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Banana Stem and Prolactin: A Dietary Intervention for Postnatal Mothers

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ABSTRACT
Breastfeeding is accepted as the best food for newborn babies and it is recommended by many experts and organisations like WHO and UNICEF. Although breastfeeding is the ideal practice, numerous mothers fail to do due to lactation problems and insufficient breastmilk production is one among them. The current study aims to identify the effects of banana stem diet on blood prolactin levels (BPL) for the postnatal mothers and to assess their satisfaction level after the intervention with nursing care provided. Methods: The study included 100 postnatal mother who has undergone vaginal delivery. Quasi experimental study was adopted and selected only 4th-day postnatal mothers with lactation problem. Data was collected in two phases: first phase was screening and then follow by home visit and intervention was provided for one week. BPL was checked before and after the administration of the intervention. The experimental group receive standardised diet where as the control group receive a routine diet. Result: The study found that a banana stem-based diet significantly increased BPL in postnatal mothers. The experimental group has shown a greater significant compare to the control group with ($t = 12.64$, $p < 0.001$). These results support the effectiveness of banana stem as an effective dietary intervention to enhance lactation.

Keywords: *Banana stem, dietary intervention, blood prolactin level, lactation support, postnatal mother.*

1. INTRODUCTION

Breastfeeding is accepted as the most ideal food for the newborn babies, which has all the essential nutrients. Breastfeeding practice is widely recognised as the most advantageous diet for the newborn which is beneficial for the baby as well as mother. The World Health Organization (WHO) prioritise the importance of continuous breastfeeding for six months and during this period, even small amounts of water should not be given. WHO stressed more on exclusive breastfeeding as it is very essential for the growth and development of the newborn, it also supports the immune system of infants. [1]. Despite global recommendations and the continuous efforts by WHO, UNICEF and expert health care personnel, the rate of exclusive breastfeeding remains at suboptimal levels globally.

The process of lactation and breastfeeding normally start between 2nd and 5th day following child birth irrespective of the mode of delivery [2,3]. However, many mothers faced challenges breastfeeding, and less milk production is one of the factors often leading to early supplementation with formula or bottle feeding. Reasons for insufficient lactation include stress, emotional disturbances that have been seen to bear a negative impact on milk production, postpartum depression and maternal mindset [4,5].

When their milk supply doesn't meet it, many mothers will switch to cow 's milk and bottle feeding options which can expose a newborn baby to infection [6]. Although there are pharmaceutical options to increase milk production, postpartum women's lack of awareness, cost, and accessibility limit their use. Many communities use traditional dietary practices to increase breast milk production in response to these difficulties. Because of their alleged galactagogue qualities, which studies have demonstrated, banana stems and flowers are frequently consumed in areas such as Northeast India.[7–9].

Flavonoids and alkaloids, two bioactive substances abundant in these foods, are believed to increase prolactin, a hormone necessary for lactogenesis (Wray et al., 2021). According to research, these phytochemicals have the ability to stimulate mammary gland activity and affect endocrine pathways. [10]. Studies have demonstrated that these phytochemicals can stimulate mammary gland activity and affect endocrine pathways. [11–13]

Additionally, the stem of bananas contains phenolic compounds and saponins like isoquercetin and catechin, which have antioxidant qualities and support the physiological stability and hormonal balance of the mother, both of which are essential for a successful lactation. [14].

The lactogenic potential of banana stem is further supported by comparative studies, such as those on the flavonoids found in mulberry leaves [15]. Banana flower extract dramatically raised serum prolactin levels and enhanced postpartum mothers' production of breast milk, according to empirical data from Indonesia [16]. Other studies looking into how natural galactagogues affect breastfeeding outcomes have found similar results. [17]

Even though traditional diets like banana stem are inexpensive, easily accessible, and simple to prepare, their effectiveness needs to be thoroughly tested by science. Given the drop in breastfeeding rates, this is especially crucial for late preterm and early term infants, who are more susceptible to abrupt breastfeeding cessation. [18] Stressed the importance of focused breastfeeding assistance and economical solutions for lactation challenges. This study examines the effect of a banana stem-based diet on prolactin levels in postpartum mothers. It also wants to look at breastfeeding habits and see how happy mothers are with the nursing care they got after giving birth.

