Parents Perception of Childhood Overweight and Obesity and their Attitude toward Behaviour and Lifestyle Changes: A 2020 Study on a Lebanese Population

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ABSTRACT

Background: Overweight and obesity are a major problem in communities; it affects greatly children whose lifestyle and diet are usually dictated by parents. A healthy childhood, is a concept with different understanding among different cultures, from this point of view, studies that assess parents' perception about this topic are lacking in the Lebanese population, whose cuisine have conquered the world.

Objectives: Our aim is to assess the perception of parents about childhood obesity and overweight; by assessing their understanding about children healthy food lifestyle, observe their practices, and check any under or overestimation to healthy lifestyle habits; thus, being able to approach them correctly, and help improve their child's chances for healthier future.

Methods: Parents of 100 participants were interviewed through a questionnaire-based study about different parameters including how they perceive their child's health status, their child's lifestyle, their socioeconomic status, and a group of 16 major questions using Likert Scale to evaluate parents' response (example if they recognize a child's weight health risk, if they seek advice, if they tried weight reducing strategies before;...). The interviews were held in different hospitals (Sahel, Bahman, Rafic Hariri) after fulfilling the inclusion criteria. Finally, the obtained data was analyzed using SPSS software.

Results: Among the 100 participants, 55% were males and 45% were females. After thorough analysis, the Lebanese sample showed an underestimation to children weight related risks; upon further analysis, and in relation to several factors; we concluded that the underestimation increases with lower educational levels of parents (P-value < 0.001), and when kids have a high BMI range/obesity versus overweight (P-value = 0.007); it decreases with higher parents' income (P-value = 0.001), and private school enrolment.

Conclusion: Most of the parents whose children suffered from overweight or obesity lacked awareness or underestimated their child weight status and related risks, thus posing a significant problem when approaching them around this issue. This highlights the need for more studies on this topic, the necessity to increase parents' awareness and education about their pivotal role in influencing their child's habits and practices, and raises a gap in appropriately speaking about this critical topic and probably spots the need to launch workshops or public education to engage parents in the process of children weight management strategies..

Keywords: Pediatrics; Clinical pediatrics; Perception; Overweight; Obesity

INTRODUCTION

The World Health Organization (WHO) defines overweight and obesity according to growth charts for children, teens and youngsters. In fact, their body mass index (BMI- ratio of weight in kilogram < Kg > to the square of height in meter < m2 >) is calculated then plotted on the chart's curve to obtain the corresponding percentile. In consequence, children between 85th and 95th percentile are considered overweight while those above 95th percentile are considered obese. Overweight and obesity are common in childhood and adolescence, in particular in Middle Eastern countries which are considered to have a high prevalence of childhood and school-aged obesity. In fact, in these countries around 10 % of school aged children are considered to be obese [1-2]. Moreover, a study done in 2014 by Nasreddine et al. to assess the prevalence of obesity among Lebanese children and adolescents found that around 9.6% of the studied population are considered obese [1]. Since this age group is for some degree still dependent on the parents, the latter would play a vital role in directing their child toward a certain lifestyle which could be either healthy or the opposite, and through some perceptions which intends to show a sign of good parenting and affection (as overfeeding the child, and give a free space when it comes to food and candies) parents may favour the development of overweight and obesity in their children as some studies had showed [1-3]. From what just preceded about the role of parents in determining a balanced life style for their children, our study will aim at surveying the perception of several Lebanese parents whose children are either overweight or obese, and to understand how they see/think about their children situation in order to come up in the end with a set of recommendations on how to deal with parents, and how to improve their compliance and cooperation with health care providers.

OBJECTIVES

Our main objective behind this study is to know how Lebanese parents think about and understand their child's overweight and obesity through a survey of 16 questions that we'll reflect upon to serve this purpose. The secondary objectives of our study are:

a) To establish a possible relationship between parents' perception and socioeconomic status (salary and education level) of the participating parents.

b) To establish a possible relationship between parents' perception, lifestyle and school type.

SUBJECTS AND METHODS

Study Design: This is a prospective, descriptive type of study based on a questionnaire conducted through the months of (February, March, and April) of year 2020. The study included children and adolescents, aged between 5 and 15 years old, above 85th percentile for weight (according to WHO definition of overweight and obesity) theirs parents were consented orally after explaining the goal behind our study. Weight and height of each enrolled participant were measured using a single standard weight and height balances.

Study Population: The target sample size was achieved with 100 child/ adolescent (using online estimation calculator https://www.surveysystem.com) who were admitted to the floors for acute complaints (like fever, diarrhea, vomiting), and not chronic ones (cancer, thalassemia, autoimmune diseases) whose parents were interviewed after fulfilling our inclusion criteria. Participants were collected mainly from Beirut district presenting to Rafic Hariri University Hospital, Sahel general hospital, Bahman hospital.

Inclusion criteria: Were included in our study

a) Participants in the age group range (5-15 years)

b) Participant affirmed as obese or overweight for age (according to the criteria mentioned in the introduction)

c) Lebanese participants, residents or living in Lebanon for more than 10 years.

Exclusion Criteria: Were excluded from our study

a) Participants with chronic debilitating health problems (e.g. cancer, autoimmune diseases, immune deficiency, and growth retardation)

b) Participants on medications that cause weight gain (e.g. steroids)

c) Participants (children) with underlying psychiatric illness

d) Participants who are living with proxies and not their parents.

Data Collection: To validate the Arabic version of the questionnaire parents were asked to fill our survey after explaining the goal of the study and the content of each question apart in Arabic language and repeating the question(s) in different ways when needed in order to make sure that the content was understood to avoid any misunderstanding. This scaling score allows respondents to specify a certain level of agreement or disagreement or even neutral attitude on a symmetric agree-disagree scale for a series of statements (example: score 1 means strongly disagree, score 2 means disagree and so on).

