, and anthropometric measurements were performed during the visit. Health-centre questionnaires were collected continuously during outpatient visits throughout the study period.

Participants stood on the digital scale barefoot and in light clothing. Instruments were calibrated before each measurement. Height was measured with a portable stadiometer, and weight with a digital scale, values were recorded on the questionnaire and later entered into an electronic database to calculate BMI and percentiles. BMI was calculated as weight (kg)/height $(m)^2$ and compared with age and sex specific percentiles on growth charts defined by the recommendations of the National Centre for Health Statistics and the National Centre for Chronic Disease Prevention and Health Promotion (NCCDPHP) (14, 15).

In accordance with the NCCDPHP recommendations, children were classified as underweight (<5th percentile), normal weight (≥5th and <85th), overweight (≥85th and <95th), or obese (≥95th percentile) (14).

In accordance with adult BMI categories, parents were classified as underweight (<18.5), normal weight (18.5–24.9), overweight (25.0–29.9), or obese (30.0+), with obesity subdivided into Class I (30–34.9), Class II (35–39.9), and Class III (≥40) (15).

Statistical analysis

Analyses were conducted in R version 4.5.1 (R Foundation for Statistical Computing, Vienna, Austria) and RStudio version 2025.08.0 (Posit Software, PBC, Boston, MA, USA). Continuous variables were summarised by mean ±SD, range (min–max), or median (Q1–Q3) depending on distribution; ordinal variables by median and interquartile range or frequency distribution; categorical variables by absolute and relative frequencies. Bivariate associations between parental characteristics and child overweight and obesity were tested with Pearson's chi-square, with Fisher's exact test when chi-square assumptions were not met. The

association between parental BMI category and child BMI category was analysed separately for mothers and fathers using Pearson's chi-square test, and odds ratios (ORs) with 95% confidence intervals (CIs) were calculated. Chi-square test was used to assess gender differences in the BMI categories of children and parents. Variables associated with child BMI category were entered into a multinomial logistic regression model, with child BMI category as the dependent variable and normal weight as the reference category. Inclusion of variables in the multinomial logistic regression model was not based on bivariate p-values. The p-values reported in the bivariate analyses were treated as descriptive screening measures. The main inferences were based on the multinomial logistic regression model. Effect estimates are presented as relative risk ratios (RRR) with 95% confidence intervals (CI). Statistical significance was set at $p<0.05$.

RESULTS

The study included 1,343 parent–child dyads. The children were aged 3–6 years (36–72 months), with a mean age of 54 ± 11 months. There were 644 (48%) girls and 699 (52%) boys. In most cases, the information was provided by the mother 1104 (82.2%). Parents were categorized into age groups (Table 1).

Overall, 460 (34.25%) parents were overweight, and 140 (10.43%) were obese. Class I obesity was observed in 38 (15.9%) fathers and 81 (7.34%) mothers (Table 2). Fathers had significantly higher BMI values than mothers (mean BMI 27.4 vs. 24.6, $p<0.001$).

Based on BMI percentile values, 171 (12.7%) children were underweight, 790 (58.8%) had normal weight, 159 (11.9%) were overweight, and 223 (16.6%) were obese. Accordingly, 382

(28.5%) participants were in the ≥85th percentile group, indicating that nearly one third of the children were overweight or obese (Table 3).

There was no statistically significant difference in BMI category distribution according to child sex (χ^2=1.02; p=0.797).

Among mothers, children were significantly more likely to be overweight or obese if their mother was overweight or obese than if she was of normal weight (36.7% vs. 22.0%; OR=2.05, 95% CI 1.57–2.68; p<0.001). Among fathers, the corresponding difference was smaller and not statistically significant (33.7% vs. 26.9%; OR=1.38, 95% CI 0.74–2.59; p=0.31).

Parental BMI was significantly associated with the child's BMI (p<0.001). In the total sample overweight or obese children more often had parents with overweight (41.1% vs. 31.5%) and Class I and Class II obesity (12.3% and 2.62% vs. 7.49% and 0.73%) (Table 4).

