Journal of Pharmaceutical and Scientific Innovation
www.jpsionline.com
Research Article

ESTABLISHMENT OF REFERENCE RANGE FOR LIPID PROFILE IN HEALTHY NEW BORN, INFANT AND LOW BIRTH WEIGHT NEWBORN IN INDIAN POPULATION

Piyush B. Tailor*, Shailesh M. Patel, Chinmay J. Shah, Niharika Upadhyay
Govt. Medical College, New Civil Hospital, Surat, India
*Email: cjshah79@yahoo.co.in

Received on: 11/04/12 Revised on: 20/05/12 Accepted on: 09/06/12

ABSTRACT
Cardiovascular disease is among the major cause of morbidity and mortality in industrialized countries.The earlier prevailing belief that chronic disease in adulthood are the consequences of adult lifestyle choices and exposures, has now also given room for thought to the concept that the process of atherosclerosis begins in childhood and that the fatty streaks are present in children as young as three year of age. In present study, infant and newborn baby, coming to S.S.G Hospital, Vadodara were taken in to study. Infants were divided in three groups. First group included new born between age of 1-5 days, second group an infant between age of 6-12 weeks and the third group infants suffering from low birth weight. Blood samples were collected from the vein of normal new born, age group of 6-12 weeks and from LBW babies. Samples from new born babies were collected within the 24 -36 hours of birth time. Serum Cholesterol was measured using PAP method, Triglyceride using GPO method and HDL-Cholesterol using PTA method, VLDL-Cholesterol and LDL-Cholesterol was calculated by using Friedewald's equation. Each and every baby has corresponding normal value according to its age. It cannot be comparable with other age group norm with adult. Lipid profile of the Indian population baby cannot be comparable with norms of the other country because there are many factor can change profile value, like dietary habit, living habit and condition, environment and atmosphere also. Baby suffering or come with SFD and LBW has higher chance of CHD in an adulthood compare to other normal child.
Keywords: Lipid profiles, new born, infants, Indian population

INTRODUCTION

Cardiovascular disease is among the major cause of morbidity and mortality in industrialized countries[1].The earlier prevailing belief that chronic disease in adulthood are the consequences of adult lifestyle choices and exposures has now also given room for thought to the concept that the process of atherosclerosis begins in childhood and that the fatty streaks are present in children as young as three year of age. In addition, fetal origins of adult disease are also gaining importance recently on the basis of evidence that impaired fetal growth might predisposes the survivors to coronary disease later in life[2] and as from different studies it is proven that cardiovascular disease affects almost exclusively adults mainly due to atherosclerosis, which is main pathogenesis for ischemic heart disease which is dependent upon status of serum cholesterol level[3].

A children and adolescents with high cholesterol levels have more chance of coronary artery disease in late life than who is having normal cholesterol level[4,5,6] It means atherosclerosis process start from childhood. So pediatricians should identify children at highest risk for the development of accelerated atherosclerosis by screening lipid profile levels in children by others[4,5,6] have stated that there is an inverse relationship between birth weight and mortality from coronary heart disease and Incidence of CHD is also higher in baby with histories of low birth weight at birth and at the age of 1 year and also in premature baby[5,6,7,8].

Normal lipid profile varies in different countries according to it's geographical area, dietary pattern and life style. Here study is mainly concentrated on developing norms of lipid profile in infant and newborn baby of S.S.G Hospital coming from lower socioeconomic status. Interference to this value, a high risk baby can be identified. This high risk baby can be treated with good dietary regime, like low intake of cholesterol and saturated fat. It will help them to nullify future hypercholesterolemia and also early onset of disease related to hyperlipidemia in adulthood[9,10,11,12].

AIMS OF STUDY

1. Developing reference range of lipid profile, including serum cholesterol, serum triglyceride, serum HDL-cholesterol, serum VLDL-cholesterol and serum LDL-cholesterol for healthy new born and infants between the age of 6-12 weeks attending SSG Hospital
2. To compare lipid profile between healthy newborn and Low Birth Weight newborn.

MATERIALS AND METHODS

In present study infant and newborn baby coming to S.S.G Hospital, Vadodara were taken in to study. Infants were divided in three groups. First group included new born between age of 1-5 days, second group an infant between age of 6-12 weeks and the third group infants suffering from low birth weight.