The main 16 questions (all obligatory to answer) aimed to reflect the perception\understanding of the parents, for example parents are asked if they really consider the weight-health status of their child as a problem (abnormal) or not, and whether they are planning to help and change their child's life healthy habits or not according to their answer of the former question. They were also asked if they find their cooperation with healthcare providers good for their child, or if they believe that at some point, they tried to help their child by themselves but failed for some reasons, and therefore need guidance to cooperate with health professionals.

Moreover, to evaluate their understanding and perception of their child's weight, they were also asked how they see their child (obese, overweight, or normal) regardless of his\her real weight status. Then their responses were analyzed according to the corresponding percentile of each child in order to know how accurate are the term(s) used by the parents in describing their child physical status and thus helping more understand their perception in the ultimate purpose of a better approach when explaining their child condition. Moreover, the questionnaire collected data about the socioeconomic status of the parents (such as level of education and their average monthly income), also information about the daily lifestyle of the children (the average time they spent on television (TV) daily, on electronic devices as tablets and phones, and how much do they exercise per week that gave us an idea on how much active the child is). These interviews were done either in health care facilities or in private clinics.

Statistical Analysis

After finishing the interviews, the collected data were filled on a Microsoft Office Excel sheet, and all statistical analyses were performed using IBM SPSS statistics, version 22. Categorical variables were summarized using descriptive statistics and were reported as frequencies and percentages. The association between two qualitative variables was tested using either Pearson Chi-Square test or Fisher test depending on the analyzed data. All tests were two sided and P-value < 0.05 was considered statistically significant.

RESULTS

Population Generalities

Among the 100 enrolled children in our study, there were 55 male participants and 45 female participants. They were categorized initially according to the BMI status into overweight and obese groups regardless of the gender, with 65% of participants fit within the overweight group and 35% within the obese group. As the study was conducted in Beirut district, most of the participants were Beirut residents (90%) and the rest 10% were from South, North, and Beqaa regions but they were receiving care in Beirut at the time of the study. Next, we will present the analyzed data on how several socio-economic, demographics, and lifestyle factors interact and affect parents' perception of their children health and weight status.

Parents' Perception of their Children's Weight Status

This part is the pivot of our study since it elaborates its main objective. In fact, we wanted to see how many parents will have a misperception/misunderstanding of their child true weight status even after being informed about their child BMI. Moreover, we wanted to test a hypothesis saying that when parents are not aware of their child health status (weight), and not perceiving it rightfully this could result in unhealthier weight status/management and having more BMIs in the overweight/obese range (this would be reflected through the obtained percentages). For this purpose, the data were collected and analyzed as presented in (Table 1).

We divided the results as follow: For the overweight group, 41 out of 65 parents answered that they see their child as normal status, and 4 see their child as obese while 20 parents answered correctly about their child true health status. So, the majority 45 (69.2%) out of 65 parents of the overweight group had answers that didn't match the child true status regardless of answering with normal or obese while 20 (31%) parents had matched answers. For the obese group, 7 parents out of 35 answered that they perceive their child as normal, and 24 answered that they see their child as overweight while just 4 parents answered correctly that say see their child as obese. The great majority of parents 31 (89%) had a misperception about their child being obese regardless of answering normal or overweight while just 4 (11%) had matched answers (Figure 1 and Table 1).

We did a chi-square testing through which we obtained a Pearson chi-square value (p-value) of <0.001 thus we could say that the hypothesis about most parents (with high BMI status children) would not know the true BMI status of their child was significant/valid.

Also, in the same notion, we looked at the underestimation in parents with overweight children and those with obese children to see would there be a difference in between them. We found that in the overweight group the underestimation percent was 63.1% while it was higher in the obese group 88.6%. So, we calculated the p-value to see if the hypothesis that as we go up higher in the BMI range, we will see higher percentage of underestimation from parents, according to Pearson chi-square test the value was (0.007) so our hypothesis was significant (Table 2).

Table 1: Parents' perception (match or mismatched) toward their child weight status in relation to each group (overweight and obese).

Answer/ Group	Matched	Unmatched	p-value
Overweight n=65(100%)	20(31%)	Normal: 41 (63%)	< 0.01
		Obese: 4 (6%)	
Obese n=(35%)	4(11%)	Normal: 7 (24%)	
		Overweight: 24 (68%)	

Note: P-value < 0.001, calculated with Pearson chi-square testing, indicates that the proposed hypothesis (majority of parents in these BMI range groups are not aware of their child health status and thus his/her problem) can be considered significant.
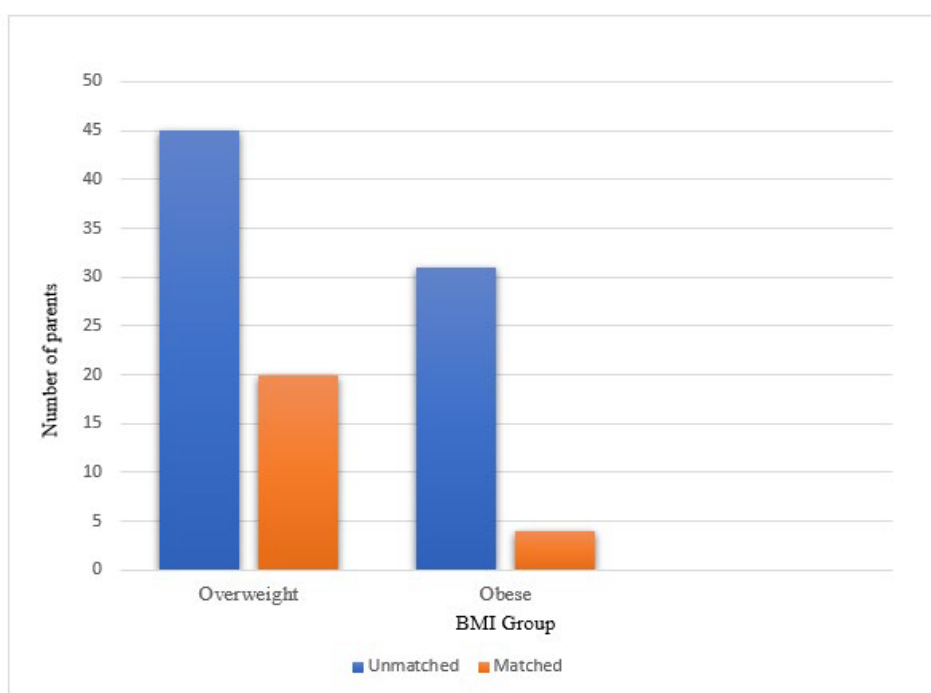

Figure 1: Unmatched and matched parents' answers about their children weight status in both BMI groups.

