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Percentile Values of Serum Lipids Profile for Bengali School Going Boys in West Bengal, India

Supriya Kumar Misra
Assistant Professor, Department of Physiology, Saldiha College, PIN- 722173
Bankura, West Bengal, India.

(Corresponding author: Dr. Supriya Kumar Misra)*
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ABSTRACT: Death rate due to cardiovascular disease is increasing in Bengali population in India. Serum lipids are associated to racial, environmental, gender and age specific in a particular community. To assess the dyslipidaemia and cardiovascular disease serum lipids are useful marker. The aim of this study was to assessing the percentile reference data of fasting serum lipids in normal healthy Bengali boys aged between 5 -12 years in West Bengal, India. This present cross-sectional and descriptive study was done on 291 boys in West Bengal aged 5-12 years. The selected subjects were partitioned into four different age groups such as (5-6), (7-8), (9-10) and (11-12) years respectively. From 5th to 95th percentiles values of fasting serum lipids such as serum Total cholesterol, Triglycerides, LDL cholesterol, HDL cholesterol, TC: HDL cholesterol ratio were analysed for four selected age groups of boys. From this study it is noted that the 5th, 10th, 25th, 75th, 90th and 95th fasting serum total cholesterol (TC), high density lipoprotein cholesterol (HDL-C), low density lipoprotein cholesterol (LDL-C) percentiles values were lower level and also higher level triglycerides (TG) when compared to Americans boys in all the selected age groups boys. This difference may be the cause of ethnical variances and environmental related factors like dietary pattern as well as physical inactivity. These percentiles reference data will help to identify and early assessment of cardiovascular disease and dyslipidaemia in Bengali children in future.

Keywords: Boys, Bengali, CAD, Dyslipidaemia, Lipid, Lipid Profile.

INTRODUCTION

Risk factors in early life including abnormal level of blood cholesterol and low density lipoprotein cholesterol (LDL-C) have been exhibited to raise the chance of atherosclerosis and coronary heart disease in later life (Berenson *et al.,* 1998; Baker *et al.,* 2007; Kumar *et al.,* 2021). Different studies in paediatric populations have reported that lower level of HDL cholesterol and elevated level of serum cholesterol, LDL cholesterol along with raised intima-media thickness of carotid artery, an indicator of development of atherosclerosis and cardiovascular disease in later ages (D'Angelo *et al.,* 2015).

Obesity, high body fat percentage, high BMI, hypercholesterolemia, lack of exercise, high calorie containing food consumption, high blood pressure, create ideal conditions for the development of ischemic heart disease (Joshi *et al.,* 2014; Puri *et al.,* 2015; Bansal *et al.,* 2017). To evaluate the cardiovascular disease serum lipids levels are useful indicator. Blood lipids profiles are associated to ethnicity, gender and age in children (Bao *et al.,* 1997; Taheri *et al.,* 2014). Developing countries like India, coronary artery disease and its related determinant such as high body mass index, hypertension and higher level body fat percentage increasing day by day.

For this reason, study of serum lipids of children is important. Percentiles reference data of serum lipids in Bengali boys are not available in present. This important data of serum lipids is very important for early diagnosis and prevention of hypercholesteromia and cardiovascular diseases. We aim to determine of serum lipids percentiles values in the age group of 5 - 12 years healthy male school children Bengali by race.

MATERIALS AND METHODS

Present cross-sectional, descriptive and analytical research work was conducted on 320 normal healthy Bengali male children aged between 5-12 years in different government aided primary and upper primary school of Bankura and Paschim Medinipur district in West Bengal. Among 320 subjects, only 291 subjects were included in this study on the basis of their voluntary agreement. The data collection of this study was conducted and analysed during March 2018 to July 2018. For this research work, head teacher of the participating school and mother of the selected subjects were asked to give written agreement letter for their children to be participated in this study. Human ethical consent was obtained from the Institutional Ethics Committee of the Vidyasagar University, West Bengal before beginning of the study.

Inclusions criteria of the subject:

(i) The participating boys did not have any present and previous history of family related and hereditary cardiovascular disease before selection.

ii) The participating boys would not have any of the chronic disease like asthma, hypothyroidism, nephropathy or endocrine disorder such as diabetes before selection.