Secondary school education of parents was more common among parents of overweight children (38.5% vs. 30.4%). Children with overweight or obesity more often came from families with average income (76.7% vs. 69.2%) and less often from families with above-average income (18.8% vs. 26.9%).

Parental perception of the child's body weight showed a discrepancy between the groups. In the total sample, based on objective measurements 11.9% of children were overweight and 16.6% were obese (Table 3). According to parental perception, 3.35% of all children were considered overweight and 0.22% obese. Among children with objectively measured overweight and obesity, as many as 324 parents (84.8%) considered their child to be of normal weight, while 37 (9.7%) considered their child overweight, 3 (0.8%) obese, and 18 (4.7%) underweight (Table 4). Parental perception of child overweight and obesity showed very low sensitivity of 10.5% (95% CI 7.8–13.9), while specificity was 99.2% (95% CI 98.4–99.6), indicating substantial under-recognition of excess weight.

Parental BMI was the strongest factor associated with child nutritional status in our model. Multinomial logistic regression showed that higher parental BMI was associated with a lower relative risk of underweight (RRR = 0.94; 95% CI: 0.89–0.99; p = 0.021), a slightly higher relative risk of overweight (RRR = 1.04; 95% CI: 1.00–1.09; p = 0.047), and higher relative risk of obesity (RRR = 1.09; 95% CI: 1.04–1.13; p < 0.001). The association became greatest for obesity (Table 5). Parental BMI was modelled as a continuous variable, and the reported RRRs correspond to a 1 kg/m² increase. A five kg/m² increase in parental BMI corresponded to an RRR of 0.73 (95% CI 0.56–0.95) for underweight, 1.22 (95% CI 1.00–1.54) for overweight, and 1.54 (95% CI 1.22–1.84) for obesity, compared with normal weight.

During the study period, 922 respondents (68.65%) self-reported being of normal weight, 360 (26.81%) as overweight, 35 (2.61%) as obese, 23 (1.71%) as underweight, and 3 (0.22%) as significantly underweight. However, objective measurements revealed that 100 overweight (7.44%) and 105 obese (7.82%) parents misclassified themselves as being of normal weight (Figure 1).

DISCUSSION

This study confirmed that children with overweight and obesity were more likely to have parents with overweight and obesity. An identical finding was published in a previous systematic review of 23 studies, which reported findings that children of parents with overweight and obesity are more likely to be obese than those of normal-weight parents (5). Likewise, a meta-analysis of 46 studies found that parental BMI was positively associated with children's BMI in adolescence and adulthood (7).

However, obesity is multifactorial and cannot be explained solely by genetic predisposition. If a child has a predisposition to increased appetite and greater fat storage, dietary habits should be appropriately adapted (3-5).

Our research also indicated that sociodemographic factors, including parental educational level and family monthly income, are associated with BMI in preschool children. Overweight and obesity were more common among children whose parents had a secondary school education, and from families with average monthly incomes. Similar patterns have been reported in other studies (16,17). Moreover, unhealthy dietary patterns are more common among children from families with lower levels of education and socioeconomic status (18-20).

In contrast, we found no statistically significant association between parental age and child overweight and obesity. Most parents were in the 31–35 and >35-year age groups, often considered appropriate for parenthood due to emotional maturity, completion of education, and greater economic stability (21).

In our study, parental perception of children's body weight was inadequate, with a marked discrepancy between perceived and objectively measured BMI. A study in south-west Sydney reported that parents were less likely to identify overweight and obesity when they did not perceive it as a problem, 35% of parents misperceived their child's weight status (9). In Northern Lebanon parents underestimated their child's weight status in 61% of cases (4). Similarly, in Vienna elementary schools, 48.4% of parents underestimated their child's weight (10). In Turkey, a survey of mothers of 200 children aged 2–9 years found that more than half of mothers presenting due to "poor appetite" believed their child was malnourished, although almost all of these children had normal body weight (11).

