

A COMPARATIVE STUDY TO ASSESS LIPID PROFILE BETWEEN DOWN SYNDROME AND HEALTHY CHILDREN

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Abstract

Background: Down syndrome is the most common syndromic condition associated with children's developmental delay and severe mental retardation. Obesity and insulin resistance, which are common among individuals with DS, are associated with unfavorable (more atherogenic) lipid profiles, characterized by high triglycerides (TGs) and low high-density lipoprotein (HDL) cholesterol. **Aim:** To estimate and compare the concentration of lipid profile (Total cholesterol, Triglyceride, Low-density lipoprotein, High-density lipoprotein, very low-density lipoprotein) in Down syndrome children and with normal healthy children. **Materials and Methods:** This prospective study was conducted in Raja Mirasudhar Hospital, Thanjavur medical college, from Jan 2020 to Dec 2020. The study groups are Down syndrome children attending DEIC for follow-up cases 35 children and normal children attending the outpatient services as control group 35 controls. Down syndrome children with congenital cardiac defects requiring heart surgery, intestinal anomalies and hypothyroid children were excluded. **Result:** Comparing the BMI of above five years, the mean BMI of DS was 15.6 and for normal children was 13.97, a p-value of 0.029, which is statistically significant. The concentration of lipids was evaluated based on sex and age centile charts. For LDL, 33.4 % of DS and 0% of Normal children were above the 90th centile. The groups significantly differ significantly in LDL, HDL, Cholesterol, and Triglyceride percentile. On comparing lipid profile values between DS and healthy children, the mean \pm SD of serum TC, TG, HDL, LDL, and VLDL in DS, respectively, P. values < 0.05, which is statistically significant. **Conclusion:** Down syndrome children have high LDL, VLDL, serum triglyceride and serum cholesterol, and low HDL levels.

INTRODUCTION

Down syndrome is the most common syndromic condition associated with children's developmental delay and severe mental retardation. Every year march 21st is celebrated as World Downs syndrome day. Obesity and insulin resistance, which are common among individuals with DS, is associated with unfavourable (more atherogenic) lipid profiles characterised by high triglycerides (TGs) and low high-density lipoprotein (HDL) cholesterol.^[1] The incidence of Down syndrome in India is approximately 1:825 to 900 live births.^[2] which increases with increasing maternal age. Causes for Obesity in Down Syndrome children are hypothyroidism, decreased resting metabolic rate, increased leptin levels, masticatory dysfunction, short stature and low lean body mass.^[3] Causes For

Abnormal Lipid Profile in Down Syndrome: There are no clear reasons for the abnormal lipid profile in children with Down syndrome. Probable mechanisms are, in chromosome 21 in the region 21q11, a locus has information for Very Low-Density Lipoprotein receptors and is important for controlling lipid metabolism. In Trisomy 21, this control metabolism is altered. Some studies show that Trisomy 21 fetuses in utero have higher cholesterol levels, indicating a genetic predisposition to abnormal lipid values in Down syndrome.^[4]

Managing Down Syndrome children is through regular health supervision from birth and early intervention. Guidelines for regular supervision are to detect Congenital Heart Defects, Hearing Impairment or Loss, Hypothyroidism, Strabismus, Cataracts, Nystagmus, Constipation, Celiac Diseases, Hematologic Disease, Growth and Development,

Obstructive Sleep Apnea, Atlantoaxial Subluxation or Instability, Gynecologic Care, Recurrent Infections, Psychiatric, Behavioral Disorders by regular follow up and detect earlier and to intervene earlier to reduce morbidity.^[5,6]

Blood Cholesterol Screening American Academy of Pediatrics recommends universal cholesterol screening for all children. According to this, Lipid Profile should be checked for all children between 9 and 11 years of age and another screening at 17 and 21 years of age because cholesterol levels may vary after puberty. When the parents or grandparents had premature coronary artery disease or cholesterol > 240mg/dl, screening should be done as early as 2 yrs. For screening, a non-fasting lipid profile was assessed. Some studies showed that a non-fasting lipid profile is the same as a fasting one. But for Down syndrome children, there are no standard blood cholesterol screening guidelines.^[7]

Aim

The study aims to estimate and compare the concentration of lipid profile (Total cholesterol, Triglyceride, Low-density lipoprotein, High-density lipoprotein, very low-density lipoprotein) in Down syndrome children and with normal healthy children.

