

To Study the Effect of Exclusively Breastfeeding and Exclusively Cow Milk Feeding on Lipid Profile of Babies at 3 and 6 Month of Life

Abhinav Ahuja¹, Syed Moiz Ahmed², Alka Bhambri³, Rajesh Bansal⁴

ABSTRACT

Introduction: Breastfeeding is a natural source of enormous value and is necessary for the life of babies. The influence of infants' eating patterns, on subsequent cholesterol levels is of interest. Breastfeeding has been found to be protective against atherosclerotic cardiac diseases and better lipid profile later in life compared to bovine milk. Hence, the study was carried out with aim to compare the lipid profiles of exclusively breastfed infants and cow milk fed babies.

Material and Methods: It was a Prospective Observational Study conducted among fifty exclusively breastfed babies and fifty exclusively cow milk fed babies. Lipid profile were compared at three and six month of life over a span of one year in Rohilkhand Medical College and Hospital, Bareilly who fulfilled inclusion criteria of study.

Results: In the present study, the exclusive breastfed babies showed lower levels of cholesterol and low density lipoprotein, rising levels of HDL/LDL ratio, high density lipoprotein in exclusive breastfed babies as compared to cow milk fed babies which showed declining concentrations of high density lipoprotein, HDL/LDL ratio, rising levels of low density lipoprotein.

Conclusion: The study was conclusive of the fact that exclusive breastfeeding for initial six month of life shows an edge to the positive lipid profile (decreasing cholesterol, low density lipoprotein, triglycerides, and increasing high density lipoprotein and HDL/ LDL ratio) over six month as compared to exclusively cow milk fed babies.

Keywords: Low density lipoprotein, High Density Lipoprotein, Triglyceride Acid, Very Low Density Lipoprotein,

(MHFW), Government of India (GOI) 2013, "It is estimated that 1.3 million death could be prevented each year, if babies are exclusively breastfed for the first six months followed by appropriate complimentary feeding at least for one year of life" and all together the exclusive breast feeding offers the family and the nation an economic way to improve infant health.³

Breastfed babies are at a lower risk of mortality and around 19% of Under 5 Deaths can be prevented if baby are exclusively breastfed till 6 month of life.⁴

According to the National Family Health Survey 3 (NFHS-3), only 46% of infants are exclusively breastfed at 6 month age and remaining are on top feed, most commonly with diluted cows' milk, etc.⁵

Nutrition in the neonatal and early infancy may have major, long-term 'programming' effect on physiology and metabolism of cholesterol. Hence the influence of infants' eating patterns, on subsequent cholesterol levels, are of growing interest.⁶

Breastfeeding has been found to be protective against atherosclerotic cardiac diseases and a better lipid profile later in life⁷ in comparison to bovine milk. Serum Lipid profile especially Serum Cholesterol, increased Low density lipoprotein (LDL), increased Triglyceride acid (TGA), decreased High Density lipoprotein (HDL), decreased HDL/ LDL ratio are major risk factor and prognostic criteria for atherosclerotic heart disease later in life.

Keeping in mind the growing evidence that risk of Coronary artery disease have started to begin from early childhood there is increasing concern and few studies conducted showed evidence that exclusive breastfeeding has influence on the lipid profile and other parameters influencing development of atherosclerotic heart disease and with era of globalization and women employment being hindrance to breastfeeding

INTRODUCTION

Reproduction and nurturing of baby empower women in ways that is unparalleled. Breast milk is God's gift and is best suited for the baby. Breast- feed is the normal food for a newborn.

Breast-feeding promotes close physical and emotional bonds between the mother and the baby. Exclusively breastfed babies have less chance of behavioral disorders in children. Breastfed babies have a higher intelligent quotient (IQ) and have less chance of developing hypertension, obesity, coronary artery disease and diabetes in their adulthood.¹ Breastfed babies are protected against allergies, including asthma.