An inappropriate parental perception of their own and their children's weight status has developed into a global problem. We also assessed how parents classified their own weight status. Self-assessment was adequate only among parents with underweight children. According to parents' reports, the percentage of overweight and obesity in their own childhood was 4.2%, while in our study, this percentage among their children was 28.5%.

This is consistent with other evidence showing that childhood obesity has quadrupled worldwide (1,2). These results are concerning and misperception may be one of the factors contributing to the global rise in obesity (5,11).

Our study had some limitations. A cross-sectional design cannot establish causality, and questionnaire-based research may be subject to response bias. Child BMI was assessed in relation to the BMI of only one parent; inclusion of BMI data from both parents would have allowed a more comprehensive evaluation of parental influence.

Strengths of the study include the public health relevance of obesity, a substantial sample of preschool children and parents, and the availability of data on nutritional status and BMI in both groups. Although this is the first study in our country, parents' misperception of both their own and their children's body weight status contrasts with objectively measured BMI. As such, it fills an important gap and offers evidence that may inform future guidelines and parent-focused interventions aimed at preventing childhood overweight and obesity.

CONCLUSION

Higher parental BMI was significantly associated with child overweight and obesity, while parental misperception of both their own and their child's weight status was common. These findings support the need for early parent-focused preventive strategies to increase awareness of childhood weight status.

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Conflicts of interest: None to declare.

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Ethics statement: The study was approved by the Ethics Committee of the Health Centre of Sarajevo Canton and the Ministry of Education of the Canton (28.05.2024, number: 01-06-33-2-2043-2/24 and 28.08.2024, number: 11-04/01-34-31677-1.1/24).

Data availability statement: The datasets generated and analysed during the current study are available from the corresponding author on reasonable request.

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TABLES AND FIGURES

Table 1. Sociodemographic and individual characteristics of parents/respondents

Parents/respondents	N (%)
Information provider	
Mother	1,104 (82.20)
Father	239 (17.80)
Parents' age group	
≤ 20 years	10 (0.74)
21-25 years	26 (1.94)
26-30 years	226 (16.83)
31-35 years	422 (31.42)
> 35 years	659 (49.07)
Parents' education level	
Elementary school	6 (0.45)
Secondary education	439 (32.69)
Higher education	78 (5.81)
University degree	533 (39.69)
Master's or PhD degree	287 (21.37)
Family monthly income	
Below average	54 (4.02)
Average	958 (71.33)
Above average	331 (24.65)
Total	1,343 (100.0)

Table 2. Anthropometric measurements of parents

Variable	Parents/respondents		
	Total (N=1343)	**Mother** (N=1104)	**Father** (N=239)
BMI category of parents, N (%)			
Underweight	16 (1.19)	15 (1.36)	1 (0.42)
Normal weight	727 (54.13)	661 (59.87)	66 (27.62)
Overweight	460 (34.25)	334 (30.25)	126 (52.72)
Obesity I class	119 (8.86)	81 (7.34)	38 (15.9)
Obesity II class	17 (1.27)	12 (1.09)	5 (2.09)
Obesity III class	4 (0.30)	1 (0.09)	3 (1.26)
BMI of parents (kg/m²)			
Mean ± SD	25.1 ± 3.8	24.6 ± 3.6	27.4 ± 3.8
Median [Q1–Q3]	24.5 (22.5-27.4)	24.1 (22.1-26.6)	27.0 (24.8-29.4)
Range (Min–Max)	16.9 - 44.5	16.9 - 41.0	18.1 - 44.5

SD, standard deviation; BMI, body mass index; Q1–Q3, interquartile range;

Table 3. Anthropometric characteristics of children

Characteristics of children No (%)	BMI categories			
	Underweight 171 (12.7)	**Normal** 790 (58.8)	**Overweight** 159 (11.9)	**Obesity** 223 (16.6)
BMI, Mean (±SD)	13.1 (±0.7)	15.4 (±0.9)	17.4 (±0.4)	20.2 (±2.0)
Gender, No (%)				
Boys	78 (45.6%)	380 (48.1%)	81 (50.9%)	105 (47.1%)
Girls	93 (54.4%)	410 (51.9%)	78 (49.1%)	118 (52.9%)
Age, mean (±SD)	53.3 (±11.4)	55.1 (±10.6)	56.1 (±10.6)	54.7 (±10.2)

