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Cross Sectional Study of Lipid Profile and Serum Prolactin Levels in Lactating and Nonlactating Postpartum Women

[1]Dr.V.Aruna, [2]Dr. S.N.Bhagyamma, [3]Dr. N.Sravanthi
[1,2]Associate Professor, [3]Postgraduate of Biochemistry,
[1]GMC, Machilipatnam
[2,3]GMC, Anathapuramu

***Corresponding Author:**
Dr. V. Aruna
Associate Professor of Biochemistry, GMC, Machilipatnam

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Abstract

Background: - Breast feeding is common practice in the postpartum period. Hyper-prolactinemia is associated with breast feeding and causes lactation amenorrhoea. Prolactin reduces lipogenesis in liver during lactation. In low socio-economic groups nutritional guidance during parturition & breast feeding becomes essential to improve maternal health.

Aim: To study the effect of lactation on lipid profile

Objective:

To correlate Serum Prolactin levels with Lipid profile

To study the effect of lactation on lipid profile

Study design: To select Postpartum mothers up to 9 months of parturition from Obstetrics ward / Pediatric OPD GGH , Ananthapur . After obtaining their consent, enquire on gravida, para, status of lactation, time since parturition and status of menstruation. Recording anthropometric data (BMI). Collect blood samples for evaluation of fasting blood sugar, fasting lipid profile and prolactin levels.

Inclusion Criteria: Postpartum women up to 9 months of parturition irrespective of mode of delivery both lactating and nonlactating mothers.

Exclusion Criteria: - Gestation diabetes mellitus, Preeclampsia, pregnancy complicated by anemia/heart disease/ jaundice/ any other chronic illness. Midtrimester abortions. Though lactating not breast feeding due to complications in new borne

Material and methods: This is a cross sectional study conducted in Govt. General Hospital, Ananthapur from December 2022 to September 2023. 220 postpartum women were selected from Obstetric ward, mothers attending PP unit, mothers attending immunization clinic and mothers attending Pediatrics OPD after carefully considering inclusion and exclusion criteria. Informed written consent was taken from the study group. Fasting venous blood samples were collected from all under strict aseptic conditions. The samples were analysed for Lipid profile & Blood sugar. Serum Prolactin was estimated on Beckman Coulter's Access 2 (Immunoenzymatic assay). BMI was recorded to rule out Obesity.

Results: Results were expressed as Mean±SD (Standard deviation) for continuous variables. The probability value of <0.05 at 95% confidence interval considered statistically significant. Mean and SD of parameters was 37.08±2.46(BMI), 84.3±5.8 (FBS), 202.98 ±44.526(TC), 135.89±47.203(TGs), 40.27±4.39(HDL), 134.42±41.003(LDL), 26.05±6.27(VLDL) and 34.88 ±9.43 (Prolactin). One-way ANOVA(Analysis of Variance) of Mean±SD (TC, TG.HDL, LDL and PRL) of entire study group was statistically significant (P Value < 0.00001) as shown in Table 2. Detailed history was recorded regarding duration of individual

breastfeeds, number of feeds per day, time since parturition, history of supplementary feeds and history of mensuration after delivery. Based on the details different subdivisions were made to know the relationship of prolactin to lipid profile. Statistically significant values were ascertained in subdivisions with P value < 0.0001 as shown in Table 3,4 & 5. Unpaired student's test showed significant correlation of BMI and TC to Prolactin. (P value <0.0009 and <0.00001 respectively)

Conclusion: We could not establish the role of Prolactin on lipid profile during postnatal period as very low PRL levels were obtained during analysis.

Keywords: Prolactin, Lipid Profile, Lactating women

Introduction

The metabolic changes during pregnancy and parturition are multiple and lead to weight gain by mother. In the 1st & 2nd trimesters increased lipogenesis & cholesterol synthesis occurs (increased anabolism). During the 3rd trimester catabolism of depot fats is a major change. The metabolic adaptations during lactation on the contrary include an increased basal metabolic rate and increased energy expenditure by 15% -25%. [1, 2] During lactation milk production dominates maternal metabolism viz nutrients requirement & utilization by nonmammary tissues. Lactation requires mobilization of lipids for milk synthesis. As a result, Triglycerides decrease, and High-density lipoproteins increase in circulation.