Exclusive breastfeeding is when a baby receives only breast milk, without any additional food or drinks, including water, until 6 months of age. The first feed should be offered to the baby within half to one after birth.²

According to Ministry of Health and Family Welfare

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and easy shift to cow milk as alternative, our study aimed at examining the effect of exclusive breastfeeding on lipid profile over period of six month and comparing with effect of cow milk fed babies on lipid profile.

MATERIAL AND METHODS

The study was a Prospective Observational Study and was conducted in Rohilkhand Medical College & Hospital, Bareilly among the patients coming on OPD and IPD basis. Fifty exclusively breastfed babies and Fifty exclusively cow milk fed babies with known gestation (35-41 weeks by LMP) and birth weight (between median and -1SD) and apparently healthy, along with their mothers, were recruited at 3 and 6 month of age (+/- 2 weeks) in the hospital from 1st November 2017 to 31st October 2018. Sample size was obtained on the basis of convenient sampling.

Babies who were exclusively breastfed, exclusively cow milk fed, late preterm and term birth (equal to or greater than 37 completed weeks gestation) and birth weight (>1500gm or =1500gm), were included in study.

Babies who were on mixed feeding, preterm less than equal to 34 weeks, very low birth weight, infants born to mother with gestational diabetes, hypertension, eclampsia, pre-eclampsia, hypo/hyperthyroidism, infants with inborn error of metabolism, infants with chronic renal failure, babies with history of hereditary dyslipidemia in parents, obesity in mother and macrosomic infants (more than 4 kg), were excluded from study.

STATISTICAL ANALYSIS

All the data were recorded with help of standard case record proforma. The data were entered on a Microsoft Excel spreadsheet and imported into Statistical Package for Social Sciences (SPSS) version 22 for statistical analysis. Data was present in mean and standard deviation. Independent and paired t-test was performed to find significant difference in different variables in between two groups and within the groups. A P-value less than 0.05 was considered statistically significant.

RESULTS

The current study was conducted over a period of twelve month in Rohilkhand Medical College & Hospital, Bareilly. A total of 100 patients, 50 in each group of exclusive

breastfeeding and exclusive cow milk feeding respectively, satisfying the inclusion and exclusion criteria were enrolled

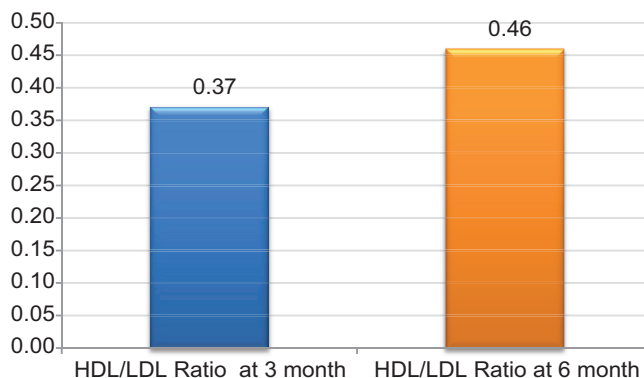


Figure-2:

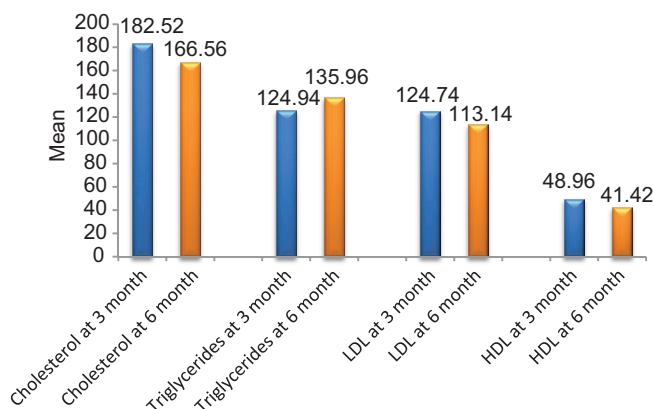


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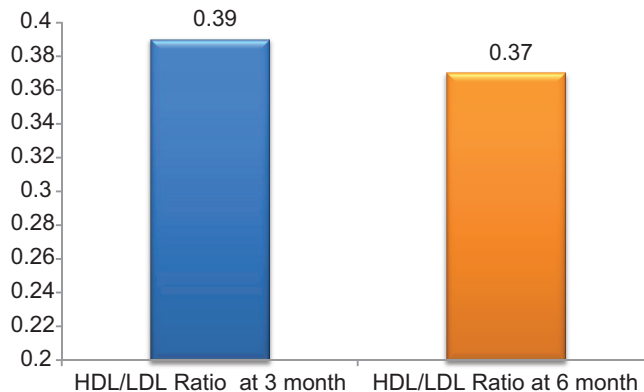