1. Normal new born babies were selected who had no complication during time of birth and were born at normal gestational age between 36-38 weeks.
2. Infants selected had no active disease currently or no major illness in past requiring hospitalization.
3. Infants with Low Birth Weight with their birth weight less than 2.5 Kg with full term gestational age were selected.

Specimen collection

Blood samples were collected from the vein of normal new born, age group of 6-12 weeks and from LBW babies. Samples from new born babies were collected within the 24 - 36 hours of birth time. Samples were collected in plain bulb and tests were performed within 24 hours after collection. All mother were from lower class of Indian family. Samples were collected from labour room, pediatric ward and P.I.C.U., S.S.G. Hospital, Baroda. Following Tests were done in Clinical Chemistry Laboratory, S.S.G. Hospital, Baroda. (Haemolysed samples were not taken in study).

Serum Cholesterol was measured using PAP method, Triglyceride using GPO method and HDL-Cholesterol using PTA method, VLDL-Cholesterol and LDL-Cholesterol was calculated by using Friedewald's equation as below

Serum VLDL- Cholesterol conc. (mg/dl) = $\frac{\text{Triglyceride}}{5}$

Serum LDL- Cholesterol conc. (mg/dl)
= Total Cholesterol–[HDL-Cholesterol+VLDL-Cholesterol]

RESULTS AND DATA ANALYSIS

Here in this study, a lipid profile has been done in an infants of the S.S.G Hospital, Baroda. In Group 1 there were 35 normal new borns, in Group 2, 50 normal infant and in Group 3 of new born suffering from Low Birth Weight (LBW) there were 35 infants. Biochemical parameters were as follow:

Range of lipid profile in Group – I and II:

According to the Mean ± 2 SD, a range of lipid profile is as follows for individual parameter:

Form above range, it is observed that there is significant difference with adult lipid profile. Triglyceride and S.cholesterol level is low in the normal new born which increase with age of baby. The result indicates that major part of the total cholesterol is composed of LDL-cholesterol (around 61%) and very less amount of HDL-cholesterol (21%).

Results of the lipid profile in the group-II shows that infant between 6-12 weeks of age have a major difference in lipid profile values from group-I. There is almost 35% rise in S.Triglyceride and S.VLDL-Cholesterol. Also in S.cholesterol and S.LDL-cholesterol, there is approximately 20% increase in comparison to the normal new born (Group-1). In group – II, the lipid profile shifts towards adult's normal range from normal newborn.

In group III of the baby, total cholesterol composed of LDL-cholesterol is increased approximately 30% and there is decrease in HDL-cholesterol content from 55% to 60%. There is very significant difference between group 1 and group 3.

Table I

Biochemical parameter	Group I (n=35)	Group II (n=50)	Group III (n=35)
	Mean (SD)	Mean (SD)	Mean (SD)
Triglyceride	97.5 (17.9)	133.0 (21.0)	130.2 (35.6)
Cholesterol	108.3 (19.6)	132.5 (17.5)	129.9 (22.7)
HDL	22.9 (5.4)	23.8 (5.7)	16.9 (7.5)
VLDL	19.4 (3.5)	26.5 (4.2)	26.0 (7.2)
LDL	65.8 (18.8)	82.1 (18.0)	85.7 (25.8)

	Group I	Group II
S. Triglyceride	61.6 to 133.3 mg %	91.0 to 175.0 mg %
S. Cholesterol	68.9 to 147.6 mg %	97.3 to 167.6 mg %
S.HDL-cholesterol	11.9 to 33.8 mg %	12.2 to 35.3 mg %
S.VLDL-cholesterol	12.3 to 26.6 mg %	18.1 to 34.9 mg %
S.LDL-cholesterol	28.2 to 103.5 mg %	45.9 to 118.2 mg %