Socioeconomic status of the parents: Level of education: In this part, we assessed the underestimation of the real children's weight by their parents in terms of the latter level of education. We found that as we move up higher in terms of education level (from no school entry, elementary education till university) there was a diminish in the percentages of parents who had underestimation of their child real weight, and this in turn reflects their way of perceiving or understanding their child problem (Table 3). For example, the percentage of underestimation in parents who didn't enter school (toward the high BMI and regardless of being overweight or obese) was 85.7%, and remained almost the same in parents with elementary education (88.6%) then decreased gradually with high school and university level of education (75.8% and 12.5% respectively). The higher the educations level of the parent, the lower the underestimation (P < 0.001).

Monthly income: Similar to the previous approach, we looked at the monthly salary in Lebanese pound (LBP) of the parents to see how the percentages of underestimation are changing with the change of the salary. We found that for parents with monthly income less than 1 million (M) LBP, the percentage of underestimation was high (84%). However, there was a significant drop in this percentage (to 51.4%) with income >1M LBP (Table 4). We hypothesized that the high level of monthly income would lead to a decrease in the percentage of child weight underestimation by the parents. We calculated the p-value for this relation using the 2-sided exact fisher test, and it was significant (0.001). So, we can say there exist a relation between a high monthly income (>1M LBP), and lower percentages of weight underestimation.

School type and its influence on parents' perception of children's weight: We wanted to see from this comparison between public and high schools, if the type of school would affect parents' perception and ability to judge their child weight and health status accurately. Among parents who had children enrolled in public

Table 2: Variation of parents' estimation of children weight between the overweight and obese groups

			Underestimation		p-value
			No	Yes	
Obesity	Overweight	Count	24	41	0.007
		% within Obesity	36.90%	63.10%	
	Obese	Count	4	31	
		% within Obesity	11.40%	88.60%	

Note: (No) means no underestimation, (Yes) means there exist underestimation. There was an association between the real weight of the child and its underestimation by parent (p-value =0.007); a higher underestimation exists among parents of obese children (versus overweight).

Table 3: Underestimation of parent's perception of their child's weight status in relation with their level of education

			Underestimation		p-value
			No	Yes	
What is the education level of the parents?	Didn't enter a school	Count	1	6	< 0.001
		% within What is the education level of the parents?	14.30%	85.70%	
	Elementary education	Count	5	39	
		% within What is the education level of the parents?	11.40%	88.60%	
	High School	Count	8	25	
		% within What is the education level of the parents?	24.20%	75.80%	
	University	Count	14	2	
		% within What is the education level of the parents?	87.50%	12.50%	

Note: (No) means no underestimation, (Yes) means there exist underestimation. P-value < 0.001, calculated obtained from fisher exact test 2-sided, means the hypothesis of less underestimation about children's weight in parents with higher level of education is significant.

Table 4: Underestimation of parent's perception of their child's weight status in relation with their monthly salary.

			Underestimation		p-value
			No	Yes	
What is the average monthly income of the family?	< 500,000 LBP Or 500,000 and 1,000,000 LBP	Count	10	53	0.001
		% within What is the average monthly income of the family?	16%	84%	
	> 1,000,000 LBP	Count	18	19	
		% within What is the average monthly income of the family?	48.60%	51.40%	

Note: (No) means no underestimation, (Yes) means there exist underestimation. p-value=0.001, obtained from fisher exact test 2-sided, means the hypothesis of less underestimation about children's weight in parents with high monthly income is significant.

school, the percentage of underestimation was 81.3 %, whereas; the percentage was 61.7% in parents with children enrolled in private schools (Table 5). The theory that parents who have kids in private schools would have lesser percentages of underestimation (may be due to higher level of cooperation between the private schools and parents, also private schools may have health personnel who keeps in touch with parents and guides them) was tested, and for that we calculated the p-value with Pearson chi square test and it was (0.031) thus validating our postulated theory.

Life style of children: Time spent on electronic devices per day and television: We wanted to see how such factor would influence the ability of parents to have right or good estimation about the real weight status of their children (regardless of being overweight or obese). For this purpose, we collected data about how much time do children spend per day on the different electronic devices available these days, and we found that the percentages of underestimation were high in both groups (those who spend time between 1 and 5 hours per day and those who spend > 5hours per day) with results of 74.4% and 70% respectively (Table 6). We looked if there was a relation between spending more time on these devices (> 5hours per day) and higher underestimation from parents toward their children weight so we calculated the P-value for this relation on the basis of fisher 2-sided exact test, and it was (0.870) thus such proposed relation is not valid.

Similarly, for TV we looked at how estimation changes with time spent per day (regardless of being overweight or obese), and we found that when children spent between 1 and 5hours per day the underestimation by parents was 67.3% while it jumped to 77.8% when children spent > 5hours/ day. A Pearson chi-square p-value obtained (0.244) meaning that the hypothesis of having higher underestimation percentages with more time spent on TV was not valid despite having higher percentage when children spent > 5hours (Table 7).