Collection of Blood Sample

12hours fasting blood samples were obtained from 291 participated subjects to determine the serum lipids. About 5ml of blood sample was collected from the vein of the left hand of all selected subject and then allowed to clot near about 15 minutes, after that centrifuge and supernatant serum sample than separated and it was stored in a freezer at -20 °C until analysis.

Supernatant serum sample were later analysed for serum total cholesterol, triglycerides, HDL-C and LDL-C. Reagents of the specific test kits (DiaSys, USA) were stored and it is used as per the direction mentioned in the test kits user manual.

Estimation of serum Total Cholesterol (TC), serum triglycerides (TG), high density lipoprotein cholesterol (HDL-C) were conducted according to the methods describe by Richmond (1973), Fossati & Prencipe (1982), Lopes-Virella *et al.* (1977) respectively. The LDL cholesterol level was calculated from the formula of Friedewald *et al.* (1972). The formula is as follows:

$$\text{LDL Cholesterol (LDLC)} = \text{(TC)} - (TG/5) - \text{(HDL-C)}$$

All the statistical data analyses were carried out using the statistical packages SPSS program, (version 20).

RESULTS AND DISCUSSIONS

Serum total cholesterol (TC), triglycerides (TG), high density lipoprotein cholesterol (HDL-C), low density lipoprotein cholesterol (LDL-C), and total cholesterol to HDL-C ratio (TC:HDL-C) at 5th, 10th, 25th, 50th, 75th, 90th and 95th percentiles among four different age groups are presented in Table 1, 2, 3, and 4 respectively. The result from the Table 1 showed that from the lowest (5th) to highest (95th) percentile values of serum TC were 101.80, 192.86; 115.62, 187.50; 125.47, 210.53 and 128.21 219.56 respectively in four different age groups. Among four age groups, 9-10 and 11-12 years had lowest (5th) to highest (95th) percentile values of total cholesterol. We also found an increasing pattern of total cholesterol with advancement age.

From lowest 5th to highest 95th percentiles values for TG were higher in 11-12 years age when compared to others age groups (Table 2). The lower and highest mean values of serum triglycerides were found for elder aged groups i.e. 9-10 and 11-12 years respectively.

The 95th percentile values for HDL-C were higher in 5-6 and 11-12 years age groups (Table 3). The age groups of 5-6 and11-12 years had lowest and highest mean of HDL cholesterol. Selective percentiles values of LDL cholesterol among four different age groups have been presented in Table 4. The result from the Table 4 showed that the mean values of LDL cholesterol had higher in 9-10 years age group of boys when compared to others selected age groups of boys. It is also found from the Table 5 that mean of serum total cholesterol: HDL cholesterol ratios had higher 9-10 years age group. The lowest 5 th to highest 95 th percentiles values of TC: HDL cholesterol ratios were higher in 9-10 years age when compared to others age groups.

Table 1: Selective Percentiles values of total cholesterol (TC) among four different age groups.

Age groups	Number	Mean	SD	Percentile						
				5th	10th	25th	50th	75th	90th	95th
5-6	69	137.09	27.45	101.80	108.85	119.13	130.24	153.63	178.45	192.86
7-8	74	144.23	24.34	115.62	117.12	124.00	140.72	155.40	172.6	187.50
9-10	72	155.18	28.88	125.47	127.82	131.34	145.05	185.19	194.32	210.53
11-12	76	157.13	28.20	128.21	128.81	136.54	147.49	173.24	192.65	219.56

Table 2: Selective percentiles values of triglyceride (TG) among four different age groups

Age groups	Number	Mean	SD	Percentile						
				5th	10th	25th	50th	75th	90th	95th
5-6	69	80.68	32.99	33.07	37.42	52.37	78.86	108.79	125.09	132.44
7-8	74	77.41	32.60	38.87	40.76	49.21	73.99	107.56	119.38	122.20
9-10	72	82.95	33.62	29.13	34.47	58.52	85.02	102.27	129.57	137.29
11-12	76	90.45	34.84	31.21	42.22	65.22	95.53	120.56	134.90	141.56

Table 3: Selective percentiles values of high density lipoprotein cholesterol (HDL-C) among four different age groups.

Age groups	Number	Mean	SD	Percentile						
				5th	10th	25th	50th	75th	90th	95th
5-6	69	35.92	14.29	21.33	24.86	27.49	31.16	39.20	59.00	74.06
7-8	74	39.01	13.60	25.94	26.60	29.80	34.50	43.24	64.40	68.50
9-10	72	38.47	11.57	25.33	26.05	30.36	36.85	41.83	52.00	64.25
11-12	76	40.06	14.08	26.78	27.85	29.49	36.47	43.33	68.50	74.45

Table 4: Selective percentiles values of low density lipoprotein cholesterol (LDL-C) among four different age groups.