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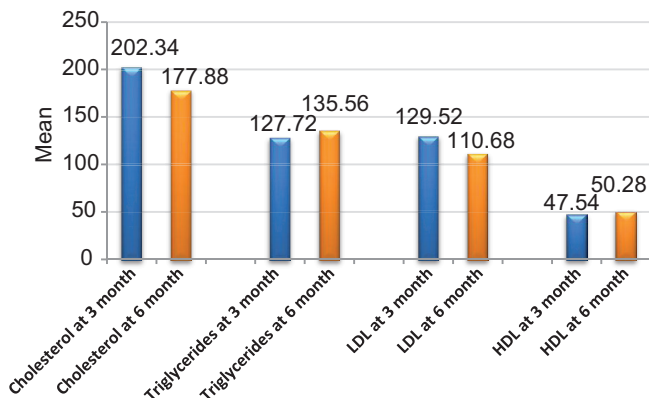


Figure-1:

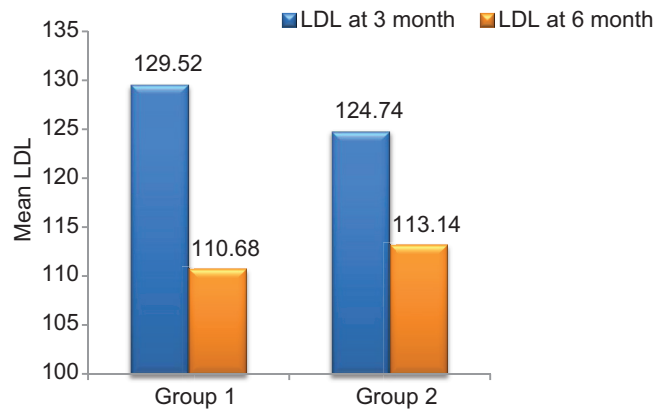


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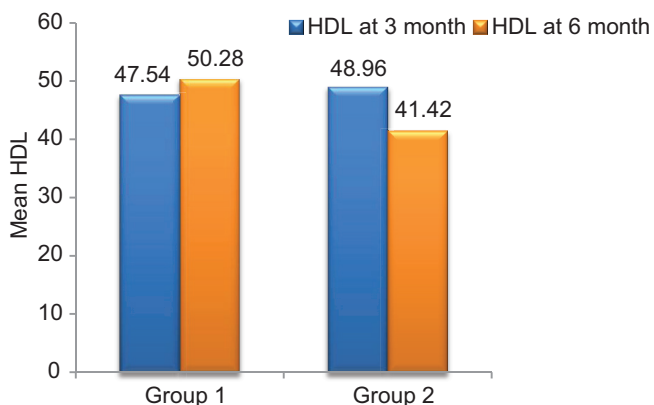


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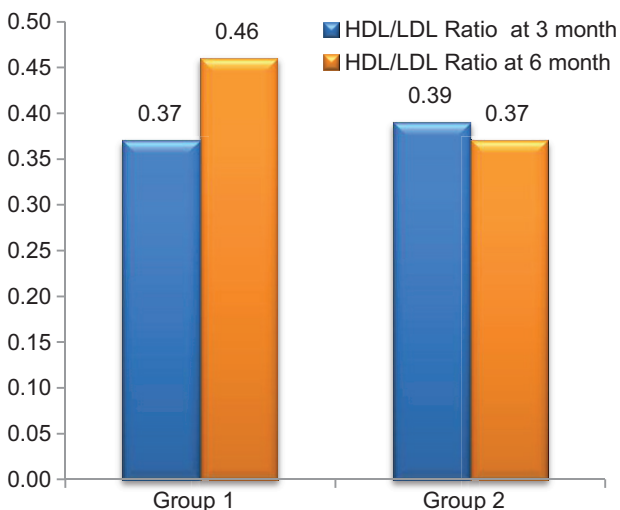


Figure-7:

in the study after taking consent from the patient.