Frequency of exercising per week: In a similar fashion, we tried to assess the variation of parents' estimation of their children weight status with how much children exercise per week. We originally included 3 choices for this question but since none of the parents answered that their children practice (≥ 3times per week) we omitted this choice from the table data. The results showed no major difference of underestimation percentages between groups (those who exercised once per week and those who exercised twice) with percentages of underestimation 72.4% and 70% respectively (Table 8). We tried to see if there was an influence between higher number of exercises per week and lesser underestimation by the parents so we obtained the p-value according to fisher 2-sided exact test which was (1.00) so we cannot say that such relation exists.

Demographics and residency: The great majority of the enrolled children were residing in Beirut with 90% of the total participants (we looked at the place of residency and not at the place of the hospital where the interview was conducted) while the rest were from Beqaa, North, and South. We wanted to see how parents' estimation would vary from place to place and mainly from an urban region like Beirut to rural areas like North, Beqaa, and South. The results showed that in Beirut the percentage of underestimation reached 71.1%, in South 83.3%, in Beqaa 50%, and in North 100% without forgetting that Beirut alone had 90 participants out of 100 (Table 9). To test our hypothesis which says that parents in major urban regions have lower percentages of underestimation of their children weight, we calculated the P-value using the exact fisher 2-sided test and it was equal to (0.830) thus not having a valid hypothesis to build on?

Major variables influencing parents 'perception of their children weight: In this part we looked at the major variables that influenced the perception of parents in terms of significance, odds ratio, and confidence interval, and these variables were chosen automatically by the SPSS. We found that each increase of TV watching per day by one hour, increased the risk of weight underestimation by 6 times, and according to this analysis it showed there was an association between increasing number of hours spent on TV and underestimation by parent with P-value = 0.024 (Table 10).

Table 5: Relation between the nature of school and its influence on parents' estimation of children weight.

| | | | Underestimation | | p-value |
			No	Yes	
School	Private	Count	18	29	0.031
		% within School	38.30%	61.70%	
	Public	Count	10	43	
		% within School	18.90%	81.10%	

Note: (No) means no underestimation, (Yes) means there exist underestimation. P-value = 0.031, obtained from Pearson chi square test, means the hypothesis of less underestimation about children's weight in parents with children in private schools is significant.

Table 6: Relation between the times spent by children on electronic devices per day and parents' estimation of their weight.

| | | | Underestimation | | p-value |
			No	Yes	
What is the average time spent on electronic devices (Tablets, video games, phones.) per day?	< 5 hours	Count	0	1	0.87
		% within this group	0.00%	100.00%	
	Between 1 and 5 hours	Count	10	29	
		% within this group	25.60%	74.40%	
	> 5 hours	Count	18	42	
		% within this group	30.00%	70.00%	

Note: (No) means no underestimation, (Yes) means there exist underestimation. p-value = 0.870, obtained from fisher 2-sided exact test, means the hypothesis of a relation between more time spent on electronic devices and higher underestimation percent of parents is not valid.

Table 7: Relation between the time spent by children on TV per day and parents' estimation of their weight.

			Underestimation		p-value
			No	Yes	
What is the average time spent on TV per day?	Between 1 and 5 hours	Count	18	37	0.244
		% within What is the average time spent on TV per day?	32.7%	67.3%	
	> 5 hours	Count	10	35	
		% within What is the average time spent on TV per day?	22.2%	77.8%	

Note: (No) means no underestimation, (Yes) means there exist underestimation. p-value=0.244, obtained from Pearson chi-square test, means the hypothesis of a relation between more time spent on TV and higher underestimation percent of parents is not valid.

Table 8: Relation between exercising frequency per week by children and parents' estimation of their weight.

			Underestimation		p-value
			No	Yes	
How many times does your child exercise per week?	Once	Count	26	67	1.0
		% within How many times do your child exercise per week?	28.0%	72.0%	
	Twice	Count	2	5	
		% within How many times do your child exercise per week?	28.6%	71.4%	

Note: (No) means no underestimation, (Yes) means there exist underestimation. p-value = 0.870, obtained from fisher 2-sided exact test, means the hypothesis of a relation between more exercises per week and lower underestimation percent of parents is not valid.

Table 9: Distribution according to major Lebanese regions, and its relation to parents' underestimation of their children weight.

			Underestimation		p-value
			No	Yes	
Current Residency	Beirut	Count	26	64	0.83
		% within Current Residency	28.9%	71.1%	
	Beqaa	Count	1	1	
		% within Current Residency	50.0%	50.0%	
	North	Count	0	2	
		% within Current Residency	0.0%	100.0%	
	South	Count	1	5	
		% within Current Residency	16.7%	83.3%	

Note: (No) means no underestimation, (Yes) means there exist underestimation. P-value = 0.830, obtained from fisher 2-sided exact test, means the hypothesis of a relation between residing in urban regions and lower underestimation percent of parents is not valid.

Table 10: Major variable influencing parents' perception of their children weight.

	Sig.	Exp (B)	95% CI. for EXP(B)	
			Lower	Upper
What is the average time spent on TV per day?	0.024	6.354	1.269	31.815
[a] What is the education level of the parents?	0			
[b] What is the education level of the parents?	0.002	164.31	6.889	3918.698
[c] What is the education level of the parents?	0	229.869	21.156	2497.626
[d] What is the education level of the parents?	0	63.418	6.683	601.82
Constant	0	0.015		

Sig. refers to p-value, Exp (B) refers to odds ratio.
a = refers to parents who didn't enter school at all
b = parents with elementary education
c = parents with high school education
d = parents with university level of education

Similarly, with the level of education, which showed a significant association with parents' underestimation toward their children' weight (lower level of education causes higher underestimation) we found that between parents with no school entry and those with university education there is 164 time more risk of underestimation with no school entry, 229 time increase risk of underestimation with elementary education, and 63 time more risk of underestimation with high school education (Table 10).

