Original article

Serum fasting blood glucose status in nursing mothers

Khadiza Begum[1], Rokeya Begum[2], Masuma Tasnim[3], Sharmin Jahan[4], Nahid Yasmin[5]

Abstract

Background : There is an association between breast feeding & maternal blood glucose status. Breast feeding improves maternal blood glucose status & may reduce the risk of developing type 2 diabetes.

Objective : To observe Serum fasting blood glucose level in lactating & nonlactating mother.

Method : This cross sectional analytic study was conducted in the Department of Physiology, Dhaka Medical College, during the period of July 2010 to June 2011. A total 300 subjects were included within the age limit from 20 to 40 years of women. Among them100 were normal healthy subjects & had child above 3 years were considered as group A (control). The rest 200 women were selected as study subject (group B) having child between the age 6 weeks to 2 years. Group B is again subdivided into group B1 (100 lactating mother) & group B2 (100 nonlactating mother). The subjects were selected from pediatric ward & OPD of pediatrics, DMCH and BSMMU, Dhaka. The study parameter is serum fasting blood glucose was done in the Department of Physiology, Dhaka Medical College.

Results : Serum fasting blood glucose level in group B1 was lower from group A and in group B2 was significantly higher than that of group A. These values were significantly higher in nonlactating mother than lactating mother. It was observed that high level of study parameter were more in B2 than that of group B1.

Conclusion : From the results of the present study it may be concluded that lactation has effect on lowering serum fasting blood glucose.

Key words : Lactation, diabetes, serum fasting blood glucose.

Introduction

Breast feeding is the preferred method of feeding infants up to first 12 month of age[1]. Breastfed infants experience fewer & less severe infections and may be protected against future disease development[2]. Mothers who breast feed potentially experience accelerated weight loss, lower risk of development of breast and ovarian cancer[3], improves metabolic status[4], lower risk of type 2 diabetes[5] or the metabolic syndrome in later life than nonlactating mother[6].

Type 2 diabetes mellitus affects about 9 million adult women in the United States. This disease and its complications impose a considerable burden on the health care system[7]. Multiple lifestyle factors, including diet, exercise and obesity are associated with risk of diabetes[8].

Pregnancy is a critical period for weight gain and obesity in women[9]. There is physiological insulin resistance has been observed in the last trimester of gestation. Which possibly increase glucose utilization by placenta and fetal tissues[10-12]. Insulin resistance could also increase insulin bio-availability for mammary tissue which regulates mammary gland lipoprotein lipase enzyme[13].

Lactation imposes a substantial metabolic burden on mothers, with an increased requirement of approximately 480 kcal/ d[14-16]. Both human studies and animal models have demonstrated improved insulin sensitivity and glucose tolerance during lactation compared with nonlactating mothers[17,18].

Many investigators of different countries studied metabolic syndrome by measuring the fasting blood glucose, serum insulin and insulin resistance in lactating & nonlactating women. They found that lactation has effect on insulin & glucose homeostasis. lactating women had significant lower fasting glucose levels and insulin level among lactating versus nonlactating women. They also found improved glucose metabolism with recent gestational diabetes compared to nonlactating women[15,19] .

Some author found that breast-feeding history was inversely associated with insulin resistance, independent of obesity[9,20] .

1. Assistant Professor, Department of Physiology, Ad-din Akij Medical College, Khulna.
2. Head of the Department of Physiology, Rangpur Medical College, Rangpur.
3. Associate Professor of Physiology, Rangpur Medical College, Rangpur.

Correspodence: Md. Abul Hasanat
email: hasanat_imc06@yahoo.com,

Another study said that long term breastfeeding has more of a delaying effect than a prevention effect on diabetes, especially in women with very strong risk factors for the diabetes. Another interesting finding was that the longer the period of exclusive breast feeding per pregnancy, the greater the effect against diabetes[21,22].

The American Academy of Pediatrics recommends that all infants should be exclusively breast feed through 6 months of age and that breastfeeding should continue until the infant is 1 year of age. Although 80% of US women initiate lactation, only 36 % report breast feeding and 14% report exclusive breast feeding their infants at 6 months of age 2.

Bangladesh is a country usually noted for prolonged breast-feeding. A research work found that 60% of infants were being exclusively breast-fed and 30%, predominantly breast-feed at the time of discharge from hospital. After 2 weeks at home, 75% of the mothers were breast-feeding exclusively but 25% of mothers failed to continuing exclusive breast-feeding, despite of having been counseled during their hospital stay[3].

Lactation has effect on lowering Serum fasting blood glucose level. Present study will provide us knowledge about beneficial effect of breast feeding on maternal health, which will increase the public awareness of breast feeding among nursing mothers.