Table II: COMPERISION OF LIPID PROFILE BETWEEN GROUP-I & GROUP-III

	Group I (n=35)		*Group III (n=35)*		P Value
	Mean	SD	Mean	SD	
Triglyceride	97.51	17.94	130.2	35.6	< 0.0001
Cholesterol	108.3	19.68	129.9	22.75	< 0.0001
HDL	22.91	5.48	16.97	7.53	0.0003
VLDL	19.46	3.58	26.03	7.20	< 0.0001
LDL	65.89	18.81	85.74	25.84	0.0005
Cholesterol / HDL ratio	4.95	1.41	9.20	4.28	< 0.0001
LDL / HDL ratio	3.05	1.25	6.28	3.69	< 0.0001

Table and graph shows a comparison of the lipid profile between the normal & low birth weight new born. In Group III, there is very significant increase in value of S.Triglyseride, S.Total cholesterol & S.VLDL-C, having 99.9% significant with p value <0.0001. Calculated parameters like Cholesterol : HDL-C ratio and LDL-C : HDL-C ratio, to evaluate the risk of atherosclerosis also shows very high rise in value, with p value <0.0001 which is highly significant.

DISCUSSION

Here the study has been done an infant coming from lower socio-economic status in S.S.G. hospital, Baroda. From results of Group-I, it can be observed that the lipid profile value in the new born baby is very much different from adult population. It shows that all the values are very lower than the adult's lipid profile values. The lower value of cholesterol in serum is probably the cause of the fall in plasma LDL-cholesterol concentration due to increase of its uptake by the fetal adrenal gland for steroid hormone production, as postulated by Parker Jr. et al[12]. In new born, liver cells and its enzymes are not well developed for lipid metabolism and so can contribute to lower values in lipid profile.

In Group II there is increase in all parameter of lipid profile values and shifting towards adult's normal lipid profile when compared to Group I. This increase in serum level of lipid profile between 6 -12 week of life is because of breastfeeding[13] as lipid value differs with the dietary habit. Some studies also showed that lipid profile progressively increases up to 3 - 5 years of age than it become equal to the adult's lipid value in serum. At the age of 5 years, liver becomes fully mature for all catabolic and anabolic function and child weaning also completes so child has started all normal human diet, equivalent to adult.

It means that between the age of 0 to 5 years, there is frequent change of lipid profile value due to progressive maturation of liver and change in dietary habit. So for reference value of lipid profile in children, there is requirement of big and broad category population study with different age group from 0 to 5 years of age. And from this reference range, according to it's corresponding age group of

child, diagnosis can be made for abnormality in lipid profile. Here in this study, infants from lower socioeconomic status coming in S.S.G.Hospital are divided into two groups, normal new born of age between 0-5 days and infants of ages between 6-12 weeks and reference range of lipid profile in them was determined.

In third group, sample from 0 – 1 weeks infants were taken for lipid profile who were suffering from low birth weight (LBW). Result of lipid profile of this group shows significant difference when compared with normal new born. There is increase in serum value of triglyceride, total cholesterol, LDL-C and VLDL-C except HDL-cholesterol which falls, significantly. The fall in HDL-cholesterol levels may be associated with an increase in the activity of the lecithin cholesterol acyl transferase enzyme. Spear et al[14].demonstrated that lecithin cholesterol acyl transferase enzyme activity was lower in near-term neonates compared with the term infants.

Here, in low birth weight babies of Group-III, Cholesterol: HDL- cholesterol ratio and LDL: HDL-cholesterol ratio is also significant higher than normal new born. Which is supporting a study done by Diaz M[15]. This, all are risk factor for atherosclerosis. Generally, clinical sequele of atherosclerosis occur in adulthood, but several experimental and clinical studies have shown that these lesions may have their onset at a very early age. In their multicentric study named PDAY (Pathobiological Determinants of Atherosclerosis in Youth), McGill and McMaham made important remarks about the progression of fatty striae, the initial atherosclerotic lesions that may be detected in aortas of children and coronaies of adolescents.

It can be determined that atherosclerosis start to form fatty plaque from childhood and baby who are suffering from LBW are more prone to atherosclerosis and get high risk for coronary heart disease than normal person in adulthood, as from the Framingham study which suggested that the incidence of coronary artery disease increased with total cholesterol level.