DISCUSSION

Prevalence of obesity and overweight among children is steadily rising [4]. This study aimed at linking some socioeconomic, demographical and lifestyle factors with the increased incidence of children weight underestimation among parents in order to control the factors responsible of misperception and thus limiting obesity. Parental perception of childhood weight seems to be of major influence on overweight/obesity status. In fact, we tried to see if parents can accurately describe their child health problem or not since accurate weight perception is the first step toward addressing parents for their child health problem. The results showed that a total of 76% of participants don't really know the real BMI status of their children regardless if it is normal, overweight or obese.

Our population sample comprised 35 obese children; 31 out of those 35 (89%) were misperceived as either normal (7 out of 35) or overweight (24 out 35) and 4 children were correctly perceived as obese. On the other hand, 65 out of 100 of our participants were overweight, 45 out of 65 (69.2%) were misperceived as having normal weight (41 out of 65) or obese (4 out of 65) whereas 20 out of 65 children were correctly perceived as overweight. Therefore, 89% of parents misperceived their child weight in the obese group and 69.2% of parents had false perception of weight in the overweight group. These results are in concordance with many studies done abroad which demonstrate poor parental awareness for children weight status [5-6]. For example, some studies done by Hudson et al. showed that 45% of parents of obese children and 81% of parents of overweight children underestimated their children weight [7]. In addition, a study done by Eckstein et al. identified that 49% of parents of obese children and 70% of parents of overweight children incorrectly stated their children weight [8].

Another Canadian study also reported same conclusive results but with different percentages [9]. Moreover, we tried to calculate the percentage of underestimation in each group in order to confirm our hypothesis that underestimation tends to be more important in children with higher BMI. Promising results were obtained as 63.1% of parents underestimated their child weight in the overweight group whereas 88.6% underrated their child weight in the obese group. This increasing percentage among the obese group (higher BMI status) confirms our hypothesis that as we go higher in BMI more parents tend to underestimate their child weight. A significant correlation is found since p-value = 0.007 (<0.05). This can be explained by the fact that parents who let their children reach a state of franc obesity are more likely to be careless or negligent toward their children weight and thus more likely to underestimate it. Despite that no studies were found in literature supporting our findings, one study done by Jain et al. showed that parents may not really understand what does overweight means. This was demonstrated by doing qualitative interviews with low income mothers trying to understand their point of view about when a child is considered overweight. Results were surprising as many mothers refused to admit the classifications used by health

care professionals for obesity/overweight [10].

Other findings demonstrated that parents may also be unwilling to admit about their real child weight [11]. Therefore, these findings could play a role in increasing percentage of underestimation among higher BMI children since parents don't know when a child is considered overweight or obese. Several factors were assessed in our study trying to correlate the socioeconomic status, demographics, lifestyle factors and children BMI with the percentage of underestimation among parents. Factors studied include place of residency (major district), being a public or private school student, the socioeconomic status including the educational level and monthly income of the parents (the ones who were interviewed), and lifestyle of the children (time spent on electronic devices, TV and physical exercise). When approaching the socioeconomic status and its effect on overweight/obesity, many studies conducted in other countries showed that the socioeconomic status could have a direct influence on developing obesity among children.

However, some evidences also showed that this relationship can differ in industrialized vs developing countries [12]. In other words, children from low socioeconomic status are at higher risk of obesity in developed countries whereas children from rich families appear to have a higher risk of obesity in developing countries [12,13]. One of the socioeconomic factors studied is the educational level of the parents (didn't enter school, elementary school, high school or university level of education). Parents with higher educational level are more aware about the complications of obesity can better estimate their child BMI than parents with no/low educational level (less weight underestimation in more educated parents) and thus can contribute to better control of their child diet and weight. Results showed that 7% of interviewed parents didn't enter school, 44% of the interviewed parents had an elementary level of education, 33% had a high school level of education and only 16% were university students. 85.7% of parents who didn't enter school underestimated their child weight.

A similar percentage is seen among parents who had elementary education with 88.6%. However, the percentage decreased among parents who had high school level of education to 75.8% and diminished more significantly in parents who were university students to 12.5%. These results support our hypothesis of more educated people is more aware of their child BMI and can better estimate it. Moreover, the correlation is highly significant since p-value <0.001. This finding is consistent with a study done by GENESIS who found that more educated mother can better estimate their child weight as compared to less educated one [5-14]. On the other hand, other studies showed that higher parental education was associated with decreased risk of overweight/obesity in developing countries [15,16].

Moreover, we tried to demonstrate a correlation between parents' monthly income and BMI status underestimation by proving that parents with higher income are less likely to underestimate their children weight. Results showed that majority of parents (59%) have an income between 500000 LBP and 1000000 LBP and 37% more than 1000000 LBP whereas only 4% had a monthly income less than 500000 LBP. Since small percentage of parents from our sample had a monthly income less than 500000 LBP, we divided our sample to 2 groups according to their monthly income (less than 1M LBP and more than 1M LBP). Among those who have an income less than 1M LBP, 84% of them underestimated their children weight. A remarkable decrease in percentage of

underestimation to 51.4% was seen among parents who have a monthly income of more than 1M LBP. In addition, a significant correlation could be established (p-value = 0.001 < 0.05). Thus, these results support our hypothesis. Studies about this correlation are limited in literature. However, some studies supported our findings and showed that low income mothers have higher risk of weight underestimation due to many factors (lack of knowledge about the standardized statistically-based definitions of a normal or healthy weight, ethnic differences for perception of obesity among low income mothers, role of grandmothers in deciding what infants should eat...) [10].