Methods

This cross sectional analytic study, was carried out in the Department of Physiology, Dhaka Medical College, Dhaka from July, 2010 to June, 2011. A total 300 female subjects were included within the age of 20-40 years. Group A (control): Consists of 100 apparently healthy, non gravid & nonlactating mother having child of age above 3 years or mother not in lactation period (to compare with study group).

Group B (study group): Consists of 200 female subjects having baby between 6 weeks to 2 years or mother in lactation period but not in purperium (the period of purperium is avoided as most of the physiological changes during pregnancy revert back to normal with in this period) Group B is again divided into group B1: 100 lactating mother, B2: 100 non lactating mother. All subjects were selected from the pediatric indoor & out door, of Dhaka Medical college Hospital and from BSMMU,Dhaka. All the subjects belonged to middle socioeconomic status. Pregnant mother with baby below 2 years or mother having adopted child or mother having baby<6 weeks (as it is the period of puerperium) were excluded from the study. Mothers with heart disease, liver disease, kidney disease or any endocrine disease like thyroid disease were also excluded. After selection of subjects the purpose of the study was explained to each subject and encouraged for their voluntary participation. They were also allowed to withdraw themselves as soon as they wish. Ethical clearance was taken from ethical review committee of Dhaka Medical College. Data were collected in a predesigned questionnaire after taking informed written consent of the subjects. All the subjects were requested to be empty stomach before giving blood sample. Before taking blood sample an informed written consent was taken from each subject. Then blood was collected and fasting blood glucose was measures by using portable glucometer. statistical analysis were done usuing computer with SPSS version 17.

Correlation was analyzed by Pearson's correlation test. Unpaired Student's 't' test was performed to compare between groups. The test of significance was calculated and p values<0.05 was accepted as level of significance.

Results

Fasting blood glucose

The mean (± SD) fasting blood glucose were 96.08 ±16.24, 93.76 ±11.57 & 113.45 ± 32.51 mg/dl in group A, B1 & B2 respectively. Fasting blood glucose level in lactating mother was lower than that of control group but was statistically not significant. In case of nonlactating mother the level was higher than that of control as well lactating mothers, both were statistically highly significant (p< 0.001).

The mean (±SD) duration of lactation of the child are 11.99±6.88 & 3.42 ±1.68 months in group B1 & B 2 respectively.

The duration of lactation of the child in lactating mothers was higher than that of group nonlactating mothers & was statistically highly significant (p<0.001).

When correlation was done between the fasting blood glucose level & mean duration of lactation it showed negative correlation (r= -0.212) in lactating mothers but positive correlation(r=+0.195) in nonlactating mothers. But the relation was statistically not significant in both cases.

From the frequency distribution we can see more

nonlactating mothers show high level of fasting blood glucose than others groups.

Table–I :

Fasting blood glucose in different groups (n=300)

Groups	n	Fasting blood glucose (mg/dl) (Mean±SD)
A (Control)	100	96.08±16.24
B_1 (Lactating mother)	100	93.76±11.57
B_2 (Nonlactating mother)	100	113.45±32.51
Statistical analysis		
Groups		Fasting blood glucose (p value)
A vs B_1		0.246ns
A vs B_2		0.0001***
B_1 vs B_2		0.0001***

N = Number of subjects ns = Not significant

***= Significant at P<0.001

Table–II :

Duration of lactation in lactating and nonlactating groups(n=200)

Groups	n	Duration (months)(Mean±SD)
B1		
B2	100	
100	11.99±6.88	
3.42±1.68		
Statistical analysis		
Groups		
B1 vs B2		Duration (p value)
		0.0001***

Fig : 12
Frequency distribution of subjects by fasting blood glucose in different groups

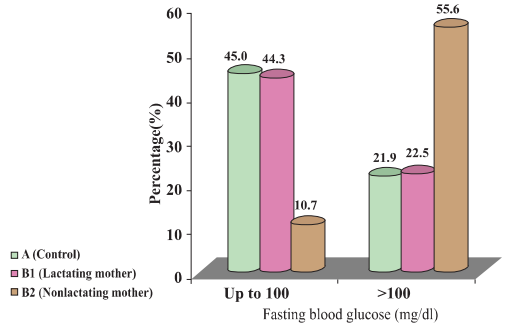
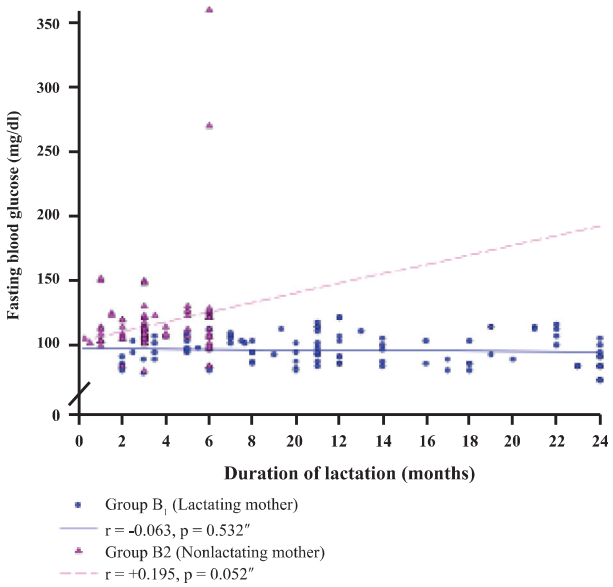