Prolactin (PRL) is an anterior pituitary hormone having 198 amino acids. Its secretion increases significantly during lactation, may attain values as high as 120-200ng/ml. Suckling stimulates PRL secretion. During lactation insulin receptors increase in mammary tissues & the rate of insulin clearance by mammary glands increases which leads to fall in plasma insulin levels.[3] Concurrently hepatic lipogenesis decreases, and oxidation of fatty acids increases. [4] High PRL levels reduce insulin resistance, preventing Type 2 Diabetes mellitus. Reduced lipogenesis by liver and adipose tissue occurs during lactation. Influence of PRL on circulating lipid levels reduces cardiometabolic risk women.

The aim of the study was to know lipid profile alterations during lactation and its relation to PRL. The same would help us guide feeding mothers regarding diet modifications and supplements.

Material and methods

This is a cross sectional study conducted in Govt. General Hospital, Ananthapur from December 2022 to September 2023. 220 postpartum women in the age group of 18yrs to 40yrs were selected from Obstetric ward, mothers attending PP unit, mothers attending immunization clinic and mothers attending Pediatrics OPD after carefully considering inclusion and exclusion criteria. This study has institutional ethical committee approval (IEC No. 1/12/2022/GMC/ATP) Informed written consent was taken from the study group. Fasting venous blood samples were collected from all under strict aseptic conditions. The samples were analysed on Semiautoanalyser Erba Chem 7 for Lipid profile & Blood sugar. Serum Prolactin was estimated on Beckman Coulter's Access 2 (Immunoenzymatic assay). Anthropometric data like BMI recorded to rule out Obesity.

Results

Results were expressed as Mean±SD for continuous variables. Statistical analysis included Student's 't' test done to find statistically significant difference between means. One-way ANOVA is done to assess interrelationships of variables. The probability value of <0.05 at 95% confidence interval is considered statistically significant.

220 individuals, who are breast feeding were selected irrespective of the mode of delivery. Their serum samples were analysed for FBS, Lipid profile and prolactin. BMI was calculated from Height and weight (Wt. in Kgs / (Height in Mt)2. The values were expressed as Mean and Standard deviation (SD) as shown in table. BMI was shown to be moderately elevated. Out of 220 mothers 150 mothers were lactating and nonmenstruating, less than 3 months

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parturition and 80 were immediate postpartum 3 – 5 days of parturition. Breast-feeds started but scanty (table 5) and 62 mothers were more than 3 months of parturition, and the babies are totally on maternal feeds. Menstrual cycles started for these 62 mothers.

Table: 1

Parameter	Normal range	Mean	Std. Dev.
BMI	19 -25	37.08	±2.46
FBS	80-110mgs/dl	84.3	±5.8
TC	150-200mgs/dl	202.98	±44.526
TGs	120-150mgs/dl	135.89	±47.203
HDL	35-60mgs/dl	40.27	±4.39
LDL	100-110mgs/dl	134.42	±41.003
VLDL	2-30mgs/dl	26.05	±6.27
Prolactin(lactating♀)	70-100ng/ml	34.88	±9.43

Table: 2 ONE WAY ANOVA OF MEAN ± SD OF TC, TG, HDL, LDL WITH PROLACTIN (N = 220)

Source	*SS*	*df*	*Variance*	
Between gr	4446889.83	4	1111722.46	F ratio
Within gr	1314039.78	1095	1200.04	926.4073
Total	5760929.62	1099		

The f-ratio value is 926.4073. The p-value is < .00001. The result is significant at p < .05.

Tukey HSD Post-hoc Test...

Group 1 vs Group 2: Diff=-66.0909, 95%CI=-75.1121 to -57.0697, p=0.0000

Group 1 vs Group 3: Diff=-161.7046, 95%CI=-170.7258 to -152.6834, p=0.0000

Group 1 vs Group 4: Diff=-67.8864, 95%CI=-76.9076 to -58.8652, p=0.0000

Group 1 vs Group 5: Diff=-167.0946, 95%CI=-176.1158 to -158.0734, p=0.0000

Group 2 vs Group 3: Diff=-95.6137, 95%CI=-104.6349 to -86.5925, p=0.0000

Group 2 vs Group 4: Diff=-1.7955, 95%CI=-10.8167 to 7.2257, p=0.9827

Group 2 vs Group 5: Diff=-101.0037, 95%CI=-110.0249 to -91.9825, p=0.0000 o

Group 3 vs Group 4: Diff=93.8182, 95%CI=84.7970 to 102.8394, p=0.0000

Group 3 vs Group 5: Diff=-5.3900, 95%CI=-14.4112 to 3.6312, p=0.4772

Group 4 vs Group 5: Diff=-99.2082, 95%CI=-108.2294 to -90.1870, p=0.0000

one-way ANOVA of Mean±SD (TC, TG.HDL, LDL and PRL) of entire study group was statistically significant (P Value < 0.00001) as shown in Table 2. Lipid profile correlates with Prolactin in postpartum period irrespective of mode of delivery and longevity of postpartum period. Turkey HSD posthoc test showed HDL

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values did not correlate with PRL with p value < 0.477. Similarly, Tgs and LDL did not correlate with P value of <0.9827. This means a reduction in hepatic lipogenesis did not influence LDL levels. Hitherto the notion of cardiovascular protection from atherogenesis during breast feeds could not be biochemically confirmed in our study.