Other studies also showed that   parents who have low socioeconomic status have higher risk of underestimation for their child weight [5-17]. Other associations were studied as being a public or private school student since majority of private schools in Lebanon have health care professionals who take good care of children health and well-being (by arranging conferences for health awareness, organizing social and physical activities, offering healthy foods...). Furthermore, private schools can better communicate and orient the parents toward their child health and weight status hence contributing to less weight misperception. The study showed that 53% of participants were public school students and 47% were private school students. 61.7% of parents who have their children enrolled in private schools underestimated their weight whereas the percentage of underestimation was 81.1% among parents whom children are enrolled in public schools. A significant association could be found between type of school and BMI status underestimation (p-value = 0.031 < 0.05).

Literature review reported variable findings concerning the association between type of school and childhood BMI. One study reported that children enrolled in private schools had higher BMI than those enrolled in public schools [18]. Others studies in the same context mentioned that children of private schools had higher access to unhealthy snack foods, are less physically active and have shorter school physical education classes compared to those in public schools [19]. However, no studies in literature was found supporting the association between type of school that children are enrolled in and how it affects parental perception of their weight. Another parameter studied is children lifestyle. Therefore, we had to ask parents on the average time their children spent on electronic devices, television and physical exercise.

Those parameters could help us find a relationship between lifestyle of children and BMI status underestimation by the parents. In fact, some parents consider that increasing weight is a sign of prosperity and good health for their children, as long as they maintain some physical activity with good appetite and eating healthy foods no matter what is his/her weight [10]. Thus, this could play a major role in affecting parental perception toward their children weight. Our results showed that 55% of children spend between 1 and 5 hours on television and 45% spend more than 5 hours. However, it seemed that majority of their time were spent on electronic devices where 60% of them spend more than 5 hours and 40% spend between 1 and 5 hours and only 1% spend less than 1 hour.

On the other hand, when asked how many times they exercise per week, results were as following: 93% exercise once per week and 7% exercise two times per week. These results showed that majority of overweight/obese children have a sedentary lifestyle with more hours spent on television/electronic devices and less hours on physical exercise. Then, we calculated the percentage of underestimation among each lifestyle factor. First, regarding the

number of hours spent on TV per day, results showed that children who spend between 1 and 5 hours on TV, 67.3% of their parents underestimated their weight. The percentage is a bit higher (77.8%) among children who spend more than 5 hours per day on TV. No significant association could be found (p-value = 0.244 > 0.05).

Concerning children who spend more time on electronic devices, 74.4% of their parents underestimated their weight when they spend between 1 and 5 hours whereas 70% of parents underrated their weight when they spend more than 5 hours. However, no significant association could be achieved (P-value = 0.870 > 0.05). Regarding number of physical exercises per week, results showed that 72% of parents underestimated the weight of their children who exercise once per week. A very close percentage of underestimation (71.4%) was seen among parents of children who exercise twice per week. No association between number of physical exercises per week and weight underestimation was found with P-value being equal to 1.00.

However, previous studies done regarding lifestyle influence on weight perception showed that parents are more concerned about their children weight if they are less active or have activity limitations such as spending more time on TV and electronic devices and less time on physical activity [8,10,20]. Therefore, this could lead them to more underestimate their children weight when they are more active (less time spent on TV, electronic devices and more time exercising) and less underestimate their weight when they are less active since their concern toward their sedentary children let them more aware of their weight and thus to more correct perception. Arriving to the demographic factor, our study showed that 90% of the interviewed children live in Beirut (capital of Lebanon). 2% were from Beqaa, 2% from north and 6% from south. This can be partially explained by the fact that most of our interviews were conducted in healthcare facilities located in Beirut.

We tried to calculate the percentage of weight underestimation among parents having a place of residency in Beirut, north, south and Beqaa in the purpose of finding a correlation between place of residency (urban or rural region) and rate of children weight underestimation by parents. Results showed that 71.1% of parents living in Beirut underestimate their children weight; underestimation was lower in Beqaa (50%), 100% among parents living in northern of Lebanon and 83.3% for those living in south. These results and due to the data limitations in the regions outside the capital no correlation could be demonstrated between the place of residency and its influence on parental weight perception (p-value = 0.830 > 0.05). A study in literature showed that the prevalence of overweight/obese women living in urban areas tend to be higher compared to women living in rural areas especially in countries with low to moderate gross domestic product (GDP) [21].

Another study among school-aged children in Poland showed that boys living in urban and bigger cities tend to be more obese and overweight than those in rural areas and those primary schools in urban areas tend to have children with lower rates of normal BMI than those in rural areas [22,23]. However, no studies were found in literature elaborating the influence of the place of residency (urban vs rural areas) on parental perception of their children weight. Finally, a multivariable analysis was done to elaborate the major variables influencing the percentage of underestimation. 2 major variables were found to have a significant association: Number of hours watching TV per day and level of education of the parents.

First, we found that every 1-hour increase in watching TV there is 6 times more increase of weight underestimation with a significant association since p-value = 0.024. It can be explained by the fact that it is a matter of parent mentality. In other words, the same parents that allow their children to spend more time watching TV are the same parents that do not have a problem with their child eating habits and thus with gaining weight. This finding contradicts the literature where most of the studies showed that underestimation decreases when children are less active [8,10,20].

Second, concerning the level of education, our results showed that underestimation risk increase 164 times more among parents who didn't enter school and 229 times more among parents who had elementary education in comparison to parents who had a university level of education. Whereas the risk decreases to 63 times more among parents who had a high school level of education in comparison to parents with a university level of education. These finding have a significant association since p-value is less than 0.0001. Our results are compatible with many studies in literature that state that underestimation of weight decreases among more educated parents [5-14] and that less educated mothers tend to more underestimate their child weight [5-10]. In addition to factors mentioned in our study, international data related a number of factors to parental misperception of their children weight [14,24,25].

In other words, many potential causes may be responsible for this inaccurate perception. Hence, some researches projected that increased parental BMI may be associated with higher risk of misperception and underestimation for children weight [26-28]. This can be due to the fact that parents with higher BMI are accustomed to their elevated weight and thus are less able to see their child as overweight. Another factor that can contribute to the incorrect perception of the parents is the age of the child. Global studies showed that the younger the child is, more likely that his parent will misperceive his weight. It may be due to the common belief that normal weight gain is a sign of good health and prosperity in children [10-16].