Fig : 20
Correlation between duration of lactation and fasting blood glucose in group B_1 and B_2



Discussion :

The present study was carried out to observe serum fasting blood glucose in lactating(group B_1) & nonlactating mother (group B_2) and also in age matched apparently healthy adult female who are not in lactation period (group A) for comparison.

Distributions of the parameter was observed among the groups &was also correlated with duration of lactation in both study groups to observe any relationship with the duration of lactation.

In the present study, findings of all the parameters in healthy subjects or baseline control group were almost within normal range and also similar to those reported by the other investigators from different counties[11,12,7]. However no published data of the study parameter of lactating mother are available for comparison in our country.

In the present study serum fasting blood glucose level of lactating mother was nonsignificantly lower than that of control subjects. FBG level in nonlactating mother was significantly (p<0.001) higher than control subjects. Lactating mothers showed significantly lower level of FBG than nonlactating mothers. Fasting blood glucose level showed negative correlation in lactating mother &

positive correlation in nonlactating mother with duration of lactation. Fasting blood glucose > 100 mg/ dl were observed in 33(21.9%), 34(22.5%), 84(55.6%) subjects in group A, B1, B2 respectively.

Similar type of findings were reported by some authors they found that insulin levels & insulin: glucose ratios were significantly lower in lactating mother than nonlactating mother. They suggest that independent of body adiposity breast feeding has long lasting protective effect on lowering fasting blood glucose level[18,20,21,22].

Some investigators found significantly lower fasting glucose & insulin levels in lactating than nonlactating women at 8 week postpartum. They also found that prevalence of type 2 diabetes was half in lactating than nonlactating group[20, 22]. This is due to preferential use of glucose by mammary gland. These study are also in agreement with the present study.

Some other stated that lactation has beneficial effect on glucose tolerance to women with history of GDM. They also suggested that lactation has post weaning effect on maternal metabolic profile[15,16].

On the other hand some found that duration of lactation was inversely associated with risk of type 2 diabetes in young & middle aged women by improving glucose homeostasis[23]. This study is in agreement with the present study.

During lactation body weight decreases as lactation alters maternal fuel metabolism and increases energy expenditure by 15-25%. About 400 – 500 Kcal /day required for milk production during the first 6 months for exclusive breastfeeding[20] .

Persistent of Pregnancy related metabolic change in fat distribution specially central adiposity is of greater importance than over all obesity, because intra abdominal (visceral) fat may associated with development of obesity related insulin resistance and production of adipocytokines that regulate insulin sensitivity[20]. Excess adipose tissue releases several products that apparently exacerbate metabolic risk factors. They include nonesterified fatty acids (NEFA), cytokines and adiponectin. A high plasma NEFA level overloads muscle and liver lipid, which enhances insulin resistance[24] .

After parturition there is change from overall insulin resistance to insulin sensitivity. Low insulin levels lead to increase fat mobilization and transfer to the mammary gland. Insulin stimulates glucose and lipogenesis and controls mammary gland lipoprotein lipase. As a result lactating women exhibit lower blood glucose & insulin concentrations along with higher rates of glucose production and lypolysis compared with nonlactating women[17,18] .

Conclusion

Lastly it can be concluded that lactation increases metabolic demand & thus has significant effect in lowering fasting blood glucose level. Further studies can be done in gestational diabetic mothers to see the effect of lactation on FBG.

References

1. Heinig MJ & Kathryn GD. Health effects of breast feeding for mothers: A critical review. Nutrition Research Reviews.1997; 10: 35 – 56.

2. Gundeson EP. Breast feeding after gestational diabetes pregnancy. Diabetes care 2007; 30: 161-168.

3. Haider R, Kabir, Hamadani J.D, Habte D. Reasons for failure of breast-feeding counseling mothers' perspectives in Bangladesh. Bulletin of the World Health Organization1997; 75: 191-196.