Materials and methods: A quasi experimental study was conducted between April 2024 to November 2024. A total of 100 postnatal mothers were recruited using convenient sampling.

The target population comprised postnatal mothers on the fourth day after delivery who were experiencing challenges with breastfeeding. The accessible population included all such mothers residing in the Imphal West district.

Inclusion Criteria:

Mothers on the fourth day postpartum experiencing breastfeeding difficulties due to low milk production

Both primiparous and multiparous mothers who had normal vaginal deliveries

Mothers not using any lactation-inducing medications and willing to participate

Exclusion Criteria:

Mothers who had undergone cesarean sections (LSCS)

Those with postnatal complications such as bleeding or anemia

Mothers of infants with complications, congenital anomalies, or stillbirths

Cases of lactose intolerance, Individuals with psychiatric disorders or those who declined to provide consent

Ethical approval was obtained from the Research Ethical Board (Reference No: A/206/REB/Prop (FP) 207/135/13/2023, dated 24/08/2023).

Procedure of data collection: The study was conducted in two distinct phases. Initial phase is the screening which is done in the Postnatal ward and a follow-up home visit. A structured maternal satisfaction scale, based on a 5-point Likert format and consisting of 10 items, was utilised for the assessment. Strongly disagree =1 to Strongly Agree = 5, and Items 3, 8, and 10 were negatively worded so reverse-scored has been worded (i.e., 1 = strongly agree to 5 = strongly disagree). Scores were interpreted as follows: 1–24: Unsatisfactory, 25–50: Well-satisfied

Maternal satisfaction levels were evaluated on the 11th day postpartum.

2. RESULT

Table 1: Pre test and Post test comparison of Blood prolactin level

BPL	Control Group		Experimental Group	
	Mean	SD	Mean	SD
Pre Test	212.66	21.85	239.28	43.57
Post Test	227.48	12.58	302.90	40.29
Change	14.82	16.647	63.62	35.132
Intragroup (paired t test)	t=6.30, **p<0.001**		t=12.81, **p<0.001**	

In the Control Group, paired t-test analysis revealed a statistically significant increase in BPL scores from pre-test to post-test, with a t-value of 6.30 and a p-value less than 0.001.

Experimental Group: Similarly, the Experimental Group showed an even more pronounced improvement, with a t-value of 12.81 and a p-value of <0.001, reflecting a significant increase in scores from pre-test to post-test.

Both groups exhibited significant improvements in blood prolactin levels post-intervention, with the Experimental Group showing a markedly greater enhancement, highlighting the intervention's efficacy in improving breastfeeding performance.

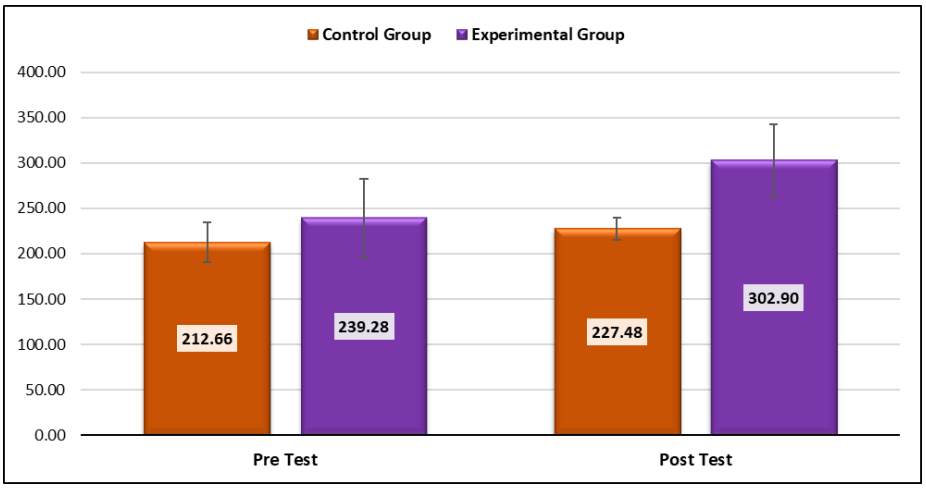

Fig: Pre-test and Post-test blood prolactin level.

