## Cardiac Functions & Lipid Profile in Obese Children & Adolescents

Dr .T. Ajith Kumar[1], Dr. Vineeta Pande[2], Dr. Sharad Agarkhedkar[3], Dr. Mayank Surana[1]

[1]Resident, [2]Professor, [3]Professor & Head, Department of Paediatrics, Dr. D. Y. Patil Vidyapeeth's (DPU) Dr. D. Y. Patil Medical College & Hospital, Pune- 411018

Corresponding Author : Dr. Vineeta Pande

E-mail : ajithkumar127@gmail.com

Address : Department of Paediatrics, Dr. D. Y. Patil Vidyapeeth's (DPU) Dr. D. Y. Patil Medical College & Hospital, Pune- 411018

**Abstract :**

**Background:** Obesity is a disease which results from genetic or lifestyle factors. Such diseases are called Non communicable diseases. The epidemic of obesity among youth is spreading at an alarming rate due to lack of physical activity, dietary habits. The percentage of youths who are at risk of becoming overweight continues to increase. National data indicates that 16% of children aged six to nineteen years are overweight.(1) Considering the high prevalence of obesity among children and adolescents and its associated cardiovascular complications like hypertension, left ventricular hypertrophy, increased left ventricular mass, decreased left ventricular ejection fraction, the present study was planned to assess cardiac functions and lipid profile in obese children and adolescents. Early detection and intervention can help in reducing the complications associated with obesity. **Objective:** Primary objective is to assess cardiac functions and lipid profile in obese children and adolescents. **Methodology:** 100 obese children and adolescents in the age group 6-18 years were taken after excluding obese children with evidence of endocrine disease, malformation syndromes and iatrogenic obesity (drug treatments). **Results:** In the present study 7% subjects were hypertensive while 8% were prehypertensive. 71.43% children with hypertension were performing physical activity for < 30 min in 1-3 days/week while 49.11% normotensive children were performing physical activity for > 30 min per day. 3% obese children were having abnormal LVEF on 2DECHO .All the 3 obese children with abnormal LVEF were having physical activity less than 30 min in 1-3 days /week and the difference was statistically significant. All the three children with abnormal LVEF were hypertensive and the difference was statistically significant. 6% children were having raised serum cholesterol >190mg/dl. Serum triglyceride >150mg/dl was observed in 17% obese children. HDL level <20mg/dl was observed in 7% children while LDL above 130mg/dl was observed in 6% children. The proportion among male and female children was comparable. **Conclusion:** Cardiovascular complications of adulthood in obese children and adolescents may be prevented by early identification and intervention in the form of healthy life style, dietary intake and physical activity.

**Keywords:** Obesity, Cardiac functions, Lipid profile.

**Introduction:**

The problem of overweight and obesity can be seen among children and adolescents of developed as well as developing countries. Previously obesity was exclusively seen in adults, becoming more prevalent with advancing age, however with children's sedentary lifestyles due to a number of factors, over consumption of high-caloric foods, excessive TV viewing during meals, obesity in children is also on the rise. Children with high cholesterol level were found to suffer from increased cholesterol and cardiovascular complications in adulthood.(2) The cardiovascular complications associated with obesity include hypertension, left ventricular hypertrophy, increased left ventricular mass, decreased left ventricular ejection fraction. These children are at high risk for psychological and social adjustment problem, low self-esteem, symptoms of depression and increased suicidal thoughts and attempts. Musculoskeletal symptoms include impaired mobility and fractures. Life style modifications and adequate physical activity play a major role in preventing, controlling obesity and its associated complications.

**Methodology:**

Cross sectional observational study conducted in 100 obese children and adolescents in the age group of 6-18 years attending paediatric OPD of tertiary care hospital from August 2017-August 2019. Obese children with evidence of endocrine disease, malformation syndromes and iatrogenic obesity (drug treatments) were excluded. After obtaining the consent, history was taken, required physical examination and necessary investigations were done as per proforma. Blood pressure was recorded in supine position on three different occasions and compared with IAP BP centile charts.