Age groups	Number	Mean	SD	Percentile						
				5th	10th	25th	50th	75th	90th	95th
5-6	69	85.03	19.34	55.32	58.62	71.86	82.63	99.63	112.68	119.88
7-8	74	89.74	19.92	61.85	63.66	77.12	86.27	100.16	113.76	130.29
9-10	72	100.11	22.80	70.36	78.82	84.35	93.10	110.49	132.09	147.78
11-12	76	98.98	15.20	80.92	81.62	88.25	95.11	111.20	118.04	122.34

Table 5: Selective percentiles values of TC: HDL-C among four different age groups.

Age groups	Number	Mean	SD	Percentile						
				5^{th}	10^{th}	25^{th}	50^{th}	75^{th}	90^{th}	95^{th}
5-6	69	4.10	0.99	2.50	2.90	3.36	4.19	4.84	5.39	5.85
7-8	74	3.95	0.97	2.47	2.61	3.10	3.87	4.61	5.13	5.53
9-10	72	4.42	0.99	2.89	3.11	3.50	4.07	4.81	5.40	6.26
11-12	76	4.13	0.77	2.94	3.08	3.66	4.23	4.72	4.93	5.19

Serum Total Cholesterol (TC) and Triglycerides (TG)

To early detection and prevention of the coronary artery disease (CAD) fasting blood lipid profile is useful indicator. It is well established that risk factors in early life such as abnormal cholesterol and LDL cholesterol level in blood have been exhibited to higher risk of atherosclerotic disease, stroke and diabetes in older age. It is well establishment that the gonadal maturation is concern to lower levels of serum cholesterol in boys (Wennlof *et al.,* 2005). It is also evident from the study that boys total cholesterol levels increase faster in early life of adulthood (*Yip et al.,* 2006). For the Bengali children of between 5-12 years of age, all the selective percentile values of serum total cholesterol (TC) lower than the American children (Charles *et al.,* 2007). From results of the present study, mean serum total cholesterol level compared well with those of Uttarpradeshi, and Kashmiri children (Bansal *et al.,* 2017*;* Wajid *et al.,* 1995).

From this result of this study it is revealed that lower 5^{th} to higher 95^{th} percentile values of serum TG level were lower than Iranian children in the 6 to 12 years age groups (*Taheri et al.,* 2014). This difference may be cause of racial, environmental and dietary habits factors. During adolescence period, gradually increased pattern of serum triglycerides levels are found in boys. It may be cause of the pubertal elevated of insulin resistance that occurs during early stage of puberty (Bansal *et al.,* 2017*;* Al-Zahrani *et al.,* 2021). The mean triglyceride level was higher in 5-6 years age groups, probably due to milk-rich food. In early life of childhood, the values of serum lipid reduce to their lowest level and after that continuously increased with advancement of age (Kottke *et al.,* 1991; Jagarinec *et al.,* 1998).

High Density Lipoprotein Cholesterol (HDL-C) and Low Density Lipoprotein Cholesterol (LDL-C)

Among the lipoproteins, lower level of HDL cholesterol is strong and independent risk factor for formation of coronary artery disease and stroke which is not influenced by level of LDL-C (Bansal *et al.,* 2017). It is well established that the LDL cholesterol is the most important atherogenic factor to development of CAD. Moreover, LDL cholesterol and HDL cholesterol have played particular roles for risk assessment of coronary artery disease. On the other hand, serum triglycerides and total cholesterol have key roles considering screening tests (Yip *et al.,* 2006; Kriti and Sing., 2022). From the basis of the results of the study, 5th to 95th percentiles of HDL-C level were higher than Iranian boys (Taheri *et al.,* 2014; Bulut *et al.,* 2017). It is also noted from this study, all the selected percentile values of LDL-C were lower when compared to American boys in the all selected age groups of children (Charles *et al.,* 2007).

Another study on Asian Indian children showed that percentile values of HDL cholesterol were higher at lower percentiles than their same age groups in the American children (Madhavan *et al.,* 2005). Even though the LDL-C and TC levels are lower in urban Asian Indian children when compared to other populations (Vikram *et al.,* 2005).