Table – 2 : Association of demographic characteristics with BPL Pre & Post Test Scores

Demographic Characteristics		BPL - Pre Test		BPL - Post Test	
		Mean	SD	Mean	SD
Age	21 - 25 years	206.27	21.03	236.18	35.84
	26 - 30 years	234.46	40.93	268.23	51.61
	31 - 35 years	225.22	37.18	275.63	45.37
	36 - 40 years	223.25	34.65	262.50	49.61
	41 - 45 years	225.00	11.31	231.50	7.78
	ANOVA	F =1.30, p = 0.276		F = 1.72, p = 0.152	
Mother's Education	Primary education	222.88	32.95	270.73	54.16
	Secondary education	228.92	41.87	262.69	46.99
	Graduation and above	222.91	28.94	264.48	45.04
	ANOVA	F = 0.33, p = 0.720		F = 0.24, p = 0.787	
Husband's Education	Primary education	219.00	8.49	243.00	31.11
	Secondary education	221.82	31.03	267.56	47.64
	Graduation and above	229.75	41.62	264.02	49.49
	ANOVA	F = 0.60, p = 0.553		F= 0.28, p = 0.758	

Type of Family	Nuclear Family	223.66	36.36	264.91	47.60
	Joint Family	228.02	37.43	265.43	49.08
	unpaired t test	t = 0.59, p = 0.557		t = 0.01, p = 0.957	
Family Monthly Income	Below 10000	236.00	29.36	295.25	60.36
	10001-15000	227.58	36.53	267.40	47.06
	15000 and above	222.17	38.45	258.17	48.46
	ANOVA	F=0.39, p=0.676		F=1.23, p=0.296	

Table 2, explained the mean pre-intervention BPL scores across different age groups ranged from 206.27 (SD = 21.03) for the 21-25 years group to 234.46 (SD = 40.93) for the 26-30 years group, and the post-intervention scores ranged from 231.50 (SD = 7.78) for the 41-45 years group to 275.63 (SD = 45.37) for the 31-35 years group. The ANOVA results for both pre-test (F = 1.30, p = 0.276) and post-test (F = 1.72, p = 0.152) scores indicated no statistically significant differences between age groups, suggesting that age did not significantly affect the BPL scores.

The mean pre- intervention BPL scores for different education levels ranged from 222.88 (SD = 32.95) for primary education to 228.92 (SD = 41.87) for secondary education. The post-intervention scores ranged from 264.48 (SD = 45.04) for those with graduation and above to 270.73 (SD = 54.16) for primary education. The ANOVA results for both pre-test (F = 0.33, p = 0.720) and post-test (F = 0.24, p = 0.787) scores revealed no significant differences, indicating that the mother's education level did not influence the BPL scores significantly.

Pre-test BPL scores for different education levels of the husband ranged from 219.00 (SD = 8.49) for primary education to 229.75 (SD = 41.62) for those with graduation and above. The post-test scores ranged from 243.00 (SD = 31.11) for primary education to 267.56 (SD = 47.64) for secondary education. The ANOVA results for both pre-test (F = 0.60, p = 0.553) and post-test (F = 0.28, p = 0.758) scores showed no significant differences, suggesting that the husband's education level did not significantly impact the BPL scores.

The pre-test blood prolactin levels for mothers from nuclear and joint families were 223.66 (SD = 36.36) and 228.02 (SD = 37.43), respectively, while the corresponding post-test values were 264.91 (SD = 47.60) and 265.43 (SD = 49.08). The unpaired t-test for both pre-test (t = 0.59, p = 0.557) and post-test (t = 0.01, p = 0.957) scores showed no statistically significant difference, indicating that the type of family (nuclear or joint) did not have a significant impact on BPL scores.

The pre-test BPL scores for different income groups ranged from 222.17 (SD = 38.45) for those with income above 15,000 to 236.00 (SD = 29.36) for those with income below 10,000. The post-test scores ranged from 258.17 (SD = 48.46) for income above 15,000 to 295.25 (SD = 60.36) for those with income below 10,000. The ANOVA results for pre-test (F = 0.39, p = 0.676) and post-test (F = 1.23, p = 0.296) scores revealed no significant differences, indicating that family income did not significantly affect the BPL scores.

