

Trends in Body Mass Index and Obesity Prevalence among School Going Students with Down Syndrome in Islamabad and Rawalpindi

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ABSTRACT

Introduction: Down syndrome is present in every 1 in 700 births, associated with developmental disability and comorbidities, like obesity which significantly contributes to morbidity and mortality in these children.

Objective: To identify the trends in body mass index and prevalence of obesity in school going down syndromes.

Methodology: A descriptive cross-sectional survey conducted at special children's schools in Islamabad and Rawalpindi. A questionnaire was designed after literature search and was filled by the parents of the selected candidates according to inclusion criteria i.e., school going down syndromes and residents of Islamabad and Rawalpindi, in an interactive counselling session conducted by authors in collaboration with pediatrician, with parents at respective schools of their child, keeping the questionnaire anonymous. After data collection it was entered in SPSS v25 for statistical analysis in terms of frequencies and percentages.

Results: Our survey included 44 candidates in which majority was between the age group 11 years to 20 years i.e., 52% (n=23) and 27% (n=12) were below 10 years. This survey showed that 95% (n=42) of our selected candidates have Normal BMI while 4.5% (n=2) of our candidates fall in Overweight (High BMI) category.

Conclusion: Most of our selected Down syndrome individuals are protected from obesity as they indulge in different sports, physical activities, physiotherapy and maintain a balanced diet. It is therefore recommended to emphasize the importance of physical activities, active participation in sports, gymnastics, regular exercises and maintaining a healthy diet plan to avoid obesity in these individuals so that further complications of obesity can be prevented thus improving the quality of life of these individuals.

Keywords: Body Mass Index, Down Syndrome, Obesity

INTRODUCTION

Down syndrome (DS) is the most prevalent chromosomal disorder associated with subnormal intellect and learning disability globally¹. This disorder occurs at a rate of approximately 1/1000 live births². DS occurs due to an additional chromosome i.e., 47 chromosomes instead of 46 chromosomes which are present normally³. According to one research paper, prevalence of DS in Pakistan was found to be 1/300 live births but this study was conducted on a limited number of individuals as larger study population is required to calculate national prevalence rate of a disease⁴. Individuals with DS suffer from multiple health related problems that affect their quality of life. Common diseases include congenital heart defects, gut related issues and pulmonary diseases⁵. Other health related conditions include bone disorders, low thyroid hormone level and childhood obesity. Research has shown that prevalence of obesity in people with DS is more than the general population. Despite the fact that there is a high rate of obesity in the general population, there is not much data about the prevalence of obesity in children with DS across the world⁶. Obesity is an emerging public health concern both in developed and underdeveloped nations. Incidence of obesity is rising worldwide and it can predispose an individual to complications like heart diseases, pulmonary problems, type 2 diabetes mellitus, bone and joint disorders. These co morbidities can have a negative impact on the daily life activities of an individual and can play a significant role in reducing the life span⁷. Estimated prevalence of obesity in general childhood population is 5% and around 12% in the adult age group⁸. Various factors are responsible for causing obesity in these individuals like genetics, socioeconomic and eating practices. Dietary practice is one significant factor for determining nutritional status of any child and it is of utmost value in determining the risk of obesity in children with DS. Balanced diet and adequate physical activity can help prevent the risk of gaining weight in these children⁹. Other key factors that are identified for causing increased weight gain in DS are slow basal metabolic rate, hypothyroidism and reduced tone of

muscles. Anthropometry is an important tool for the assessment of nutritional status of individuals with DS. It is therefore emphasized that more research should be conducted to collect data regarding the nutritional status of children with DS so that suggestions should be given for improvement in the present health care services for them¹⁰. Increased ratio of stunted growth and obesity in DS highlights the importance of nutritious diet and healthy dietary practices in these individuals¹¹. Appropriate assessment of growth parameters of young individuals with DS is utmost necessary for the prevention and recognition of multiple health related issues. Body mass index (BMI) is an important indicator for assessing nutritional status in any age group¹². Hatch Stein et al have found Center for disease control (CDC) BMI growth charts for DS individuals as a useful tool for early recognition of obesity¹³. The national health care system of our country is not well regulated and lags behind in providing adequate services and facilities for individuals with disabilities and special needs. Pakistan is a nation with high incidence of individuals with learning disabilities and DS is one of them¹⁴.

The aim of this study is to identify the trends in body mass index and the prevalence of obesity in school going DS students. As the data regarding body mass index of individuals with DS in Pakistan is limited so this study will help in the better management of these cases, thus improving their quality of life and increasing their life span.

To date there have been no previous study about prevalence of obesity in children and young adults with DS in Pakistan.

MATERIALS AND METHODS

This is a descriptive cross sectional study conducted at Special children Bahria college, Islamabad and Sedum Special Children school, Rawalpindi from February to March 2021. The data was collected randomly from 44 students (23 males and 21 females) having DS, who were studying in the above mentioned institutes between the ages of 5-32 years.

Inclusion Criteria: School going students with DS.

Exclusion Criteria: Major organ system illness, unstable cardiac disease, other chromosomal disorders.

Anthropometric measures i.e., height and weight of these individuals were measured using standard techniques. Weight was measured in kilograms on an electronic weighing scale and height was measured in centimeters using standard techniques by trained medical staff and was plotted on CDC (Center for disease control) growth charts specific for DS individuals aged 2-20 years and WHO categories were used for individuals above 20 years of age.

A questionnaire was also designed after literature search and was filled by the parents of selected candidates in an interactive counselling session by the authors in collaboration with pediatrician regarding the physical activity, participation in sports, physiotherapy and dietary practices of these individuals keeping the questionnaire anonymous.