MATERIALS AND METHODS

This prospective study was conducted in Raja Mirasudhar Hospital, Thanjavur medical college, from Jan 2020 to Dec 2020. The study groups are Down syndrome children attending DEIC for follow-up cases 35 children and normal children attending the outpatient services as control group 35 controls. Informed consent was obtained from the guardians of all the enrolled children. Down syndrome children with congenital cardiac defects requiring heart surgery, intestinal anomalies and hypothyroid children were excluded. Height, weight and BMI of both groups were recorded, and random blood samples were sent for analysing of TC, HDL, LDL, VLDL, S. Cholesterol and TG.

The data were entered in an MS office excel sheet and analysed using SPSS version 16. Continuous data with normal distribution were expressed as mean

with standard deviation. Categorical data were expressed as the frequency with percentage. An unpaired 't' test was used to compare the mean between the two groups. Fisher's exact test was used to compare the frequency between the groups. P<0.05 was considered statistically significant.

RESULTS

Comparing the BMI of the above five years 18 cases and control, the mean BMI of DS was 15.6 and for normal children was 13.97 't' value 2.27 p-value of 0.029, which is statistically significant. The concentration of lipids was evaluated based on sex and age centile charts. For LDL, fourteen children were excluded since there was no data for < 4 years, less than four years old.

Comparing 21 children, 33.4 % of DS and 0% of Normal children were above the 90th centile. For serum cholesterol, on comparing 35 cases 17, % of DS and 0% of normal children were above the 90th centile. For serum Triglyceride, on comparing 35 cases, 88.6% of DS and only 28.6% of normal children were above the 90th centile. For HDL, fourteen children were excluded since there was no data for < 4 years less than four years old. Comparing 21 children, 100% of DS and 14.3% of normal children were below the 10th centile p-values < 0.05, which is statistically significant.

Figure 1: Plasma cholesterol and triglyceride levels in childhood and Adolescence: Means and Percentiles

Table 1: Comparison of BMI between the case and control groups observed in the study

| S. No | Parameter | Case group (n=17) | | Control group (n=17) | | P-value |
|-------|-----------|-------------------|------|----------------------|-----|---------|
| | | Mean | SD | Mean | SD | |
| 1 | BMI | 15.6 | 2.74 | 13.9 | 1.4 | 0.029* |

Table 2: Comparison of LDL, HDL, cholesterol, and triglyceride percentile category between the case and control groups with mean

| | | Case group (n=21) | | Control group (n=21) | | P-value |
|-------------|--------------------------------------|-------------------|------|----------------------|-----|---------|
| | | N | % | N | % | |
| LDL | >90 th - 95 th | 1 | 4.8 | 0 | 0 | 0.004* |
| | >95 th | 6 | 28.6 | 0 | 0 | |
| HDL | <5 th | 20 | 95.2 | 1 | 4.8 | <0.0001 |
| | 5 th - 10 th | 1 | 4.8 | 2 | 9.5 | |
| Cholesterol | >90 th - 95 th | 3 | 8.6 | 0 | 0 | <0.0001 |
| | >95 th | 3 | 8.6 | 0 | 0 | |

| | | | | | | |
|--------------|--------------------------------------|----|------|---|-----|---------|
| Triglyceride | >90 th – 95 th | 9 | 25.7 | 7 | 20 | <0.0001 |
| | >95 th | 22 | 62.9 | 3 | 8.6 | |