SD, standard deviation; BMI, body mass index;

Table 4. Bivariate associations between parental characteristics and child overweight and obesity

Parents	Childs			
Variable	**Total** (N=1343)	**Normal weight** (N=961)	**Overweight or obesity** (N=382)	**p**
Age group				
≤ 20 years	10 (0.74)	8 (0.83)	2 (0.52)	
21-25 years	26 (1.94)	16 (1.66)	10 (2.62)	0.200
26-30 years	226 (16.8)	155 (16.1)	71 (18.6)	
31-35 years	422 (31.4)	293 (30.5)	129 (33.8)	
>35 years	659 (49.1)	489 (50.9)	170 (44.5)	
BMI category				
Underweight	16 (1.19)	12 (1.25)	4 (1.05)	
Normal	727 (54.1)	564 (58.7)	163 (42.6)	
Overweight	460 (34.2)	303 (31.5)	157 (41.1)	<0.001
Obesity I	119 (8.8)	72 (7.49)	47 (12.3)	
Obesity II	17 (1.27)	7 (0.73)	10 (2.62)	
Obesity III	4 (0.30)	3 (0.31)	1 (0.26)	
Education level				
Elementary	6 (0.45)	4 (0.42)	2 (0.52)	
Secondary	439 (32.7)	292 (30.4)	147 (38.5)	0.022
Higher education	78 (5.81)	52 (5.41)	26 (6.81)	
University	533 (39.7)	395 (41.1)	138 (36.1)	
Master's or PhD	287 (21.4)	218 (22.7)	69 (18.1)	
Monthly income				
Below average	54 (4.02)	37 (3.85)	17 (4.45)	
Average	958 (71.3)	665 (69.2)	293 (76.7)	0.008
Above average	331 (24.6)	259 (26.9)	72 (18.8)	
Perception of child's BMI				
Very thin	7 (0.52)	7 (0.73)	0 (0.00)	
Slightly thin	159 (11.8)	141 (14.6)	18 (4.7)	
Normal	1129 (84)	805 (83.1)	324 (84.8)	<0.001
Overweight	45 (3.35)	8 (0.8)	37 (9.7)	
Obesity	3 (0.22)	0 (0)	3 (0.8)	

Table 5. Multinomial logistic regression model for child BMI category, with normal weight as the reference category

Variable	Underweight	Overweight	Obesity	p
	RRR (95% CI)			
Gender of the child				
Female	ref	ref	ref	0.757
Male	1.13 (0.80–1.59)	0.88 (0.62–1.25)	0.98 (0.72–1.34)	
Child's age	0.98 (0.96–1.00)	1.01 (0.99–1.03)	0.99 (0.98–1.01)	0.072
Parent's BMI	0.94 (0.89–0.99)	1.04 (1.00–1.09)	1.09 (1.04–1.13)	<0.001
Parents' age group				
<25 years	ref	ref	ref	
26–30 years	0.82 (0.29–2.32)	0.71 (0.25–1.99)	1.22 (0.44–3.40)	0.444
31–35 years	0.71 (0.25–1.98)	0.74 (0.27–2.04)	1.17 (0.43–3.20)	
>35 years	0.79 (0.28–2.19)	0.48 (0.17–1.32)	0.89 (0.32–2.44)	
Parents' education level				
Elementary/secondary school	ref	ref	ref	
Higher education	0.46 (0.19–1.15)	0.75 (0.33–1.71)	1.08 (0.57–2.04)	0.471
University degree	0.62 (0.40–0.95)	0.91 (0.59–1.42)	0.83 (0.56–1.23)	
Master's or PhD degree	0.84 (0.51–1.39)	1.04 (0.61–1.77)	0.81 (0.50–1.33)	
Family monthly income				
Below average	ref	ref	ref	0.372
Average	2.40 (0.81–7.06)	0.93 (0.41–2.12)	1.36 (0.61–3.02)	
Above average	2.23 (0.72–6.91)	0.71 (0.29–1.76)	1.00 (0.42–2.40)	