After data collection, it was entered in SPSS version 25 for statistical analysis in terms of frequencies and percentages and unpaired T test was used for comparing variables. Percentage calculations were performed for determining the rate of prevalence of overweight and obesity in individuals with DS.

BMI was calculated by the formula, **BMI = (kg/m²)**

Overweight was defined as BMI between +2 to +3SD above mean.

Normal weight was defined as BMI between -1SD to +2SD above mean

Underweight was defined as BMI less than -3SD below mean.

RESULTS

Our study sample included 44 school going DS students, amongst them 23(52%) were male and 21(48 %) were female as shown in Table I. Mean age of the study population was 15.72 ± 7.6 years. Average age of male students was 16.7 ± 7.8 years and that of female students was 14.6 ± 7.4 years. Most of the students were between age 11-20 years i.e., 52% (n=23) and 27% (n=12) were below 10 years.

As shown in Table II mean BMI of the study population was 20.6 ± 5.8. Mean BMI of males was 20.4 ± 5.4 and that of females was 20.8 ± 6.4.

None of the subject in our study population was found to be obese. Amongst 44 participants 4.5% (n=2) were overweight, 95% (n=42) were normal weight. None was underweight. Both overweight individuals were males.

Table 1: Distribution of Gender of Subjects (n=44)

Parameter	Male	Female	Total
Sex	23 (52%)	21 (48%)	44
Age (5-32 years)	16.7 ± 7.8	14.6 ± 7.4	15.72 ± 7.6

Table 2: Percentage of BMI percentile in both sexes

Parameter	Male	Female	Total
BMI (kg/m ²)	20.4 ± 5.4	20.8 ± 6.4	20.6 ± 5.8
Underweight (≤ -3 SD)	0	0	0
Normal (>-3 SD to <+2 SD)	23 (52%)	19 (43%)	42 (95%)
Overweight (≥+2 to <+3SD)	0	2 (4.5%)	2 (4.5%)
Obese (≥+3 SD)	0	0	0

Table 3: Weight Percentiles of Study Population

Parameter	Male	Female	Total
Weight (kg)	42.4 ± 19.7	38.2 ± 18.9	40.4 ± 19.2 (kg)
Underweight = ≤ -3 SD	6 (13%)	3 (6.8%)	9 (20.4%)
Normal (>-3 SD to <+2 SD)	16 (36%)	18 (40.9%)	34 (77%)
Overweight (≥+2 to <+3SD)	1 (2.2%)	0	1 (2.2%)
Obese (≥+3 SD)	0	0	0

Mean weight of females was 38.2 ± (18.9) kg and that of males was 42.4 ± (19.7) kg as shown in Table III

Mean height of females was 131.5 (± 16.8) cm and that of males was 140.3 (± 16.4) cm as shown in Table IV

Table 4: Height Percentiles of Study Population

Parameter	Male	Female	Total
Height (cm)	140.3 ± 16.4	131.5 ± 16.8	136.1 ± 17
Short stature= ≤ -3 SD	5 (11%)	1 (2.2%)	6 (13%)
Normal stature= (>-3 SD to <+2 SD)	17 (38.6%)	20 (45%)	37 (84%)
Tall stature= ≥ 3SD	1(2.2)	0	1 (2.2)

DISCUSSION

Our study has shown that there is a very low prevalence of overweight and obesity in children and young adults with DS mostly due to healthy life style and indulging in different sports, physiotherapies and maintaining a balanced diet. Panneer Selvi G et al research was constituent with our findings which showed only 2% males with DS in India falling in the category of obesity. They considered low prevalence of obesity in their study population due to regular physical activities and participation in gymnastics¹⁵. Myrelid et al conducted a study of 354 DS participants aged 2-18 years and none of them was found to be obese¹⁶. However, Bandini et al stated that 33-35% DS individuals are overweight, Prevalence of obesity was 25% and 8% in males and females respectively¹⁷. In another case study conducted on 34 DS children in Italy, prevalence of obesity was found to be 15%¹⁸. In another study conducted on Oregon Children with DS, 23% were found to be overweight and 20.6% to be obese¹⁹. Artioli et al study observation concluded that 35.5% DS children were found to be obese, 17.7% overweight and 51% children had normal weight according to WHO z score chart⁶. Gonzalez et al have highlighted beneficial effect of physical activities in improving BMI and decreasing risk of overweight and obesity in DS individuals²⁰. Pikora et al stated that prevalence of obesity in their research population of young adults with DS was quite high i.e 57.4%²¹. Chaudhry reported obesity in more than fifty percent of individuals with DS. This increased rate of obesity was mainly attributed to dietary practices in DS individuals⁹. Martina –Espinosa et al reported that 23-70% individuals with DS are suffering from weight gain and obesity. Main determinants of obesity were identified as limited physical activity, consumption of unhealthy diet, intake of certain medicines and limited social support services¹⁰. Haddad et al also reported a high prevalence of obesity in young individuals with DS aged 16-31 years living in Australia⁵. Osaili et al found that approximately 10.3% children of DS in United Arab Emirates have excessive weight gain mainly due to decreased rate of metabolism, forceful eating due to swallowing and feeding issues¹¹, decreased tone of body muscle. Hatch stein et al reported that 30-50% DS children are obese¹³.

CONCLUSION

Most of our selected DS individuals are protected from obesity as they indulge in different sports, physical activities, physiotherapy and maintain a balanced diet. It is therefore recommended to emphasize the importance of physical activities, active participation in sports, gymnastics, regular exercises and maintaining a healthy diet plan to avoid obesity in these individuals so that further complications of obesity can be prevented thus improving the quality of life of these individuals.

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