Total Cholesterol (TC): High Density Lipoprotein Cholesterol (HDL-C)

Total Cholesterol to HDL cholesterol ratio is most important predictor for cardiovascular disease in adult. This ratio is also called "atherogenic index" and one of the most significant markers to identify coronary artery disease (Bansal *et al.,* 2017). In India, only limited numbers of studies exist concerning lipid profile abnormalities in paediatric population**.** In our study, the mean values of total cholesterol: HDL cholesterol ratios were 4.10±0.99, 3.95±0.97, 4.42 ±0.99 and 4.13±0.77 respectively in four different age groups. These data similar well to the serum total cholesterol: HDL cholesterol ratio of 3.77±0.63 and 4.3±1.4 observed previously by Bansal *et al.,* 2017; Khalil *et al.,* 1995 respectively. These ratios will help to early assessment of cardiovascular disease in Bengali children in future.

CONCLUSION

Findings from this study it may be conclude that our present reported lipid percentile values in Bengali children give significant information for important

clinical analysis of blood lipids. From this research work, it also noted that in order to decrease such atherosclerotic risk factors; Bengali boys required to be screened in regular interval. This biochemical test is an easy and effective method of early detection cardiovascular heart disease. Those boys who identifying as being at higher risk for development coronary heart disease due to higher level of serum cholesterol should receive targeted intervention, as suggested by the American Heart Association (AHA). Health professional and state government must focus on supporting the early diagnosis and prevention of blood lipid profile abnormalities in school going Bengali boys in West Bengal, India.

FUTURE SCOPE

This lipid profile screening is an almost first effort in this part of the West Bengal, India with an overall reporting on the percentile values of the Bengali school going boys in West Bengal, India. It would be beneficial for further research, using a broader sample size and not limited to sex as in this study selected subjects were very small in size and specific to male children to determine the serum lipid percentile values for four different age groups Bengali Boys.

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Conflict of Interest. None.

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REFERENCES

Al-Zahrani, J., Shubair, M.M., Al-Ghamdi, S., Alrasheed, A.A., Alduraywish, A.A., Alreshidi, F.S., Alshahrani, M.S., Alsalamah, M., AL-Khateeb, F.B., Ashathri, I.A., El-Metwally, A. and Aldossari, K.K. (2021). The prevalence of hypercholesterolemia and associated risk factors in Al-Kharj population, Saudi Arabia: a cross-sectional survey. *BMC Cardiovasc Disord., 21*(1), 22-25.

Baker, J. L., Olsen, L. W., and Sorensen, T. I. A. (2007). Childhood index and the risk of coronary heart disease in adulthood. *N Engl J Med., 357*(23), 2329-2337.

Bansal, U., Rathoria, E., Gupta, A., Gupta, N. B., Agarwal, S., Ahuja, R. and Ahuja, S. (2017). Lipid profile in school children: study from a District of Uttar Pradesh, India. *Int J Contemp Pediatr., 4*(3), 20-30.

Bao, W., Srinivasan, S. R., Valdez, R., Greenlund, K. J., Wattigney, W. A. and Berenson, G. S. (1997). Longitudinal changes in cardiovascular risk from childhood to young adulthood in offspringparents with coronary artery disease: The Bogalusa Heart Study. *JAMA, 278*(21), 1749-54.

Berenson, G. S., Srinivasan, S. R., Bao, W., Newman, W. P., Tracy, R. E. and Wattigney, W. A. (1998). Association between multiple cardiovascular risk factors and the early development of atherosclerosis. Bogalusa Heart Study. *N. Engl. J. Med., 338*(23), 1650-1656.

Bulut, T., Demirel, F. and Metin, A. (2017). The prevalence of dyslipidemia and associated factors in children and adolescents with type 1 diabetes. *J Pediatr Endocrinol Metab, 30*(2), 181–187.

Charles, A., Stanley, M. and Michael, J. B. (2007). *Defects in Metabolism of Lipids*. In: Behrman, R.E., Kliegman, R.M., Jenson, H.B, eds. Nelson Textbook of Pediatrics. 18th ed. Philadelphia: WB Saunders, 589.

D'Angelo, S., Yajnik, C. S., Kumaran, K., Joglekar, C., Lubree, H., Crozier, S. R., Godfrey, K. M., Robinsin, S. M., Fall, C. H. D. and Inskip, H. M. (2015). Body size and body composition: A comparison of children in India and the UK through infancy and early childhood. *J Epidemiol Community Health, 69*(12), 1147-1153.