Anthropometric measurements including weight, height, waist circumference, BMI was done. Lipid profile was assessed with early morning blood samples taken after a minimum of 12 hour fasting. Cardiac functions were assessed by 2D ECHO. All the data collected was entered in MS EXCEL and analysed by using SPSS. Chi square test and ANOVA test was applied to check the statistical association.

**Results:**

**Table 1:** Distribution of study population according to Age groups, Gender & Socioeconomic status

| Character | Age Groups (Years) | | | Gender | | Socioeconomic status | | |
|---|---|---|---|---|---|---|---|---|
| | 6-8 | 9-11 | 12-18 | Boys | Girls | Upper middle class | Upper lower class | Lower middle class |
| Percentage | 29 | 44 | 27 | 57 | 43 | 51 | 31 | 18 |

**Table 2:** Distribution of cases according to physical activity in study group

| Physical activity | | No of cases | Percentage (%) |
|---|---|---|---|
| Daily (n=61) | >30 min | 43 | 43 |
| | <30 min | 18 | 18 |
| 1 – 3 day/ week (n=39) | >30 min | 26 | 26 |
| | <30 min | 13 | 13 |
| **Total** | | 100 | 100 |

**Table 3:** Association between physical activity and blood pressure in study group

| Physical activity | | Blood pressure | | | Total |
|---|---|---|---|---|---|
| | | Hyper tension | Prehyper tension | Normo tension | |
| Daily (n=61) | >30 min | 0 | 1 | 42 | 43 |
| | <30 min | 2 | 4 | 12 | 18 |
| 1 – 3 day /week (n=39) | >30 min | 0 | 0 | 26 | 26 |
| | <30 min | 5 | 3 | 5 | 13 |
| **Total** | | 7 | 8 | 85 | 100 |
| Chi-square = 41.23, P<0.0001 | | | | | |

**Table 4:** Lipid profile distribution of cases according to gender in study group

| Lipid profile | | Male (n=57) | Female (n=43) | Total (n=100) |
|---|---|---|---|---|
| Sr. Cholesterol (mg/dl) | >190 | 4 | 2 | 6 |
| | <190 | 53 | 41 | 94 |
| Sr. Triglyceride (mg/dl) | >150 | 12 | 5 | 17 |
| | <150 | 45 | 38 | 83 |
| HDL (mg/dl) | <20 | 2 | 5 | 7 |
| | >20 | 55 | 38 | 93 |
| LDL (mg/dl) | >130 | 5 | 1 | 6 |
| | <130 | 52 | 42 | 94 |

**Table 5:** 2D ECHO finding distribution of cases in study group

| 2D ECHO finding | No of cases | Percentage |
|---|---|---|
| Abnormal LVEF | 3 | 3 |
| Normal LVEF | 97 | 97 |
| **Total** | 100 | 100.0 |

**Table 6:** Association between blood pressure and 2D ECHO finding in study group

| Blood pressure | 2D ECHO finding | | Total |
|---|---|---|---|
| | Abnormal | Normal | |
| Hypertension | 3 | 4 | 7 |
| Prehypertension | 0 | 8 | 8 |
| Normotension | 0 | 85 | 85 |
| **Total** | 3 | 97 | 100 |
| Chi-square = 41.09, P<0.0001 | | | |

**Table 7:** Association between physical activity and 2D ECHO finding in study group

| Physical activity | | 2D ECHO finding | | Total |
|---|---|---|---|---|
| | | Abnormal | Normal | |
| Daily (n=61) | >30 min | 0 | 43 | 43 |
| | <30 min | 0 | 18 | 18 |
| 1 – 3 day/ week (n=39) | >30 min | 0 | 26 | 26 |
| | <30 min | 3 | 10 | 13 |
| **Total** | | 3 | 97 | 100 |
| Chi-square = 20.7, P<0.0001 | | | | |

**Discussion:**

In the present study it was seen that majority of the children were in the age group of 9-11 years (44%) followed by 6-8 years (29%), 12-14 years (25%) and 15 – 18 years (2%). In Nascimento H[3] study mean age of subjects was 10.8±3.0yrs while in A.M. Zoair et al[4] mean age of obese group was 10.56±2.82yrs.