4. Gundeson EP, Jacobs DR, Chiang V, Lewis CE, Tsai A, Quesenberry Jr, Sidney S.Child bearing is associated with higher incidence of the metabolic syndrome among women of reproductive age controlling for measurements before pregnancy : the CARDIA study. American Journal of Obstet Gynecol 2009; 201(2): 177.

5. Manus MC, Chingham I, Watson A, Harker L .Beta cell function and visceral fat in lactating women with a history of gestational DM. Metabolism 2001; I.50: 715-19.

6. Knopp RH, Walden CE, Wahl PW , Bergelin R, Chapman M, Irvine S. Effect of post partum lactation on lipoprotein lipids and appoproteins. J Clin Endocrinol Metab1985; 60:542-7

7. Stuebe AM & Janet WRE. The reset hypothesis : Lactation & maternal metabolism. Am J Perinatol 2009;.26:81-88.

8. Dewey KG, Heinig MJ & Nommsen LA. Maternal weight-loss patterns during prolonged lactation. Am J Clin Nutr1993; 58: 162-166.

9. Kallio MJ, Siimes MA, Perheentupa J, Miettinen TA. Serum cholesterol & lipoprotein concentrations in mothers during

and after prolonged exclusive lactation. Metabolism 1992; 41(12): 1327-30.

10. Jimenez DM, Ramon CJ, Procovi M, Romio MA, Martinz H, Grande F. Longitudinal study of plasma lipids and lipoprotein cholesterol in normal pregnancy and puerperium. Gynecological and obstetric investigation1988; 25: 158-164.

11. Gundeson EP, David RJ, Vicky C, Cora EL, Juanan F, Charles JQJ, Stephen S. Duration of lactation and incidence of metabolic syndrome in women of reproductive age according to gestational diabetes mellitus status : A 20 year prospective study in CARDIA. Diabetes 2010;59: 495-504.

12. Ohlin A & Rossner S. Maternal body weight development after pregnancy. Int J Obes1990; 14(2):159-173.

13. Erkkola R, Viikari J, Irjala K, Solakivi- Jaakkola T. One year follow up of lipoprotein metabolism after pregnancy ', Bio Res Pregnancy Perinatol1986; 7(2): 47- 51.

14. Darmady JM & Postle AD.Lipid metabolism in pregnancy. Br J Obstet Gynaecol1982; 89(3): 211-5

15. Gundeson EP. Breast feeding after gestational diabetes pregnancy',Diabetes care 2007; 30: 161-168.

16. Kjos SL, Olivia H, Richard ML, Thomas AB, Daniel RM. The effect of lactation on glucose & lipid metabolism in women with recent gestational DM. Obstet Gynecol1993;.82: 451-5.

17. Tigas S, Sunchag A, Haymond MW. Metabolic adaptation adaptation to feeding and fasting during lactation in human. J Clin Endocrinol Metab 2002; 87: 302-307.

18. Diniz JM, Teresa HM, Costa D:Independent of body adiposity, breast feeding has a protective effect on glucose metabolism in young adult women. British Journal of Nutrition 2004; 92: 905- 912.

19. Grundy SM, Bryan HB, James IC, Sidne CS, Claude L:'Definition ofMetabolic syndrome' Report of the National Heart ,Lung and Blood Institute/American Heart Association Conference on Scientific Issues Related to Definition 2004; 109:433-438. Viewed on 5th April, 2011. <http: // circ.ahajournals.org/cgi/content/full/109/3>

20. Butte NF, Hopkingson JM, Mehta N, Moon JK & Smithg. Adjustments in energy expenditure and substrate utilization during late pregnancy and lactation. Am J Cli Nutre. 1999; 69: 299-307.

21. Ram KT, Paul B, Susan M H, Joan C, Joan S & Nanette S. Duration of lactation is associated with lower prevalence of metabolic syndrome in mid life – SWAN, the study of women's health across the nation. American Journal of Obstetrics & Gynecology. 2008;1:198-268.

22. Lenz S, Kühl C, Hornnes PJ & Hangen C. Influence of lactation on oral glucose tolerance in the puerperium. Acta Endocrinologica. 1981; 98: 428-431.

23. Stuebe AM, Rich – Edward JW, Willett WC, Manson JE & Michels KB. Duration of lactation and incidenceof type 2 DM. JAMA. 2005; 294: 601-10.

24. Gundeson EP, Muttaugh MA & Lewis CE . Excess gain of weight and waist Circumference associated with child bearing: The Coronary Artery Risk Development in Young Adult Study (CARDIA). Int J Obes Relat Metab Disord. 2004; 28: 525-535.