RRR, relative risk ratio; CI, confidence interval;

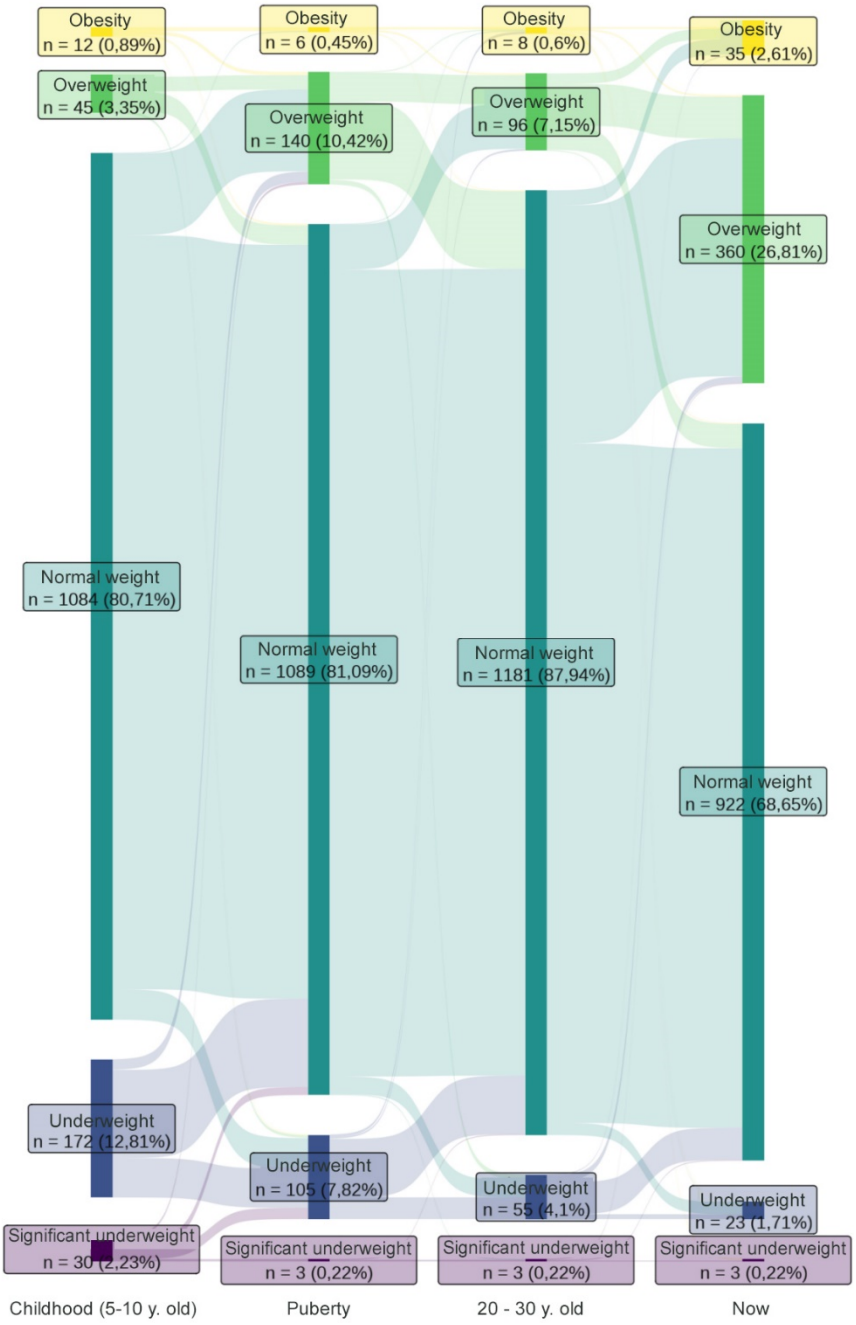

Figure 1. Sankey diagram showing parents' perceptions of their own weight across different life stages.