Table – 3 : Association of obstetric characteristics with BPL Pre & Post Test Scores

Obstetric Characteristics		BPL - Pre Test		BPL - Post Test	
		Mean	SD	Mean	SD
Gravida	Primi gravida	232.02	44.65	269.47	51.96
	Multi gravida	220.16	26.43	261.08	44.30
	unpaired t test	t=1.62, p=0.108		t=0.87, p=0.386	
Parity	One child	231.33	43.43	267.00	51.43
	Two child	220.15	28.91	258.27	43.88
	Three child and above	220.29	15.32	292.29	41.45
	ANOVA	F=1.15, p=0.321		F=1.59, p=0.210	

The association between obstetric characteristics and BPL pre-intervention and post-intervention scores was evaluated to examine the potential influence of factors such as gravida and parity on breastfeeding performance.

Regarding gravida status, primi gravida women had a mean pre-test BPL score of 232.02 (SD = 44.65) and a post-test score of 269.47 (SD = 51.96). In comparison, multi gravida women recorded pre-intervention and post-intervention scores of 220.16 (SD = 26.43) and 261.08 (SD = 44.30), respectively. An unpaired t-test revealed no statistically significant differences in BPL scores between groups at either the pre-test ($t = 1.62$, $p = 0.108$) or post-test ($t = 0.87$, $p = 0.386$) stages, suggesting that the number of pregnancies did not significantly influence BPL outcomes.

In terms of parity, women with one child had a mean pre-test BPL score of 231.33 (SD = 43.43) and a post-test score of 267.00 (SD = 51.43). Those with two children recorded pre-test and post-test scores of 220.15 (SD = 28.91) and 258.27 (SD = 43.88), respectively. Participants with three or more children had a pre-test score of 220.29 (SD = 15.32) and a post-test score of 292.29 (SD = 41.45). ANOVA results indicated no statistically significant differences in either pre-test ($F = 1.15$, $p = 0.321$) or post-test ($F = 1.59$, $p = 0.210$) scores, suggesting that parity has no significant effect on blood prolactin levels.

Table – 4: Post-Intervention Maternal Satisfaction Levels in the Experimental Group

n = 50

Among Experimental Group	Strongly Disagree		Disagree		Undecided		Agree		Strongly Agree	
	No.	%	No.	%	No.	%	No.	%	No.	%
Confident with the diet	0	0.0%	0	0.0%	6	12.0%	28	56.0%	16	32.0%
Very much comfortable with this traditional diet	0	0.0%	0	0.0%	2	4.0%	37	74.0%	11	22.0%
Not comfortable when somebody assists	4	8.0%	26	52.0%	16	32.0%	4	8.0%	0	0.0%
Baby is feeding well after taking this diet	0	0.0%	0	0.0%	4	8.0%	40	80.0%	6	12.0%
Baby passes urine adequately	0	0.0%	0	0.0%	2	4.0%	38	76.0%	10	20.0%
Baby sleeps well without interruption	0	0.0%	0	0.0%	14	28.0%	30	60.0%	6	12.0%
Baby slept well	1	2.0%	23	46.0%	25	50.0%	1	2.0%	0	0.0%
This diet may cause diarrhoea	0	0.0%	25	50.0%	24	48.0%	1	2.0%	0	0.0%
Nurse was very supportive and explained in detail	0	0.0%	0	0.0%	0	0.0%	37	74.0%	13	26.0%
Breast has not produced enough breastmilk	12	24.0%	38	76.0%	0	0.0%	0	0.0%	0	0.0%
Overall Score	59.70±4.45 (%)									

The distribution of cases according to MSS (Maternal Satisfaction Scale) component responses in the Experimental Group reveals varying levels of satisfaction with intervention (banana stem diet) and breastfeeding experiences. The following details reflect the responses from the participants:

Confident with the diet: A majority of respondents (56%) agreed and 32% strongly agreed that they were confident with the diet, while 12% were undecided. No participants disagreed or strongly disagreed.

Very much comfortable with this traditional diet: Most participants (74%) agreed, and 22% strongly agreed, with only 4% being undecided and no one disagreeing or strongly disagreeing.

Not comfortable when somebody assists: A significant portion (52%) disagreed, and 32% were undecided about discomfort when assisted, while 8% strongly disagreed and 8% agreed. No one strongly agreed.

