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LACTATING INDIAN WOMEN WITH MEDICAL ABNORMALITIES IN PRIMIGRAVIDA:

A COMPREHENSIVE RESEARCH

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ABSTRACT

Backgroundandobjectives: Colostrum, the first fluid generated by mothers, is distinct in its nutrient quality and non-nutritive bioactive substances that promote survival and good growth. The research analyzes total proteins, triglycerides, immunoglobulin A, lactose, and calcium in normal colostrum with PIH, GDM, and Anaemia individuals in primigravida to see if there are significant alterations.

Methods: The research was done on lactating mothers from the Deccan College of Medical Science, Hyderabad, India, with their approval. 80 postpartum women involved in the study, 20 as controls and 60 as instances of PIH, anaemia, and GDM. All cases were examined for protein, triglycerides, IgA, lactose, and calcium. SPSS 17.0 was used to analyse the data. Descriptive results are presented as mean and SD of several groups.

Result: Normal blood pressure (controls) was 120$\pm$6.5 mm Hg systolic and 79$\pm$3.1 mm Hg diastolic without oedema or proteinuria. Haemoglobin is 10.8+0.7g/dl. PLBS=130.7+7.6 and FBS=949.5. (92$\pm$14.6 mg/dl) Normal FBS and PLBS OGTT results. 122.5$\pm$7.8 mm Hg systolic, 74$\pm$6.8 mm Hg diastolic, 40% (8/20) oedema, 70% proteinuria. PIH, anaemia, and GDM diminish protein ($p<0.005$). PIH and anaemia had higher triglycerides than GDM ($p<0.005$). GDM exhibited more IgA than anaemia and PIH. GDM has greater mean lactose

levels than anaemia, PIH, and the control group. Lactose levels are similar in anaemia and controls. ($p<0.005$) Anaemia, PIH, and GDM lower calcium.

Conclusion: Human milk contains number of of bioactive substances that fight infection, inflammation, immunological maturation, organ development, and healthy microbial colonisation. Pregnancy hypertension impacts lactogenesis and colostrum content. Nutrition impacts milk composition. GDM affects pregnant women, mother and infant. Screening, diagnosing, and treating hyperglycemia are critical for mother and child. Regardless of diet, multivitamins are required throughout lactation. The study can't characterise all bioactive human milk components**.**

Keywords: Primigravida, Colostrum, Pregnancy, Anaemia, Protein, Triglycerides

INTRODUCTION:

Colostrum, a thick, yellow breast secretion produced after birth and for the first 1 to 5 days of lactation, is a precursor to milk. Breast milk operates nutritionally, immunologically, behaviorally, and economically.

It provides a neonate with high-quality proteins, lipids, carbohydrates (lactose), minerals, electrolytes, vitamins, and anti-infective compounds like immunoglobulins. Colostrum has higher immunoglobulins than mature milk, which benefits newborns. Due to its biological nature, human milk is the best newborn nutrition throughout the first six months of life. The breastfeeding mother secretes 150–300 ml of colostrum every 24 hours for the first 1–5 days following delivery. After 14 days postpartum, colostrum offers 58 Kcal/100 ml of energy. Transitional milk, between 6 and 14 days postpartum, has 74 Kcal/100 ml of energy, and mature milk has 71 Kcal/100 ml. Bioactive human milk is dynamic. Composition fluctuates from colostrum to late lactation, between meals, and throughout the day. Human milk is the standard infant feeding. Vitamins A, B1, B2, B6, B12, D, and iodine vary in human milk based on the mother's diet and body reserves [1,2,3].

Amino acids make proteins. They're essential for a baby's development. Human milk proteins are whey and casein. Colostrum contains casein, -lactalbumin, lactoferrin, secretory Ig A, lysozyme, and albumin. Human milk protein concentration is unaffected by the mother's diet, however it rises with maternal body weight for height and lowers in moms who produce more milk. Triacylglycerol is milk's FAT component. In the 1- and 3-positions of triglycerides and the 2-position of human milk fat, palmitic and oleic acids are detected in high amounts. Milk

fat varies the most. First milk of a feed has more milk fat than last milk. Use 102 to increase newborns' nutritional management and satiety.Human milk's fatty acid content depends on the mother's diet, especially long-chain polyunsaturated fatty acids (LCPUFAs) [3,4,5]. Immunoglobulins (Ig) are saline-soluble protein molecules that protect human milk. They're plentiful and relieve infections and inflammation.