In Group 1, out of 50 exclusive breastfeeding babies, 30 were male infants and 20 were female infants. In Group 2, out of 50 exclusive cow milk fed babies 25 each were male and female infants. The percentage of male and female infants in each group.

The mean weight of exclusively breastfed infants was 2.831 kg ± 0.204 kg, whereas mean weight among exclusively cow milk fed infants 2.763 kg ± 0.091 kg. The mean weight among exclusively breastfed and exclusively cow milk fed babies.

The mean cholesterol among exclusively breastfed infants at 3 month and 6 month was 202.34 ± 5.42 and 177.82 ± 5.29 respectively and p value less than 0.001 and was found statistically significant. The mean Triglyceride among exclusively breastfed infants at 3 month and 6 month was 127.72 ± 4.88 and 129.94 ± 4.83 respectively and was statistically significant. The mean Low density lipoprotein among exclusively breastfed infants at 3 month and 6 month was 129.72 ± 4.76 and 110.68 ± 5.09 respectively and results were statistically significant. The mean high density lipoprotein among exclusively breastfed infants at 3 month and 6 month was 47.54 ± 2.17 and 50.28 ± 2.92 respectively and results were statistically significant. The mean cholesterol, triglyceride, low density lipoprotein, high density lipoprotein at 3 and 6 month in Group 1 is shown

in figure 1. The mean HDL/LDL Ratio among exclusively breastfed infants at 3 month and 6 month was 0.37 ± 0.02 and 0.46 ± 0.03 respectively shows increasing trend and results were statistically significant and is shown in figure 2. The mean cholesterol among exclusively cow milk fed infants at 3 month and 6 month was 182.52 ± 8.4 and 166.56 ± 7.7 respectively and p value was less than 0.001 and is statistically significant. The mean triglycerides at 3 month and 6 month was 124.94 ± 4.83 and 135.96 ± 4.69 respectively and is statistically significant. The mean low density lipoprotein at 3 month and 6 month was 124.74 ± 5.21 and 113.14 ± 4.86 respectively and statistically significant. The mean high density lipoprotein among at 3 month and 6 month was 48.96 ± 1.76 and 41.42 ± 1.2 respectively and was found to be statistically significant. The mean cholesterol, triglyceride, low density lipoprotein, high density lipoprotein at 3 and 6 month in Group 2 is shown in figure 3. The mean HDL/LDL ratio among exclusively cow milk fed infants at 3 month and 6 month was 0.39 ± 0.02 and 0.37 ± 0.02 respectively and was found to be statistically significant and is shown in figure 4.

The mean Triglyceride among exclusively breastfed infants and exclusively cow milk fed infants at 3 month was 127.72 ± 4.88 and 129.94 ± 4.83 respectively and was statistically significant. The mean Triglyceride among exclusively breastfed infants and exclusively cow milk fed infants at 6 month was 135.56 ± 3.85 and 135.96 ± 4.69 respectively and was found to be statistically not significant.

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The mean Low density lipoprotein among exclusively breastfed infants and exclusively cow milk fed at 3 month were 129.72 ± 4.76 and 124.74 ± 5.21 respectively and was statistically significant. The mean low density lipoprotein among exclusively breastfed infants and exclusively cow milk fed infants at 6 month were 110.68 ± 5.09 and 113.14 ± 4.86 respectively and was statistically significant as shown in figure 5.