Some other study also proved same, like Preterm birth[16] and low birth weight[17,18] are factors for cardiovascular risk in adult life. Study done by others[4,5,6] also supporting this study. They have stated that there is an inverse relationship between birth weight and mortality from coronary heart disease. Thus the size at birth and its relation with the development of CHD during later life is indicative of fetal under nutrition.

From results of this study, we can compare lipid profile of low birth weight new born with reference range, and high risk babies can be evaluated. These babies can be advised good dietary regime to overcome hyperlipidemia and prevent early onset of Coronary heart disease in adulthood.

CONCLUSION

1. Each and every baby has corresponding normal value according to its age. It cannot be comparable with other age group norm nor with adult.
2. Lipid profile of the Indian population baby cannot be comparable with norms of the other country because there are many factor can change profile value, like dietary habit, living habit and condition, environment and atmosphere also.
3. Baby suffering or come with SFD and LBW has higher chance of CHD in an adulthood compare to other normal child.

REFERENCES

1. Balint JP: Physical findings in nutritional deficiencies. Pediatr Clin North Am 1998 Feb; 45(1): 245-60
2. Barker DJP. Fetal origin of coronary heart disease. 1995; BMJ 11: 171-174
3. Akerblom HK, Chandra RK, Franklin FE, Conclusions, guidelines, and recommendations from the IUNS/WHO workshop. Nutrition in pediatric age group and later cardiovascular disease. J Am Coll Nutr. 1992; 11:S1-S2
4. Bethesda, MD. National Cholesterol Education Program. Report of the Expert Panel on Blood Cholesterol levels in Children and Adolescents. US Department of Health and Human Servieces, Public Health Service, National Institutes of Health, National Heart, Lung, and Blood Institute; 1991. National Institutes of Health Publication 91-2732
5. Ehara, S, Ueda, M, Naruko, T, et al. Elevated levels of oxidized low density lipoprotein show a positive relationship with the severity of acute coronary syndromes. Circulation 2001: 103: 1955
6. Fall CH. weight in infancy and prevalence of coronary heart disease in adult life. BMJ 1995; 310: 17-19.
7. Barker DJP, Winter PD, Osmond C, Margetts B, Simmonds SJ Weight in infancy and death from ischemic heart disease. Lancet. 1989;:577-580
8. Beers MH, Berkow R, eds: Nutritional Disorders: Malnutrition. The Merk Manual, 17th edition, 1999:28-32
9. Brewer HB et al : Apolipoprotein and lipoprotein in human plasma : An overview. Clin chem..1988:34-B4.
10. Coppack SW et al : Effects of insulin on human adipose tissue metabolism in vivo. Clin chem. 1989:77-663
11. Davies MJ; The composition of coronary artery plaque N. Engl J Med 336:13D, 1997
12. Delahoussaye AR, Jorizzo JL: Cutaneous manifestation of nutritional disorder. Dermetol Clin chem. 1989 Jul: 7(3): 559-70
13. Diaz M, Leal C, Ramon y Cajal J, Jimenez MD, Martinez H, Pocovi M & Grande F. Cord Blood lipoproin-cholesterol: relationship between birth weight and gestational age of newborn. Metabolism,1998; 38:435-438
14. Parker Jr CR, Simpson ER, Bilheimer DW, Leveno K, Carr BR & MacDonald PC. 1980; Inverse relation between low density lipoprotein cholesterol and dehydroisoandrosterone sulfate in human fetal plasma. Science, 208: 512-514.
15. Tabas, I. Consequences of cellular cholesterol accumulation : basic concept and physiological implication . J Clin Invest 2002:110:905
16. Spear ML, Amr S, Hamos M. Pereira GR, Corcoran LG & Hamos P. Lecithin cholestero acyltranseferase (LCAT) activity during lipid infusion in premature infant. Journal of pediatric Gastroenterology and nutrition, 1991; 13:72-76.
17. Vink, H,Constantinescu, AA,AA,Spaan,JA. Oxidized lipoproteins degrade the endothelial surface layer: implication for platelet endothelial cell adhesion. Circulation 2000:101:1500
18. Wissler RW: Theories and new horizons in the pathogenesis of atherosclerosis and mechanism of clinical effects, Arch Pathol Lab Med 1992; 116:1281-1291.

Source of support: Nil, Conflict of interest: None Declared