Not only age but also gender of the child may play a role in the incorrect perception. Actually, studies showed that overweight boys are more likely to be misperceived than overweight girls [24-29]. It could be explained that communities tend to idealize girl's body shape and consider that being slim is what girls and women should be, in contrast to what is seen in boys and men, where overweight is more commonly accepted by the society. Therefore, body weight tends to be more correctly perceived in females than in males.

All the above-mentioned factors (socioeconomic status, children lifestyle, level of parental education and school type) combined seems to play an important role in the incorrect perception of parents for their children weight. Based on these factors and since accurate weight perception is an essential requirement for involving parents in childhood obesity interventions [11], efforts should be put in expanding awareness among parents about the correct definition of overweight/obesity status in children. In fact, it was proven that parents that are unaware of their child overweight/obesity status are less involved and less cooperative in such interventions [30].

For example, a study done on one adolescent family-based intervention showed that correct weight perception is a major predictor of treatment initiation [31]. However, having a correct perception for weight status alone is not enough. Owing to the fact that some parents may be insufficiently motivated or don't have enough parenting skills, they have a high chance of not succeeding in their efforts and even making things worse by adopting an extremely strict, over controlling diet leading to counter effects and increase in future BMI [32]. Therefore, efforts should be also made to motivate the parents and let them develop appropriate parenting skills in order to efficiently manage their child's overweight in family-based interventions [33-34].

STUDY LIMITATIONS

Our study main limitation was the sample size. A bigger sample size would help to increase the power of the study and maybe increase the chances of finding a positive correlation among the other parameters. Moreover, our study included only high BMI children with no control group (normal weight children) to whom we can compare the results and correlations of the high BMI group.

Therefore, further studies with a control group are needed for better analysis and more accurate correlations. Also including both variations (underestimation and overestimation) instead one would be more helpful in the future. Furthermore, most of the participants were from Beirut since most of our interviews were conducted in Beirut, and thus the results obtained do not represent the whole Lebanese population. Moreover, the usage of the global WHO growth chart may cause some divergence of results compared to results obtained according to a local Lebanese growth chart, so future local-validated growth charts should be generated and used.

Finally, almost all of the data were self-reported by parents thus there is higher chance of bias or not giving accurate information even after making sure that they understood well the goal behind the study and the meaning of each question in the survey. In addition, our study is a cross sectional study therefore no causal inference could be made.

STUDY PERSPECTIVES

Further researches, preferably with larger sample size and in various Lebanese regions, are needed to find a correlation between the increased risk of underestimation of childhood weight among Lebanese parents and the different contributing factors. Recognition of these factors would help identify strategies to correct parents' perception towards overweight/obesity in the purpose of obesity prevention. Since it is difficult to manage these factors without a parent or caregiver support, it would be more valuable to address parental misperception and mainly underestimation of childhood weight because a shared correct perception is the key to a better communication and cooperation between parents and healthcare workers. When addressing the misperception factor, efforts should be done on studying the differences between the group of parents who correctly perceive their child weight and the group of parents who don't, in order to better identify the factors that contribute to the misperception and hence correct it in the ultimate purpose of better cooperation between parents and health care professionals whom treating their children obesity.

CONCLUSION

In a nut shell, although the abnormal health status of a child (overweight or obese) could be studied in accordance to several factors, our study had showed the fact that most of the parents (with 76 % of the participating parents) don't actually know the exact weight/health status of their child when compared to the real

BMI is a significant factor that can be built on when approaching childhood obesity and overweight, and analyzing where is the problem in order to establish future plans and strategies. Factors like parents' level of education and type of schools which children are enrolled in showed significant relation with the estimation of weight by the parents meaning that these factors as well as others are potential backgrounds for either motivating the parents to adopt when affecting the estimation process in a good way, and to abandon when affecting it badly. Also, it may be beneficial to highlight on these parameters with individualized approach meaning that each set of parents with a specific strategy that exclusively fit these parents and may not work with others.

Due to the huge importance of this topic and its multi impact effects on the child, parents, and society, there would be a need to establish a national campaign, workshops, documentation, and follow up of how much affected children we have in the Lebanese society, how we are progressing with them as a healthcare system and parents, and how we can improve our methods, approaches, and policies until we get the results we seek in decreasing the incidence of obesity in childhood in the future, and controlling the current cases we have in the society.

DECLARATION OF CONFLICTING INTEREST

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REFERENCES

1. Nasreddine L, Naja F, Akl C, Chamieh MC, Karam S, Sibai AM, et al. Dietary, lifestyle and socio-economic correlates of overweight, obesity and central adiposity in Lebanese children and adolescents. Nutrients. 2014;6:1038-1062.

2. Wang Y, Lobstein T. Worldwide trends in childhood overweight and obesity. Int J Pediatr Obes. 2006;1:11-25.

3. Robinson E, Sutin RA. Parents' perceptions of their children as overweight and children's weight concerns and weight gain. Psychol Sci. 2017;28:320-329.

4. Nemecek D, Sebelefsky C, Woditschka A, Voitl P. Overweight in children and its perception by parents: Cross-sectional observation in a general pediatric outpatient clinic. BMC Pediatr. 2017;17:1-10.

5. Manios Y, Kondaki K, Kourlaba G, Vasilopoulou E, Grammatikaki E. Maternal perceptions of their child's weight status: The GENESIS study. Public Health Nutr. 2009; 12:1099-1105.

6. Regber S, Novak M, Eiben G, Bammann K, De Henauw S, Fernandez-Alvira JM, et al. Parental perceptions of and concerns about child's body weight in eight European countries--the IDEFICS study. Int J Obes. 2013;8:118–29.