Baby is feeding well after taking this diet: The majority (80%) agreed, and 12% strongly agreed, while 8% were undecided

and no one disagreed or strongly disagreed.

Baby passes urine adequately: 76% of respondents agreed, and 20% strongly agreed, while 4% were undecided. No one disagreed or strongly disagreed.

Baby sleeps well without interruption: 60% agreed, 12% strongly agreed, and 28% were undecided, while no one disagreed or strongly disagreed.

Baby slept well: 46% disagreed, and 50% were undecided, with 2% strongly disagreeing and 2% agreeing. No one strongly agreed.

This diet may cause diarrhoea: A significant number of respondents (50%) disagreed, 48% were undecided, and 2% agreed. No one strongly agreed.

Nurse was very supportive and explained in detail: 74% agreed, and 26% strongly agreed, with no one disagreeing or undecided.

Breast has not produced enough breastmilk: A majority (76%) disagreed, 24% strongly disagreed, and no one agreed or strongly agreed.

3. DISCUSSION

This study explored the impact of a banana stem-based dietary intervention on blood prolactin levels (BPL), breastfeeding behaviours, and maternal satisfaction among postnatal mothers. The results indicated a statistically significant enhancement in BPL scores across both the Control and Experimental groups, with the Experimental group exhibiting a more pronounced improvement**.** This suggests that the banana stem diet may have a positive influence on prolactin secretion, which is essential for effective lactation. A similar study has been conducted in Thailand [8,9]. The improved breastfeeding performance noted in the Experimental group reinforces the potential lactogenic properties of banana stem, corroborating traditional beliefs regarding its advantages in postpartum care.

Positive results were also found for maternal satisfaction, which was measured using a validated 10-item Likert scale. In the Experimental group, the majority of mothers reported positive breastfeeding experiences, including adequate milk production, good infant feeding, and uninterrupted sleep, and the majority also expressed confidence and comfort with the traditional diet. These results demonstrate the intervention's acceptability and perceived efficacy, indicating that culturally appropriate eating habits can improve breastfeeding success and maternal well-being.

Remarkably, neither before nor after the intervention did demographic factors like age, income, family type, or the mother's and husband's educational attainment have a significant impact on BPL scores. Its potential for wider applicability in a variety of populations is increased by the fact that the benefits of the banana stem diet were consistent across various sociodemographic groups. These results are consistent with previous studies that emphasise the value of nutritional interventions in fostering lactation and enhancing the health of mothers. However, by investigating a dietary component that is inexpensive, easily accessible, and culturally significant—banana stem—this study adds to the body of knowledge already in existence. Its incorporation into postpartum dietary recommendations is further supported by the high levels of maternal satisfaction and the lack of negative effects. Despite these encouraging results, the study has some drawbacks. Generalisability may be limited because the sample was selected from a particular geographic and cultural context. Furthermore, long-term impacts on lactation and maternal health might not be captured by the brief follow-up period (11 days postpartum). Although useful, self-reported measures can also be biased.

In order to evaluate long-term results and investigate the biochemical characteristics of banana stems that might be involved in their lactogenic effects, future studies should take longitudinal designs into account. Deeper understanding of postpartum nutrition optimisation may also be obtained through comparative studies with other dietary interventions.

4. CONCLUSION

The results of this study show that a dietary intervention based on banana stems can considerably raise blood prolactin levels and enhance postpartum mothers' ability to breastfeed. The potential lactogenic qualities of banana stem are suggested by the Experimental group's noticeably larger improvement over the Control group after receiving the dietary intervention. High levels of maternal satisfaction also highlight the acceptability and efficacy of incorporating traditional dietary practices into postpartum care, especially when it comes to confidence in the diet and nursing support.

Crucially, the intervention's effects were consistent across a range of demographic groups, indicating that it can be widely applied regardless of factors like age, income, family structure, or level of education. These findings lend credence to the inclusion of banana stem in postnatal nutritional guidelines as an inexpensive, culturally appropriate method of enhancing the health of both mothers and infants.

Although the study makes significant contributions, more research is required to assess the long-term impacts of eating banana stems. Its usefulness in larger maternal health programs will also be validated by broadening the scope to include a

variety of populations and environments.

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Conflict of Interest: NIL

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