Table 3 ONE WAY ANOVA OF MEAN ± SD OF TC, TG, HDL, LDL WITH PROLACTIN for individuals < 3months postpartum (N = 150)

	TC	TG	HDL	LDL	PRL
Mean	**254.2667**	**147.866**	**41.8667**	**180.8667**	**33.4627**
Std.Dev.	**29.1804**	**68.6199**	**6.1046**	**31.6496**	**8.74**
Source	***SS***	***df***	***Variance***		
Between gr	**5313285.84**	**4**	**1328321.46**	**F ratio**	
Within gr	**994655.06**	**745**	**1335.11**	**994.9173**	
Total	**6307940.91**	**749**			

The f-ratio value is 994.9173. The p-value is < .00001. The result is significant at p < .05.

Table 4 ANOVA of lipid profile & PRL in lactating menstruating mothers(N=62) more than 3 months postpartum

	TC	TG	HDL	LDL	PRL
Mean	**175**	**157.7**	**57.5**	**105.5**	**12.1**
Std.Dev.	**±25.8**	**±21.1**	**±13.2**	**± 26.5**	**±0.984**
Source	***SS***	***df***	***Variance***		
Between groups	**1147311.98**	**4**	**286827.99**	**F ratio**	
Within groups	**121286.80**	**305**	**397.66**	**721.2865**	
Total	**1268598.79**	**309**			

The f-ratio value is 721.2865. The p-value is < .00001. The result is significant at p < .05.

ANOVA of lipid profile and PRL of lactating, menstruating women (N=62) was found to be statistically significant p value <0.00001 (Table 4). This finding proves menstruation did not influence either PRL levels or Lipid profile inspite of surge in estrogen levels.

Table 5 ANOVA of Mean±SD of Nonlactating Postnatal mothers(N=80)

	TC	TG	HDL	LDL	PRL
N	80	80	80	80	80

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Mean	175.3	64.1	54.6	107.3	2.23
Std.Dev.	32.4	32	13.9	29.1	0.06
Result Details					
Source		***SS***	***df***	Variance	
Between-treatments		1341682.45	4	335420.61	*F* = 538.606
Within-treatments		245988.90	395	622.756	
Total		1587671.36	399		

The *f*-ratio value is 538.606. The *p*-value is < .00001. The result is significant at $p < .05$.

Nonlactating postnatal women # 3 to 5 days of parturition (N=80) have negligible prolactin levels as shown in Table 6 2.23± 0.06. ANOVA demonstrated statistically significant correlation of lipid profile with PRL P value < 0.00001. Unpaired student's 't' test of mean and SD of PRL with BMI, and TC in Non-lactating women as well as lactating menstruating mothers was statistically significant with P value <0.0009 and <0.00001 respectively (Table 6). Similarly, PRL vales in different states of postpartum period correlated significantly as shown in Table 6 (P value <0.00001)

Table 6 Unpaired 't' test results

Group	Parameter	t	P value
220(Total study group)	BMI /PRL	3.348	<0.0009
80(non-lactating mothers)	TC/PRL	47.77	<0.0001
62(Lactating Menstruating mothers)	TC/PRL	12.65	<0.0001
Lactating- menstruating / Lactating nonmenstruating ♀	PRL/PRL	89.59	<0.0001
<3months / > 3months parturition	PRL/PRL	2.58	<0.0106

Negligible portion of study group revealed occurrence of menstrual cycles once in 3 or 4 months. They were not segregated for statistical analysis.

Discussion

In this cross-sectional study among 220 lactating mothers, we found only negligible portions were offering artificial feeds to their infants. Most women were menstruating from 3 months postpartum period. Lipid profile of menstruationg and nonmenstruating lactating mothers was statistically studied.

The study group perse did not show much deviation from normal range regarding lipid profile. Prolactin levels were much lower than expected range of 70 – 110ng/ml.

