Palestinian Medical and Pharmaceutical Journal (PMPJ). 2023; 8(3): 215-220

Physical Activity Among Down Syndrome Children in Amman, Jordan

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Received: (22/9/2021), Accepted: (15/8/2022). DOI: 10.59049/2790-0231.1243

Abstract

Down syndrome (DS) is a disability that can limit productivity, especially when paired with nutritional issues. Malnutrition, measured by anthropometric factors and micronutrient deficit, is far more common in children with DS than healthy controls. In Jordan, there are no studies on the dietary status of people with Down syndrome. This study looked at children with Down syndrome's nutritional and energy consumption. A cross-sectional study of 100 boys and girls aged 8 to 18 was conducted. The participants were separated into ages 8-12 and 13–18. Body weight, height, and calculated BMI were all measured anthropometrically. To assess daily nutritional intake, three 24-hour recalls were performed. The participants' measurements were the study's average weight and height of 39.5 11 kg and 126.00 0.1 cm. The mean body fat percent BFP was 37.1 9.1. Total caloric, protein, carbohydrate, and fat intakes exceeded the recommended dietary allowance RDA (1241.5, 102.9, 316.1, 36.8), sugar and saturated fat intake exceeded the dietary guidelines DGA, and sodium intake exceeded the UL. When compared to the AI level, the intake of omega 3 and omega 6 was higher than the RDA. Children with Down Syndrome tend to overeat. It causes people to consume excessive energy, protein, and carbohydrates.

Keywords: Down Syndrome, Children, energy intake, nutrients deficiency.

INTRODUCTION

Down's Syndrome affects one in every 800 live births worldwide. However, Jamil estimates that the frequency of Down's Syndrome is one in every 700 live births. Trisomy 21, Translocation, and Mosaicism are three kinds of Down syndrome that differ in mental ability but share the same physical traits, such as short stature, broad facial profile, hyperflexibility, swollen tongue, and obesity. Obesity and being overweight are more common in children with Down's Syndrome. Fifty percent of children with Down's Syndrome are fat or in danger of becoming obese later. This worrisome incidence of obesity development in these children can be attributed to various factors, including genetics, environmental, social, and, most crucially, dietary factors.

Children with Down syndrome need specific diets and formulas to meet their nutritional needs, just like Thompson's normal children. Their needs are met and satisfied by the type of food they eat, their nutritional content, and how often and much they eat. Most children with Down syndrome have some problem with food assimilation, digestion, or absorption, which makes their eating habits more important than Franco's normal children. Diabetes is a common disease that almost all children with Down syndrome develop after a certain age. Babies with Down Syndrome suffer from constipation, which results from irregular muscle tone, and they also have structural abnormalities of the gut, which in turn require surgical intervention. Conditions like these require supervised dietary restrictions and advice (Alwhabi et al ., 2022).

Recent concerns for children with Down syndrome are their tendency to become obese later in life. According to Ogden, about 17.1 percent of children in the United States are obese. Some studies show that the number of obese children with Down syndrome is approaching Cohen's national trend. However, the obesity rate may be higher than the general population; another study found that 30 and 50 percent of children with Harris Down syndrome are obese. Fonesca found that children with Down syndrome were at an increased risk of developing Type 2 diabetes because they were overweight and had a large amount in their stomachs. One of the important factors contributing to childhood obesity is these children's lifestyle and eating habits. The foods they eat daily play a key role in the growth and trend of their obesity

children with Down syndrome have a different, rather slow, growth spurt compared to others. This study focuses on children with Down's Syndrome (DS) and how their eating choices affect their health (Pitetti et al., 2013).

Malnutrition frequently increases among children with DS and increases with age and poor economic status, as revealed by micronutrient deficiency and anthropometric measurements (Groce *et al*., 2014). Down syndrome patients are suggested to have poor nutrition compared to non-disabled children and are more susceptible to poor nutritional care (Abdallah *et al*., 2007). Feeding habits assessment for children with Down syndrome is considered necessary, as any abnormal development may affect their food intake. Decreased food intake due to poor diet or feeding problems will lead to decreased fat and muscle mass or poor growth. At the same time, overeating and low physical activity will result in overnutrition status (Seiverling *et al*., 2011). About 20-50% of normal children and 70-89% of children with special needs suffer from feeding difficulties (Benjasuwantep *et al*., 2013). These feeding problems vary from food preferences to severe problems like food dysphagia and rejection (Field *et al*., 2003). Moreover, bad food habits are associated with wrong choices of food, food intolerance, or malabsorption (Mazurek and Wyka, 2015). Also, Osaili et al. (2019) repeated that unsuitable parental feeding practices may delay the development of feeding skills which could be a consequence of an issue with swallowing, self-feeding, and chewing related to low oral muscle tone, small midface and oral cavity.