The mean high density lipoprotein among exclusively breastfed infants and exclusively cow milk fed babies at 3 month was 47.54 ± 2.17 and 48.96 ± 1.76 respectively and was statistically significant. The mean high density lipoprotein among exclusively breastfed infants and exclusively cow milk fed infants at 6 month 50.28 ± 2.92 and 41.42 ± 1.20 respectively and was statistically significant as shown in figure 6.

The mean HDL/LDL ratio among exclusively breastfed infants and exclusively cow milk fed infants at 3 month was 0.37 ± 0.02 and 0.39 ± 0.02 respectively and was statistically significant. The mean HDL/LDL ratio among exclusively breastfed infants and exclusively cow milk fed infants at 6 month were 0.46 ± 0.03 and 0.37 ± 0.02 respectively and

HDL/LDL ratio was significantly higher in exclusively breastfed babies than cow milk fed babies and shows an increasing trend over 6 month of life in breastfed babies than in cow milk fed babies as shown in figure 7.

DISCUSSION

Breastfeeding has significant influence on the lipid profile of the infants and in latter years of adult life. Exclusively breastfed babies have better lipid profile and lowers the risk of cardiovascular diseases later on in life as compared to cow milk fed babies.

The feeding regimen affects the lipid profile in human infants. Our study is also suggestive of differences in lipid profile of infants on two different feeding regimens. Lipid profile at 6 month age was qualitatively different in two groups.

In current study we compared the lipid profile of 100 babies, 50 each in Group 1 (exclusively breastfed) and Group 2 (exclusively cow milk fed) babies at 3 month and 6 month of life over a period of one year from 1st November 2017 to 31st October 2018 after applying the inclusion and exclusion criteria. In group 1, 30 were male infants with mean weight of 2.831 kg \pm 0.204 kg. In group 2, 30 were male infants and 20 were female infants with mean weight of 2.763 kg \pm 0.091 kg.

Total serum cholesterol was significantly higher in exclusively breastfed infants. Infants in group 1 (exclusively breastfed) at 3 month of life and were observed to still have hypercholesterolemia at 6 month age as compared to group 2 (Cow milk fed) with a decreasing trend in either groups. Chhonker devender et al (2015), Harit D et al (2008), showed similar results.^{8,9} The higher total cholesterol in exclusively breast fed infants might be explained by higher cholesterol levels in breast milk compared to cow milk.

Jooste PL et al (1991), Akeson PM et al (1999)^{10,11} shows normalization of serum cholesterol levels in exclusively breastfed group during later half of infancy and were comparable to mixed feeding at 9 and 12 month age.

Triglycerides levels were comparable in both the groups at 3 and 6 month of age. Low density lipoprotein levels were high in group 1 compared to group 2 at 3 month of age, falling trend in exclusively breastfed group and rising trend in cow milk fed babies at six month of life but absolute values still in higher range in group 1 compared to group 2. Owen et al. (2002)¹² showed similar results. The higher total cholesterol, low density lipoprotein, comparable triglycerides levels in breastfed infants in our study might be explained by the fact that increased lipase activity or an increased concentration of cofactor apolipoprotein E II in breast milk might enhance exogenous and endogenous triglyceride lipolysis and thus increasing serum lipid levels as postulated by Van Biervliet et al. (1986).¹³

High density lipoprotein mean concentration were at lower levels in group 1 than group 2 at 3 month life but the mean high density lipoprotein concentration shows higher values in group 1 compared to group 2 at six month of life with a declining trend in group 2. This can be postulated from the fact the study conducted by Van Biervliet et al. (1986)¹³

to compare the influence on the lipoprotein pattern in exclusively breastfed and formula milk fed babies at 0,7, 30 days of life. They found that the significant increase in the low density lipoprotein (LDL) and very low density lipoprotein (VLDL) levels at 0, 7 day of life and very low density lipoprotein (VLDL) concentration in breastfed infants subsequently decreased between 7 and 30 day. The infants receiving adapted formula had significantly higher very low density lipoprotein (VLDL) and lower values of low density lipoprotein (LDL) at 30 days of life as compared to breastfed infant. High density lipoprotein (HDL) concentration were not significantly different whereas the HDL₂ percentage were significantly lower in infants receiving formula milk as compared to exclusively breastfed babies and rising levels of high density lipoprotein concentration in breastfed babies.