7. Hudson E, McGloin A, McConnon A. Parental weight (mis) perceptions: Factors influencing parents' ability to correctly categorize their child's weight status. Matern Child Health J. 2012;16:1801-1809.

8. Eckstein KC, Mikhail LM, Ariza AJ, Thomson JS, Millard SC, Binns HJ. Pediatric Practice Research Group. Parents' perceptions of their child's weight and health. Pediatrics. 2006;117:681-690.

9. He M, Evans A. Are parents aware that their children are overweight or obese? Do they care?. Can Fam Physician. 2007;53:1493149-9.

10. Jain A, Sherman SN, Chamberlin LA, Carter Y, Powers SW, Whitaker RC. Why don't low-income mothers worry about their preschoolers being overweight? Pediatrics. 2001;107:1138-1146.

11. Gerards SM, Dagnelie PC, Jansen MW, De Vries NK, Kremers SP. Barriers to successful recruitment of parents of overweight children for an obesity prevention intervention: A qualitative study among youth health care professionals. BMC Fam Pract. 2012;13:37-10.

12. Wang Y, Lim H. The global childhood obesity epidemic and the association between socio-economic status and childhood obesity. Int Rev Psychiatry. 2012;24:176-188.

13. Dinsa G, Goryakin Y, Fumagillin E, Suhrcke M. Obesity and socioeconomic status in developing countries: A systematic review. Obes Rev. 2012;13:1067-1079.

14. Mirmiran P, Sherafat KR, Jalali FS, Azizi F. Childhood obesity in the Middle East: A review. East Mediterr Health J. 2010;16: 1009-1017.

15. World Health Organization, Report of the Commission on Ending Childhood Obesity. Implementation Plan: Executive Summary. Geneva: 2017(WHO/NMH/PND/ECHO/17.1). License: CC BY-NC-SA 3.0 IGO.

16. Baughcum AE, Chamberlin LA, Deeks CM, Powers SW, Whitaker RC. Maternal perceptions of overweight preschool children. Pediatrics. 2000; 106:1380-1386.

17. Nasreddine L, Mehio-Sibai A, Mrayati M, Adra N, Hwalla N. Adolescent obesity in Syria: Prevalence and associated factors. Child Care Health Dev. 2010;36: 404-413.

18. Mushtaq MU, Gull S, Shahid U, Shafique MM, Abdullah HM, Shad MA, Siddiqui AM. Family-based factors associated with overweight and obesity among Pakistani primary school children. BMC Pediatr. 2011;11:114.

19. De Hoog ML, Stronks K, Van Eijsden M, Gemke RJ, Vrijkotte TG. Ethnic differences in maternal underestimation of offspring's weight: The ABCD study. Int J Obes. 2012;36:53-60.

20. Araújo C, Toral N, Silva AC, Velásquez-Melendez G, Dias AJ. Nutritional status of adolescents and its relation with socio-demographics variables: National adolescent school-based health survey. Cien & Saude Colet. 2010;15:3077-3084.

21. Malta DC, de Andreazzi MA, Oliveira-Campos M, de Moura L, Crespo CD, da Silva Junior JB, et al. Trend of the risk and protective factors of chronic diseases in adolescents, national adolescent school-based health survey. Rev Bras Epidemiol. 2014;17:77-91.

22. Taylor RW, Williams SM, Dawson AM, Haszard JJ, Brown DA. Parental motivation to change body weight in young overweight children. Public Health Nutr. 2015;18:1807-1814.

23. Popkin BM, Adair LS, Ng SW. Global nutrition transition and the pandemic of obesity in developing countries. Nutr Rev. 2012;70:3-21.

24. Gurzkowska B, Grajda A, Kułaga Z, Napieralska E, Litwin M. Distribution of body mass index categories among Polish children and adolescents from rural and urban areas. Med Wieku Rozwoj. 2011;15:250-257.

25. Wolnicka K, Jarosz M, Jaczewska-Schuetz J, Taraszewska AM. Differences in the prevalence of overweight, obesity and underweight among children from primary schools in rural and urban areas. Ann Agric Environ Med. 2016;23:341-344.

26. Boutelle K, Fulkerson JA, Neumark-Sztainer D, Story M. Mothers' perceptions of their adolescents' weight status: Are they accurate? Obes Res. 2004;12:1754-1757.

27. Maynard LM, Galuska DA, Blanck HM, Serdula MK. Maternal perceptions of weight status of children. Pediatrics. 2003;111:1226-1231.

28. Chaparro MP, Langellier BA, Kim LP, Whaley SE. Predictors of accurate maternal perception of their preschool child's weight status among Hispanic WIC participants. Obesity. 2011;19:2026-2030.

29. Mamun AA, McDermott BM, O'Callaghan MJ, Najman JM, Williams GM. Predictors of maternal misclassifications of their offspring's weight status: a longitudinal study. Int J Obes. 2008;32:48-54.

30. Lundahl A, Kidwell KM, Nelson TD. Parental underestimates of child weight: A meta-analysis. Pediatrics. 2014;133:e689-e703.

31. Warschburger P, Kroller K. Childhood overweight and obesity: Maternal perceptions of the time for engaging in child weight management. BMC Public Health. 2012;12:295-310.

32. Dhingra A, Brennan L, Walkley J. Predicting treatment initiation in a family-based adolescent overweight and obesity intervention. Obesity. 2011;19:1307-1310.

33. Gubbels JS, Kremers SP, Stafleu A, de Vries SI, Goldbohm RA, Dagnelie PC, et al. Association between parenting practices and children's dietary intake, activity behavior and development of body mass index: The KOALA birth cohort study. Int J Beh Nutr Phys Act. 2011;8:18-20.

34. West F, Sanders MR, Cleghorn GJ, Davies PS. Randomized clinical trial of a family-based lifestyle intervention for childhood obesity involving parents as the exclusive agents of change. Behav Res Ther. 2010;48:1170-1179.