Colostrum contains 2% Ig G and secretory Ig A, which protects babies from various ailments. Immunological components in early milk help infant survival. Human milk sugar is lactose. Lactose is the least variable macronutrient in human milk, however more milk-producing mothers have greater lactose contents.Oligosaccharides make up 1 g/d L of human milk's other essential carbohydrates, depending on breastfeeding stage and mother genetics. Oligosaccharides are non-nutritive bioactives. Colostrum's low lactose concentration suggests that its principal functions are trophic and immunologic, not nutritional. Calcium is less prevalent in colostrum than mature milk. Colostrum has more salt, chloride, and magnesium than later milk, but less potassium and calcium. Minerals and vitamins are essential for growth, development, and metabolism. They're bodywide coenzymes. Natural balance and colostrum supply help preserve health. Colostrum has enough C, E, and A. These vitamins make colostrum antioxidant [5,6,7].

The American Academy of Pediatrics recommends a vitamin K injection to avoid baby haemorrhage, which can occur independent of the mother's diet. Insufficient maternal sun exposure, a global problem, contributes to low vitamin D levels in human milk. Human milk content varies by mother, community, feeding, and day. Maternal, environmental, and milk expression/management factors affect human milk composition. Eclampsia, diabetes, and anaemia can affect colostrum composition. PIH contributes to premature birth, maternal morbidity, and mortality. Pregnancy-related hypertension alters lactogenesis and colostrum. This affects the colostrum's total protein and IgA concentration, hindering the newborn's growth. In India, pregnancy-induced anaemia is common (PIA) [7,8,9]. Less than 11 g/dL is PIA (WHO). The ICMR defines anaemia in India as haemoglobin levels below 10%. Maternal malnutrition causes iron, anti-anemic medicines, folic acid, and vitamin B12 deficits. Maternal nutrition affects milk composition, changing colostrum's total proteins, calcium, and Ig A content. Iron deficiency anaemia is particularly common among pregnant Indian women. Older moms had more anaemia. Studies demonstrate that acute iron deficiency affects iron-dependent tissue enzymes, affecting metabolic pathways that may affect lactation in anaemic mothers. These changes impede the newborn's growth and remove

colostrum's protective components, increasing neonatal mortality. GDM refers to a condition that produces abnormal physiological changes in the body's carbohydrate metabolism (glucose). Pregnancy-related GDM is prevalent [10,11,12].

Anomalies in carbohydrate metabolism can affect milk and colostrum content. Lactose and milk fat are synthesised from glucose. Human milk's nutritional composition and non-nutritive bioactive components enhance newborn survival and development. Anaemia, pregnancy-induced hypertension, premature labour, gestational diabetes mellitus, maternal mortality, perinatal mortality, and neonatal mortality are major health hazards during pregnancy and delivery. Understanding human milk composition helps manage malnourished newborns. We will quickly analyse the nutritional content of human milk (colostrum) and present an overview of its varying macronutrient makeup, including total proteins, lipids, Ig A, carbohydrates (lactose), and calcium [12,13].

MATERIAL AND METHODS:

After receiving their permission, the current investigation was carried out on three study participants of lactating mothers and a control group in the Deccan College of Medical Science, Hyderabad, India. A total of 80 postpartum women from OHRC/PEH took part in the study, 20 of whom served as controls. Of the remaining 60 women, 20 each represented cases of PIH, anaemia, and GDM. Group 1: Twenty lactating women with straightforward pregnancies make up the control group. Group 2: Pregnant women with hypertension brought on by pregnancy; Group 3: Pregnant women with anaemia; Group 4: Pregnant women with diabetes; each group contains 20 instances.

Within 24 hours of birth, 5ml of colostrum was extracted from a single subject's breast into sterile storage vials, maintained at -20°C, and evaluated within two weeks. Pregnancy-related PIH, anaemia, and GDM diagnoses were confirmed. Estimations were performed on all instances for proteins, triglycerides, IgA, lactose, and calcium.

Utilizing version 17.0 of SPSS software, the data was examined. The mean and SD of various parameters in several groups are used to express the descriptive results. Calculating significance (p value) in between the groups was done using an independent "t" test. P values under 0.005 were deemed significant, and values over 0.005 were deemed non-significant.