Lactating, Nonmenstruating women showed high TC, Tg and LDL levels, mean ±SD being 254.2667±29.1804, 147.8667 ± 68.6199 and 180.8667± 31.6496 respectively. This contrasts with the study done by Markku J T Kallio et al who proved reduced TC, Tg and LDL in mothers who have breast fed exclusively for prolonged periods.[5]

We could not detect high PRL levels in any of the subdivisions of the study group like those menstruating/ nonmenstruating / immediate postpartum women. The reason for such a finding could not be explained as their antepartum history, menstrual history was normal. Similar values were observed in a study conducted by Griesa villa et al. [6.]

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In our study a statistically significant correlation was observed in all subdivisions between lipid parameters and PRL as shown by ANOVA in Tables 2,3,4, & 5 (P values being < 0.00001). This is consistent with the study of Ziyi Zhang, Anthony L Piro et al [7]. As our study deals with physiological hyperprolactinemia, this correlation can neither prove nor disprove any cardiovascular risk.

Prolactin levels showed statistically significant correlation with BMI, TC, and PRL as depicted by unpaired student's 't' test Table 6 (P value <0.0009, <0.00001 and <0.0106 respectively). Mean BMI in our study group was 37.08 ±2.46 indicates moderate obesity. This may cause suppression of milk production by suckling. [8]

Onset of menstruation after parturition or longevity of breast feeding did not affect either lipid profile or BMI or PRL levels as shown by the Mean PRL values of 36.753±9.89 and 33.013 ± 8.76 in our study.

We selected normotensive individual whose FBS values were within normal range. In a future study we may include Gestational diabetes individuals and study the effect of breast feeding on plasma insulin levels.

Conclusion

Lactation is a physiological process, altering mothers maternal lipid metabolism . Mobilisation of nutrients to mammary tissues and diversion to milk production are key notes. We made an attempt to correlate alterations in lipid metabolism to prolactin levels. Serum Prolactin levels were unexpectedly low irrespective of the stage of parturition of the study group. We could not prove or disprove the significant influence of Prolactin on Serum lipoprotein values. However, we could establish significant correlation of Prolactin with lipid profile and BMI. Further study on this topic may be conducted including GDM, PIH and include gravida para division among study groups.

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References

1. Butte NF, Hopkinson JM, Mehta N, Moon JK, Smith EO. Adjustments in energy expenditure and substrate utilization during late pregnancy and lactation. Am J Clin Nutr. 1999;69:299–307. [PubMed] [Google Scholar]
2. Dewey KG. Energy and protein requirements during lactation. Annu Rev Nutr. 1997;17:19–36. [PubMed] [Google Scholar
3. Burnol A.F., Leturque A., Ferré P., Girard J. Glucose metabolism during lactation in the rat: quantitative and regulatory aspects. Am. J. Physiol. 1983;245:E351–E358. [PubMed] [Google Scholar]
4. Ramos-Roman MA, Syed-Abdul MM, Casey BM, Alger JR, Liu YL, Parks EJ. Lactation alters the relationship between liver lipid synthesis and hepatic fat stores in the postpartum period. J Lipid Res. 2022 Nov;63(11):100288. doi: 10.1016/j.jlr.2022.100288
5. MJT Kallio, Martti A Simes, Jaakka Perheentupa, Leena Salamenpera, Tatu A. Miettinen Serum cholesterol and lipoprotein concentrations in mothers during and after prolonged exclusive lactation. Metabolism Vol 41, Issue 12, Dec 1992 PP1327-1330 https://doi.org/10.1016/0026-0495(92)90103-H
6. Vila, G., Hopfgartner, J., Grimm, G., Baumgartner-Parzer, S., Kautzky-Willer, A., Clodi, M., & Luger, A. (2015). Lactation and appetite-regulating hormones: Increased maternal plasma peptide YY concentrations 3–6 months postpartum. British Journal of Nutrition, 114(8), Oct. 2015 PP1203-1208. DOI: https://doi.org/10.1017/S0007114515002536
7. Ziyi Zhang, Anthony L Piro, Amina Allalou, Stacey E Alexeeff, Feihan F Dai,Erica P Gunderson, Michael B Wheeler .Prolactin and Maternal Metabolism in Women With a Recent GDM Pregnancy and Links to Future T2D: The SWIFT Study J Clin Endocrinol Metab. 2022 Sep; 107(9): 2652–2665.. doi: 10.1210/clinem/dgac346
8. Rasmussen KM, Kjolhede CL. Prepregnant overweight and obesity diminish the prolactin response to suckling in the first week postpartum. Pediatrics. 2004 May;113(5):e465-71. DOI: 10.1542/peds.113.5.e465 .

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