Due to difficulties in assessing diet, there is insufficient data on what children with Down syndrome eat. Difficulties with awareness, memory, and connection further complicate nutritional assessment practices for persons with disabilities. Several studies of children with Down syndrome have used different approaches to nutritional assessment (Grammatikopoulou et al. (2008); Marín et al. (2011); Nordstrøm et al. (2015). In most of these studies, parents answered questionnaires rather than young children with Down syndrome (Bathgate et al., 2017).

Appropriate assessment methods, early diagnosis, and timely proper intervention/treatment is the key to managing life quality of life of a patient with Down's Syndrome (Kaushal & Dhagat, 2016). Therefore, the assessment of children's food and energy intake and nutritional issues is worthy of study. There are no scientific studies on nutrition and energy intake in children with DS Amman. Therefore, this study aimed to provide scientific information on the obesity and overweight nutritional status of children with DS in Amman, with the following specific objectives:

METHODS

Study Design and Setting_A cross-sectional study of 100 children with DS was conducted in Amman, the capital of Jordan, with the approval of the Jordan University Ethics Committee, from May 2020 to November Of 2020. Among group ages between (8-12) and (13-18) years old selected from different Down Syndrome centers.

Study Sample_The sample consisted of girls and boys with Down's Syndrome, aged 8-18. Subjects were recruited through schools that provided education to children with mental disabilities. All participants lived with their families and were not on medication or hormonal therapy. All parents knew the study's objectives and gave their written consent before participating.

Ethical Considerations__The research committee approved this study at the Faculty of Agriculture and the Deanship of Scientific Research and International Review Board (IRB).

Data Collection Tools

Anthropometric Measurements_Anthropometric measurements were performed early in the morning. Body weight (BW) was measured with an accuracy of 0.1 kg using a portable digital scale (Seca diva 788). Stature was measured to the nearest cm with a portable stadiometer (LEICESTER PORTABLE HEIGHT MEASURE TANITA HR 001), with subjects standing barefoot. The percentage of body fat (%BFP) was estimated.

(1.20 x BMI) + (0.23 x Age) - 16.2 = Body Fat Percentage.

Statistical analyses Independent samples t-tests were performed between the age groups, and p-values less than 0.05 were considered significant. Values (boy/girl), (differ-

ent age group) are means ± SD. Data were analyzed using one-way ANOVA. The Tukey HSD ("honestly significant difference" or "honestly significant difference") test is a statistical tool used to determine if the relationship between two sets of data is statistically significant P <0.05. Data collected were analyzed using SPSS for Windows verse 16.

RESULTS

Anthropometrics Measurements The mean weight and height of the study participant were 39.5 ± 11 kg and 126.00 ± 0.1 cm, respectively. The mean body fat percent (BFP) was 37.1 ± 9.1. The mean body fat mass was 21.27 ± 8.99 kg (Table 1).

Table (1): Participants' anthropometric measurements (n = 100).

Characteristics	
Anthropometrics	(Mean ±SD*)
Height (cm)	126±0.1
Weight (kg)	39.5±11
Body fat percent	37.1±9.1

* SD, standard deviation

Age, Gender, and Body Mass Index Characteristics The present study was carried out on 100 participants. The studied participants' ages were divided into two main age groups; the first ranged between 8 to 12 years, with (61%) of total study participants, while the other ranged between 13 to 18 years, with (39%) of total study participants. The vast majority (69%) of the participants were boys, while (31%) of the participants were girls. Two- third (about 73%) of the participants were normal weight, while less than one-third (21%) were overweight (Table 2).

Table (2): Participants' age, gender, and body mass index characteristics (n = 100).

Characteristics	
Age (years)	(%)
(8-12)	61
(13-18)	39
Gender	
boys	69
girls	31
BMI	
Underweight	1
Normal	73
Overweight	21
Obese	5

** BMI, body mass index.

Dietary Intake The mean differences showed that total calories, protein, carbohydrate, and fat intake were higher than the RDA (1241.5, 102.9, 316.1, 36.8), respectively, while sugar and saturated fat intake were higher than the DGA (100.9, 10.4) respectively, and the sodium intake was higher than UL (4116.5). The mean differences to compare between a boy, girl, and RDA showed that total calories, protein, carbohydrate, fat, sugar, and saturated fat intake were higher than the RDA (P≤0.05), with no significant differences between both groups (Table 3).

Table (3): Macronutrient 3 days mean intakes and the mean difference compared to the recommended daily allowance (RDA) (boys/ girls).