Inclusion criteria:

All primigravidae women carrying singletons, with gestational ages ranging from 18 to 30 years old and a mean gestational duration of 39 weeks at delivery.

Exclusion criteria:

Cases with any gynaecological or medical issues prior to pregnancy.

RESULTS:

TABLE 1: Characteristics of patientsin antenatal period.

S.NO	Parameter	Control (N =20)	Group 'A' PIH	Group ' B' ANAEMIA	Group 'C' GDM
1	Blood Pressure (mm.Hg) Systolic Diastolic	120±6.5 79 ±3.1	149±10.1 97 ±8.0	115 ±5.7 78 ±3.6	122±7.8 74 ±6.8
2	Oedema	Absent	Present in All 20 Cases	Absent	Present in 8 Cases
3	Proteinuria	NIL	Present in 12 Cases	Nil	Present in 14 Cases
4	Hb (g/dL)	10.8±0.7	10.5±0.8	7.74±0.5	10.4±0.6
5	Blood Glucose FBSmg/dL	94 ±9.8	90±14.10	92.4±115	135.4±13.38
	PLBS mg/dL	130.8±7.6	125.8±5.53	122 ±5.8	218 ±17.8

After 20 weeks, patients with pregnancy-induced hypertension had blood pressures above 140/90 mm Hg. GDM patients exhibit impaired OGTT after 75 g glucose following an overnight fast. Diagnosis based on venous blood fasting glucose above 140mg/dl and/or post-prandial reading > 200mg/dl. A haemoglobin level below 10 g/dl indicates pregnant anaemia. In this study, normotensive patients (controls) had systolic blood pressure of 120$\pm$6.5 mm Hg and diastolic blood pressure of 79$\pm$3.1 mm Hg, without oedema or proteinuria. Haemoglobin averages 10.8$\pm$0.7 g/dl. Control group FBS is 949.5 mg/dl, PLBS is 130.7$\pm$7.6. Normal controls weren't hypertensive, anaemic, or diabetic.

In group A (PIH), mean systolic and diastolic blood pressures are 149.5±10.1- and 97+8.0- mm Hg, respectively. Proteinuria was discovered in only 60% (12 of 20 individuals) using the dipstick method 6 hours apart. Their mean haemoglobin is 10.5±0.8 g/dl and their mean blood glucose levels are 90±14.0 and 125±48.3 mg/dl, with no glucose intolerance by OGTT. No anaemia or diabetes. Pregnancy-induced hypertension is present in this population. Group B (anaemic) had 7.74±0.5 g/dl haemoglobin. Low haemoglobin Their systolic blood pressure is 115±5.7 and diastolic is 78±3.6. Normal OGTT results for FBS (92±14.6 mg/dl) and PLBS (122±44.2 mg/dl). Non-hypertensive and non-diabetic. OGTT demonstrates impaired glucose intolerance in group C (GDM) with FBS 135±13.33 mg/dl and PLBS 218.2±17.8 mg/dl. This group has high glucose. Blood pressure is 122.5±7.8 mm Hg systolic and 74±6.8 mm Hg diastolic, with oedema in 40% (8 out of 20 cases) and proteinuria in 70%. (14/20) Haemoglobin averages 10.40.6g/dL. This GDM group wasn't anaemic or hypertensive (GDM).

Table-2; Mean values and standard deviations of studied parameters in controls and cases (PIH, Anemic, GDM).

S.NO	Parameter	Controls		PIH		ANAEMIA		GDM	
		MEAN	S. D	MEAN	S. D	MEAN	S. D	MEAN	S. D
1	Total protein	6.05	±0.578	4.22	±0.8102	4.31	±0.642	5.75	±0.762
2	Triglycerides	940	±159.98	1050	±218.27	980	±286.04	785	±126.14
3	IgA	2.1	±0.602	1.5	±0.275	1.3	±0.256	1.9	±0.574
4	Lactose	4.5	±0.836	4.79	±0.938	4.5	±0.181	3.75	±0.461
5	Calcium	27	±2.90	23.5	±3.25	21.5	±3.27	25	±3.43

Table-3: One way ANOVAs P and F values

S NO	Parameter	F -Value	P value
1	Total Protein	36.595	0.001
2	Triglycerides	5.883	0.001
3	Ig A	12.810	0.001
4	Lactose	6.468	0.001
5	Calcium	10.457	0.001

Table-4:'t' values- correlation between control group and instances (PIH,ANAEMIA,GDM).