Fossati, P. and Prencipe, L. (1982). Serum triglycerides determined colorimetrically with an enzyme that produces hydrogen peroxide. *Clin Chem, 28*(10), 2077-2080.

Friedewald, W. T., Levy, R. I. and Fredrickson, D. S. (1972). Estimation of the concentration of low-density lipoprotein cholesterol in plasma, without use of the preparative ultracentrifuge. *Clin Chem., 8*(6), 499-502.

Jagarinec, N., Flegar-Mestric, Z., Surina, B., Vrhovski-Hebrang, D., and Preden- Kerekovic,V. (1998). Pediatric reference intervals for 34 biochemical analytes in urban school children and *Clin Chem Lab Med., 36*(1), 327–37.

Joshi, S. M., Katre, P. A., Kumaran, K., Joglekar, C., Osmond, C., Bhat, D. S., Lubree, H., Pandit, A., Yajnik, C. S. and Fall, C. H. D. (2014). Tracking of cardiovascular risk factors from childhood to young adulthood the Pune Children's Study. *Int J Cardiol., 175*(1), 176-178.

Khalil, A., Gupta, S., Madan, A. and Venkatesan, M. (1995). Lipid profile norms in Indian children. *Indian Pediatr, 32*(11), 1177-1180.

Kottke, B. A., Moll, P. P., Michels, V. V. and Weidman, W. H. (1991). Levels of lipids, lipoproteins, and apolipoproteins in a defined population. *Mayo Clin Proc, 66*(12), 1198–1208.

Kriti, K. and Singh, K.S. (2022). Quantifying the burden of lipid anomalies among adolescents in India. *BMC Cardiovasc Disord., 22(1), 385.*

Kumar, A., Pandit, K., Chatterjee, P., Mukhopadhyay, P. and Ghosh, S. (2021). S. Lipid profile in infant. *Indian J Endocr Metab., 25*(1), 20-22.

Lopes-Virella, M. F., Stone, P., Ellis, S. and Colwell, J. A. (1977). Cholesterol determination in high-density Lipoprotein separated by three different methods. *Clin Chem, 23*(5), 882-884.

Madhavan, M., Pandey, R. M., Misra, A., Vikram, N. K., Dhingra, V., Luthra, K. and Wasir, S. J. (2005). Centile values for serum lipids and blood pressure for Asian Indian adolescents. *Lipids Health Dis, 29*(4), 20.

Puri, S., Puri, S., Rehan, H. S., Sabharwal, A., Nanda, R. and Aggarwal, S. K. (2015). Prevalence and pattern of Dyslipidemia in 2500 adolescents in suburban India. *J Am. Coll. Cardiol., 65*(10), 1486.

Richmond, W. (1973). Preapration and properties of a cholesterol oxidase from Nocardia sp and its application to the enzymatic assay of total cholesterol in serum. *Clin. Chem., 19*(12), 1350-1356.

Taheri, F., Chahkandi., T., Kazemi, T. and Bijari, B. (2014). Percentile of Serum Lipid Profile in Children at Eastern Iran. *International Journal of Pediatrics, 2*(4), 31-38.

Vikram, N. K., Misra, A., Pandey, R. M., Dwivedi, M. and Luthra, K. (2005). Adiponectin levels in postpubertal asian Indian adolescents: Relationships with insulin resistance and C-reactive protein. *Metabolism* 2004, *53*(10), 1336-1341.

Wajid, A. S., Buch, N. A. and Masood, H. (1995). Serum lipid profile in Kashmiri children. *Indian J Physiol. Pharmacol.*, *39*(1), 55-58.

Wennlof, A. H., Yngve, A., Nilsson, T. K. and Sjostrom, M. (2005). Serum lipids, glucose and insulin levels in healthy schoolchildren aged 9 and 15 years from BCentral Sweden: reference values in relation to biological, social and lifestyle factors. *Scand. J. Clin. Lab Invest*, *65*(1), 65–76.

Yip, M. P., Chan, K. M., Nelken, J., Lepage, N., Brotea, G. and Adeli, K. (2006). Pediatric reference intervals for lipids and apolipoproteins on the VITROS 5, 1 FS Chemistry System. *Clinical Biochemistry*, *39*(1). 978–983.

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