The present study observed that majority of the obese children were male (57%) followed by female were observed (43%). In the Minakshi B[5] study males were 52% cases and females were 48% cases. LaFrance et al[6] stated that boys' obesity was higher than girls' obesity. In the present study it was observed that 51% children in the study were belonging to upper middle class while 31% were from upper lower class and 18% were from lower middle class. Shabana et al[7] also observed higher prevalence of obesity among Upper Socio Economic class as compared to those among children of Lower Socio Economic Class.

In the present study it was noticed that 43% children were involved in daily physical activity for more than 30min while 26% were doing physical activity 1-3days/week for more than 30min **(discussed in table 2**). Similar results are shown in the study done by S. Kumar et al[8] in Davengere which showed that those with absent physical activity had 2 times more risk of falling in obese group as compared to those who had more physical activity ($p<0.001$). The present study observed that out of total 100 obese children 7% were hypertensive while 8% were pre hypertensive and remaining 85% were normotensive. In the present study it was seen that 71.43% children with hypertension were performing physical activity for <30 min in 1-3 days/week while 49.11% normotensive children were performing physical activity for >30 min per day **(discussed in table 3)**. In this study we observed that 6% children were having raised serum cholesterol >190mg/dl. Serum triglyceride >150mg/dl was observed in 17% obese children. HDL level <20mg/dl was observed in 7% children while LDL above 130mg/dl was observed in 6% children. The proportion among male and female children was comparable. Higher serum cholesterol, serum triglyceride, serum LDL levels are seen in boys while lower serum HDL levels are seen in girls **(discussed in table 4).** Similarly in Minakshi B[5] study 85% cases had TGL levels less than 150 mg/dl and 15% had high or equal to 150mg/dl while 69% of the cases had HDL-C less than 40mg/dl and 31% of the cases had HDL-C more than or equal to 40mg/dl. This was in accordance with Freedman et al[9] and Reinhret et al[10] who found that overweight is strongly related to concentrations of HDL-cholesterol and TG and weakly related to concentrations of LDL-cholesterol; while Kim et al[11] found that all types of lipids were significantly associated with overweight and obesity. Also, Chinali et al[12] stated that obese adolescents had significantly higher total TG and lower high density lipoprotein.

In our study 3% obese children were having abnormal LVEF on 2D ECHO findings while remaining 97% were having normal LVEF (discussed in table 5). Obese adolescents exhibit changes in the left ventricular (LV) mass related to increase in cardiac workload. All the three children with abnormal LVEF on 2D ECHO were hypertensive and the difference was statistically significant **(discussed in table 6)**. In the present study it was seen that all the 3 obese children with abnormal LVEF on 2D ECHO were having physical activity less than 30 min in 1-3 days /week and the difference was statistically significant **(discussed in table 7)**. Antonio Vitarelli et al[13] assessed the presence of early myocardial deformation abnormalities in dyslipidemic children free from other cardiovascular risk factors, using 2-dimensional speckle tracking echocardiography (2DSTE) and 3-dimensional speckle tracking echocardiography (3DSTE).

**Conclusion:**

Cardiac functions were abnormal in 3% of obese children and adolescents. Abnormal LVEF on 2D ECHO finding were associated with less physical activity and Hypertension with statistically significant difference, while no significant association was observed between lipid profile and echo findings among obese children and adolescents. Cardiovascular complications of adulthood in obese children and adolescents may be prevented by early identification and intervention in the form of healthy life style, dietary intake and physical activity.

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