S.NO	Parameter	Controls			PIH		ANAEMIA
		PIH	ANAEMIA	GDM	ANAEMIA	GDM	GDM
1	Total protein	6.376	6.122	1.926	-0.348	-5.996	-6.787
2	Triglycerides	-1.685	-0.613	3.310	0.814	4.514	2.951
3	I g A	3.984	6.117	1.365	2.389	- 2.588	-4.479
4	Lactose	-1.051	-3.101	3.095	1.212	4.543	3.555
5	Calcium	4.294	6.320	2.302	2.114	-1.617	-3.103

When comparing mean values between and among groups, p <0.005 is significant. PIH and anaemia have lower total protein than GDM and the control group (p<0.005). Triglycerides are lower in GDM, greater in PIH, and somewhat higher in anaemia (p<0.005). Anaemia and PIH have lower mean IgA levels than GDM, which has a modest decrease. GDM has a lower mean lactose value than Anaemia, PIH, and the control group, but PIH has a larger value. Lactose mean value is the same in Anaemia and controls. Anaemia, PIH, and GDM have lower calcium levels than control groups (p<0.005).

DISCUSSION:

Colostrum has two purposes: it provides the infant with essential nutrients and immunological and defensive factors as well as all the materials required for normal metabolism.

The current study focused on the amounts of total protein, triglycerides, IgA, lactose, and calcium in the colostrum of 4 groups of women. Patients in group 1 did not have oedema, proteinuria, diabetes, or anaemia, and their blood pressure was normal. This group's average total protein concentration was found to be 6.05$\pm$0.578, its average triglyceride concentration to be 940$\pm$159.98, its average IgA concentration to be 2.1$\pm$0.602, its average lactose concentration to be 4.5$\pm$0.836, and its average calcium concentration to be 27$\pm$2.90, all of which fall within the normal range. This experiment's results showed lactose levels that were equivalent to those indicated in other studies. the milk proteins lactoglobulin, lactalbumin, and casein [14,15,16]. These are created in the mammary gland utilising amino acids from the blood. Along with delivering amino acids for growth, the proteins in colostrum aid in digestion, host defence, and tissue maturation. Triglycerides make up the majority of the lipids in colostrum.

The neonatal brain develops in a protective manner thanks to lipids. Colostrum's immunoglobulin IgA, which predominates, shields the child from a number of diseases. Lactose is a vital source of energy for the newborn. It is created by the mammary gland using glucose and glycogen. Between calcium that is free and calcium that is bound to citrate, casein, and phosphate, there are two types of calcium in milk. Numerous findings claim that lactogenesis includes relatively constant free calcium concentrations. The participants in group 2 met the requirements for having pregnancy-induced hypertension (PIH) [16,17,18]. Particularly preeclampsia is a major global source of maternal and newborn morbidity and mortality. This frequent medical issue that develops during pregnancy has various detrimental effects on the growth and development of the unborn child in utero and during the perinatal period. This group's mean total protein content was lower, at 4.22$\pm$0.81. Because lactalbumin accounts for 60% of the total protein nitrogen in colostrum, it is possible that lactalbumin is to blame for the decline in total proteins observed in the current study and previous experiment. If this relative lack of substrate and lactalbumin is the root cause of the lower lactose concentrations in PIH cases, more investigation is necessary.

Lowered total proteins in PIH patients may be due to vasoconstriction, which reduces blood flow and the availability of amino acids to the mammary gland. Brantzaeg postulated that the presence of proteinuria in PIH in certain participants must have contributed to the relative shortage of amino acid pool for protein synthesis in the mammary gland because the bulk of the amino acids in the mammary gland are channelled for hepatic protein synthesis. Therefore, decreased total protein values in PIH are caused by a decrease in blood flow and a deficiency in amino acid availability. This group's triglyceride content levels were discovered to be significantly greater (1050±218.27). During the first two days following birth, triglycerides are mostly produced from plasma rather than in the mammary gland from fatty acids and glycerol. The significant rise in triglycerides found in colostrum in this study must be due to our. The mean Ig A levels significantly decreased in PIH patients (1.5±0.275) [17,18,19].