Variable	Boys	Girls	RDA
Calories (kcal)	2800.9 ± 4338.8 [ab]	3680.2 ± 6697.5 [a]	2200.0 ± 0.0 [b]
Protein (g)	106.6 ± 124.4	232.1 ± 720.8	42.9 ± 7.7
Carbohydrate (g)	451.0 ± 864.0 [a]	435.1 ± 667.1 [ab]	130.0 ± 0.0 [b]
Fiber (g)	42.8 ± 110.4	29.5 ± 89.4	26.9 ± 2.6
Sugar (g)	110.4 ± 235.5 [a]	129.1 ± 251.8 [a]	15.5 ± 4.5 [b]
Fat (g)	64.2 ± 56.4 [ab]	114.7 ± 224.5 [a]	44.0 ± 8.1[b]
Saturated fat (g)	23.7 ± 16.5 [ab]	30.2 ± 35.5 [a]	15.5 ± 4.5 [b]
Omega 3 (g)	0.3 ± 0.3 [b]	0.5 ± 1.2 [b]	1.3 ± 0.2 [a]
Omega 6 (g)	1.9 ± 1.3 [b]	2.3 ± 3.4 [b]	13.3 ± 2.2 [a]

DISCUSSION

Children with Down's Syndrome do not differ significantly from their unaffected siblings regarding physical activity. However, children without Down's Syndrome are more active than those with Down's Syndrome (Pitetti et al., 2013).

In the study group, normal weight is high, with 73 percent of participants normal and 21

percent overweight. Children are more likely to consume healthy foods (Rueda Revilla et al., 2020) as they rely on their parents' food supply and biased opinions on food consumption (Savage et al., 2007). Low cholesterol and fat intake in children can also be explained by advocating parental efforts to limit food intake, a practice reported to occur among parents of DS children (O'Neill et al., 2005). Compared to healthy people, participants with Down syndrome are delayed in physical development and characterized by greater body mass and height abnormalities. The common growth retardation or slowdown in DS is one of the clinical symptoms.

In light of concern about macronutrient intake, our study revealed that the overall daily protein, carbohydrate, and total fat intake of Down syndrome participants were significantly higher than that of the RDA. An increase in fiber intake is needed for almost all subjects, particularly for Down syndrome, as they are susceptible to constipation because of overall low tone followed by a lack of fiber and fluid in the diet (Cloud, 2008).

The World Health Organization (WHO)(2020) defines physical activity as any physical movement generated by muscles and energy consumption. Physical, cognitive (Biddle & Asare, 2011), and psychological health benefits are well documented for physical activity. However, most DS children do not practice physical activity, as recommended by their doctors, and are unlikely to participate in more than one sport (Barr & Shields, 2011; Lyons,2015). According to a study conducted in the Kingdom of Saudi Arabia (KSA), compared to non-DS children, DS children exhibit sedentary behavior and lower engagement in recommended levels of physical activity (Alhusaini et al., 2017). In addition, these authors found that children aged 8 to 12 with DS had a higher body mass index (BMI) and a higher level of physical inactivity than the control group in the study (Alhusaini et al., 2017).

While most contributors expressed tremendous perceptions of their children's bodily activity, others expressed terrible perceptions of it. Most mothers noticed their teens as naturally energetic and agreed on the significance of bodily undertaking and its health advantages for their youth with DS. It was noted that the aging of children with

DS limits their physical exertion. This finding is harmonious with other studies showing that children with DS became less active as they age (Barr & Shields, 2011; Downs et al., 2013; McGarty & Melville, 2018). This drop in the position of physical exertion with aging may be due to increased body weight and musculoskeletal problems that are common among children with DS as they get age (Downs et al., 2013; Esbensen, 2010). Although physical conditioning is important for children of all periods, matters in the current study reported that their children had limited engagement in academic physical conditioning. Thus, regular engagement and monitoring for children with DS as they age is important to maintain their fitness and strength. For children with DS, as they get older is pivotal to maintain their fitness and muscle strength

CONCLUSION

In conclusion, in this study, the percentage of children with Down syndrome and overweight and obese nutritional status is alarming. Most children with Down syndrome tend not to consume the recommended energy, nutrients, and fiber intake. Therefore, efforts to improve the condition must be made. Increased focus on nutritional measures is important for the health and well-being of children with Down syndrome. Specific clinical features of Down syndrome have nutritional relevance and need to be addressed systematically. Both low and excessive weight gain is a concern for many children with Down syndrome aged 4–5 years and above. This concern calls for early prevention to avoid later comorbidities. The switch between preventing the risk of undernutrition in the child's first year of life and obesity in later life is a challenge to treatment. A need exists for more research on nutritional aspects in preventing and treating obesity in Down syndrome.

Ethics approval and consent to participate: All participants provided written informed consent for participating in this study. The Scientific Research Committee and the Institutional Review Board at the University of Jordan approved the study protocol.

Consent for publication: the authors permit the Publisher to publish the Work.

Availability of data and materials: it is available with the corresponding author

Author's contribution AA: revise the manuscript, RS: Wrote the manuscript and collected the data, HG: supervised the manuscript

Acknowledgment

Appreciation is a must for Jordan University and the department of Scientific Research for making this research possible. Furthermore, deep gratitude is forwarded to all the study participants who were very cooperative and generous in sharing their information for the sake of the investigation.

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