Table 3: Comparison of lipid levels in the case groups with respect to gender

| Parameter (in mg/dL) | Case Male (n=16) | | Case female (n=19) | | P-value |
|----------------------|------------------|------|--------------------|------|---------|
| | Mean | SD | Mean | SD | |
| LDL | 118 | 33.5 | 108 | 31.5 | 0.371 |
| VLDL | 37.1 | 13.4 | 38.9 | 9.9 | 0.651 |
| HDL | 27.3 | 4.53 | 28.5 | 7.68 | 0.586 |
| Cholesterol | 166.1 | 20.4 | 164.7 | 27.8 | 0.868 |
| Triglycerides | 143.5 | 47.8 | 130.9 | 43.6 | 0.421 |

On comparing lipid profile values between DS and healthy children, the mean \pm SD of serum TC, TG, HDL, LDL, and VLDL in DS was (165.3 \pm 24.3), (136.6 \pm 45.3), (27.9 \pm 6.4), (112.7 \pm 32.4), (38.1 \pm 11.5) while mean \pm SD of serum TC, TG, HDL, LDL, VLDL in control were (133.5 \pm 20.3) (80.1 \pm 14.8), (47.1 \pm 8.9), (88.9 \pm 15.3), (22.4 \pm 6.3). P. values < 0.05.

DISCUSSION

In this study, of 35 cases, 16 were male, 19 were female, 14 were less than five years, and 17 were above five years. Since only 17 were above 5yrs, the BMI of the above five years group were compared. The mean BMI of cases was 15.6, and for controls, it was a 13.9't' value of 2.27' p-value of 0.029, which is statistically significant.

By plotting lipid values in age and sex centile charts in fig. For LDL, since there was no data for < 4 years and less than four years old, 14 children were excluded. On comparing the rest 21 children, 7 cases were more than the 90th centile, but 0 control were above the 90th centile, hence statistically significant. For HDL, fourteen children were excluded since there was no data for < 4 years less than four years old. On comparing 21 children, all 21 cases were below the 10th centile, but only three controls were below the 10th centile and were statistically significant. On comparing cholesterol.^[6] cases were above the 90th centile, but no one in the control groups was above the 90th centile, which was statistically significant. On comparing triglyceride levels, 31 cases were above the 90th centile, but only ten controls were above the 90th centile, which was statistically significant.

On comparing the lipid profile between the cases and control group mean LDL value of cases was 112mg/dl, and for controls was 88mg/dl, with a 't' value of 3.94 and a p-value of 0.0003, which is a statistical significance. The mean VLDL value of cases was 38.1 mg/dl, and for controls was 22.4, with a 't' value of 7.08 and p-value of 0.0001, which is statistically significant. The mean HDL value of cases was 27.9mg/dl, and for controls was 47mg/dl 't' value of 10.36, a p-value of 0.0001, which is statistically significant. The mean Cholesterol value of cases was 165 mg/dl, and for controls, it was 133mg/dl, with a 't' value of 5.94 and a p-value of 0.0001, which is statistically significant. The Mean Triglyceride value of cases was 136mg/dl, and for controls was 80mg/dl, with the 't' value 7.01' p-value of 0.0001, which is statistically significant.

The Tahira Adelekan et al. study comparing lipid profiles between down syndrome and their siblings also showed that children with DS had higher TG, TC, LDL, and HDL than controls. However, age and gender were not controlled in that study.^[4]

In Salih et al. (2015) study results, the mean \pm SD of serum TC, TG, HDL, and LDL in DS, respectively, were (126.54 \pm 35.6), (104.83 \pm 35.3), (37 \pm 13.5), (76.8 \pm 33.05) while in control were (97.7 \pm 11.4) (83 \pm 10.8), (62.14 \pm 7.6), (21 \pm 10.9), P-values < 0.05. This study confirmed that significantly increased lipids were observed in children with DS compared to non-DS.^[8]

CONCLUSION

Analysing lipid profiles with mean centile charts showed that Down syndrome children have high LDL, serum triglyceride and serum cholesterol levels and low HDL levels. Comparing lipid profiles between Down syndrome and normal healthy children showed that Down syndrome children have more LDL, VLDL, serum triglyceride and serum cholesterol levels and low HDL levels. In our study, Down Syndrome children aged five years and above were found to be more obese than normal children.

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