According to Brantzaeg, secretory Ig A antibodies are produced locally in the mammary gland by cells from the generalised system of specialised B-lymphocytes. According to Brantzaeg's theory, the mammary gland is probably where the IgA production is impeded. Therefore, decreased IgA production accounts for the significantly lower IgA concentrations in both PIH patients and anaemic cases. There is no statistically significant difference between the two readings, according to the study, which found that the mean lactose concentration in this group was 4.79±0.938. Additionally, it was demonstrated that the mean calcium concentration had significantly dropped (23.5±3.25). It has been established that decreasing amounts of calcium-binding molecules, like as proteins, cause calcium concentrations to decrease in late lactation. Research into calcium-binding compounds, particularly in pregnancy-related diseases where their enhanced concentrations are the cause of higher calcium levels during lactogenesis, may therefore only be able to explain the changed calcium concentrations in these diseases [18,19].

Patients in group 3 (Anemia) were discovered to be anaemic in accordance with the afore mentioned criteria. The most typical pregnancy issue among Indian women is anaemia. It is a strong clinical indicator of malnutrition and is associated with low socioeconomic status. Average total protein (4.31±0.642), IgA (1.3±0.256), and calcium (21.5±3.27) values for these groups were found to have reduced considerably and were statistically significant (p0.005). While not statistically significant, the average triglyceride concentration increased slightly (980±286.04) [19].

The participants in group 4 were found to have gestational diabetes based on the aforementioned criteria. Pregnancy-related hyperglycemia has been found to be associated with a range of negative effects for both the mother and the unborn child. The detection of GDM allows for the identification of pregnant women who are at risk for both immediate and long-term complications. The mean total protein content in these investigations was found to be somewhat lower than the control group (5.75$\pm$0.762). It was therefore of no statistical importance. The average triglyceride concentration was found to have dramatically lowered (785$\pm$126.14), with the difference from the control group being the most notable (940$\pm$159.98). The mean lactose content in this group (3.75$\pm$0.464) was significantly lower than that in the control group (4.5$\pm$0.836). a small but statistically insignificant decrease in both the mean calcium concentration (253.43) and the mean IgA concentration (1.9$\pm$0.574) [19,20].

The abnormalities in lipid metabolism in the mammary gland cells brought on by insulin resistance brought on by glucose intolerance likely affect the esterification of free fatty acids or increase lipoprotein lipase13's lipolysis. Additionally, because glucose is a critical substrate for the synthesis of lactose, insulin resistance will lead to inefficient glucose utilisation, which is associated with reduced lactose levels. The drop in protein content may also be brought on by a corresponding decline in Ig A levels, demonstrating that starvation affects the mammary gland's ability to produce Ig A. In light of this, it seems likely that anaemia, a prominent clinical signal of malnutrition, has a considerable effect on the production of IgA.

Two more recent studies, Platt (1961) and Yoneyama (1994), revealed that mothers who were undernourished also had lower milk protein levels. Additional concerns for women with PIH, anaemia, and GDM include prematurity, small-for-gestational-age newborns, macrosomia, hypoglycemia, respiratory distress syndrome, polycythemia, and a high rate of maternal and foetal mortality [20,21,22]. Premature babies frequently have neurological and mental problems in addition to limited growth. Neonates born to women with low iron levels had lower APGAR ratings and a higher first-year mortality rate. In addition to the aforementioned issues, nutritional and protective element deficiencies in colostrum increase the risk of morbidity and mortality during the perinatal period. Therefore, newborns who are afflicted and deficient in essential colostrum components because of PIH, anaemia, and GDM during pregnancy should be given the proper supplements and anti-infection treatments.

CONCLUSION:

Human milk's nutritional content and non-nutritive bioactive substances encourage survival and healthy growth. Human milk is the best food for newborns.

Colostrum is a dynamic, multi-faceted fluid that supports newborn health and growth. Knowledge of human milk composition is expanding, leading to a better understanding of its function in newborn health and development, which can benefit preventative and protective aspects of paediatrics and neonatology. Human milk includes hundreds to thousands of bioactive compounds that defend against infection, inflammation, immunological maturation, organ development, and healthy microbial colonisation. Pregnancy hypertension affects lactogenesis and colostrum composition.

Maternal nutrition affects milk composition. GDM affects many pregnant women. GDM can harm both mother and baby. Hyperglycemia screening, diagnosis, and management are crucial to minimising problems for mother and child. Regardless of maternal diet, multivitamins are needed during lactation.This study cannot characterise all human milk bioactive components.

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Conflict of interest:

None

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