Ratio of HDL-C/LDL-C increased in the group 1 (Exclusively breastfed) and decreased in group 2 (Exclusively Cow milk fed) from 3 month of life to 6 months. This improvement in HDL-C/LDL-C ratio in exclusively breastfed babies was seen because of decrease in low density lipoprotein and increase in high density lipoprotein, demonstrating a shift toward a healthy lipid profile started early in life.

Breastfed infants initially during early phase of life have higher concentration of plasma lipids, considered to be atherogenic later in life, but various studies have shown that breastfed babies have lower risk of developing cardiovascular heart disease and its risk factors in adult life. This can be explained by the hypothesis proposed by Reiser and Seildman et al (1972)¹⁴, based on studies in rat, that newborns exposed to high levels of dietary cholesterol 'would be able to cope better with dietary cholesterol in later life' so, the high cholesterol content of breast milk sets up homeostatic mechanisms that allow the animal to metabolise cholesterol more effectively in adult life. Mott et al. (1995)¹⁵ demonstrated that adult baboons, who were breastfed, had lower cholesterol production rate on high dietary cholesterol intake which was owing to differences in levels of lipoprotein lipases and cholesterol esterifying enzyme for the same cholesterol levels. Hence higher cholesterol levels in infants in first 6 months of life may prime them for lower cholesterol production later in life. Wong et al (1993)¹⁶ carried out a study to measure the fractional synthesis rate of cholesterol in 6 breastfed and 12 formula fed infants at 4-5 month of age using ²H₂O method and concluded the mean cholesterol Fractional Synthetic Rate of the breast-fed infants remained 3-fold less than that of the formula-fed infants indicative of the fact that the greater cholesterol intake of the breast-fed infants was associated with elevated plasma low density lipoprotein (LDL-cholesterol) concentrations and that cholesterol synthesis in human infants may be efficiently regulated via HMG-CoA reductase when infants are challenged with high intakes of dietary cholesterol. Singhal et al.(2001), Owen et al. (2002) showed similar results^{13,18}, showing positive shift in lipid profile early in life and decreasing risk of cardiovascular diseases later in life.

Higher serum cholesterol levels in breastfed babies in infancy could be a physiological phase as infants require higher

cholesterol for rapid brain growth which is predominantly provided by docosahexaenoic acid and linolenic acid in breast milk. Further, infants exposed to high dietary cholesterol in early life cope better with high load of dietary cholesterol in later life because of priming. Higher cholesterol levels in infancy may prime the neonates for lower cholesterol production later in life. As shown by other studies, our study is conclusive of the fact that exclusive breastfeeding for initial six month of life shows a leaning edge to the positive lipid profile (decreasing cholesterol, low density lipoprotein, triglycerides, and increasing high density lipoprotein and HDL/ LDL ratio) over a period of six month as compared to exclusively cow milk fed babies.

CONCLUSION

Breast milk is God's gift and is best suited for the baby. Breast-fed is the normal food for a neonate baby. Over a period of six month exclusive breastfed babies show lower levels of cholesterol and low density lipoprotein, and rising levels of HDL/LDL ratio, high density lipoprotein in exclusive breastfed babies as compared to cow milk fed babies which shows declining concentrations of high density lipoprotein, HDL/LDL ratio, and rising levels of low density lipoprotein. On the basis of the findings of our study, we conclude that the Total cholesterol and Low density lipoprotein are significantly higher in exclusively breastfed during initial days of life as compared to exclusively cow milk fed babies may be physiological and useful for optimal nutritional needs, cognitive development and programming for lipid metabolism in later life. With current study, we have tried to fill the space in the current knowledge regarding the effect of exclusive breastfeeding on lipid profile and determining differential lipid profile of exclusively breastfed infants and exclusive cow milk fed infants. However, there is need for a long term follow up study to know the impact of early lipid profile later in life and its possible association with adulthood diseases.

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