Study of Some Physiological and Biochemical Parameters in Women with Breastfeeding and Non-Breastfeeding in Erbil City

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Abstract

Blood samples from one hundred healthy women (29-33 year) have been taken. The women were divided into 2 groups: group 1 including 50 women that exclusively breast-fed for 6 months, and group 2 composed of 50 women in whom lactation was inhibited with formula feeding.

The two groups were comparable in lipid profile, random blood sugar, serum calcium and phosphors, tumor markers, and testosterone hormone (P-value < 0.01). Low density lipoprotein cholesterol (LDL-C) and random blood sugar (RBS) were significantly less in the breastfeeding group (P-value < 0.01). The mean totals LDL-C were 56.01± 0.35 and 71.90 ± 0.43mg/dl in groups 1 and 2, respectively. High-density lipoprotein cholesterol (HDL-C) was higher in the breastfeeding groups than in non-breastfeeding mothers (44.21±068mg/dl vs. 40.83±0.14mg/dl) but the difference was not statistically significant. Nevertheless, serum cholesterol, serum triglyceride, and serum very low density lipoprotein cholesterol (VLDL-C) were insignificantly lowers in breastfeeding group (95.37±1.02 mg/dl) in comparison to non-breastfeeding group (112.8±1.02 mg/ dl). Tumor marker were determined with chemiluminescent immunometric methods in each group via an automatic hormone analyzer. However, breastfeeding mothers have slightly less percentage of CA 15-3 and CA 125 than formula-feeding mothers (9.67 ± 0.071 U/ml and 9.79 ± 0.079 U/ml versus 12.84 ± 0.13 U/ml and 12.34 ± 0.14 U/ml, respectively), but the difference was not statistically significant.

Key words: Breastfeeding; lipid profile; tumor markers.

Introduction

Breast milk is the optimal source of nutrition for infants in early months of life. Exclusive breastfeeding is sufficient to support ideal growth and development for the first 6 months [1]. Breastfeeding is beneficial both to the infant and the mother. Mothers who lactate may reduce their risk of developing type2 diabetes and receive protection against onset of breast and ovarian cancer later in life [2]. Moreover, a number of reviews have agreed that breastfeeding may be protective against later overweight/obesity and identified multiple factors that may affect risks for obesity [3].

Breastfeeding brings clear short-term benefits for child health by reducing mortality and morbidity from infectious disease. A collaborative reanalysis of studies conducted in middle/low-income counties reported a reduced risk of mortality from infectious disease among breastfeed infants, up to the second birthday [4]. Breastfeeding is considered the best source of nutrition for an infant. Economic and social benefits are also provided to the family, the health care system and the employer. It also an integral part of the reproductive process with important implications for the health of mother [5]. During breastfeeding beneficial hormones are released into the mother's body and the maternal bond can be strengthened [6]. Breastfeeding is possible throughout pregnancy, but generally milk production will be reduced at some point [7]. Breastfeeding releases oxytocin and prolactin hormones that relax the mother and make her feel more nurturing toward her baby [8]. Breastfeeding soon after giving birth increases the mother's oxytocin levels, making her uterus contract more quickly and reducing bleeding which leads to fewer anemia's' [9].

As the fat accumulated during pregnancy, it will be used to produce milk and after birth, the lactation plays a central role in mobilizing these accumulated fat stores and "resetting" maternal metabolism, thereby reducing maternal risk for metabolic disease [10]. However, weight loss is highly variable among lactating women; monitoring the diet and increasing the amount/intensity of exercise are more reliable ways of losing weight [11, 12]. The 2007 review for the agency for healthcare research and quality (AHRQ) found "The effect of breastfeeding in mothers on return-to-pre-pregnancy weight was negligible, and the effect of breastfeeding on postpartum weight loss was unclear" [13]. In a new study of over 7,000 older Chinese women showed that women who had breastfed their children were around half as likely to have rheumatoid arthritis, compared to women who had never breastfed [14]. Many studies have presented the relationship between breastfeeding and postnatal amenorrhea, and the occurrence of a consequent longer intergestational period [15].

Lipid profile

Cholesterol is essential for life. "It is the precursor for the biosynthesis of steroid hormones, bile acids, vitamin D, and is an essential component of cell membranes for proper permeability and fluidity [16]. Triglycerides are esters consisting of glycerol molecules coupled in three positions with fatty acids. They are the most prevalent form of fat in human diet and stored as a major fuel in the body. This provides energy used in different metabolic processes [17, 18].

High density lipoprotein cholesterol (HDL-C) are often called good cholesterol, they transport excess cholesterol from peripheral tissue to liver where it is breakdown and become part of bile. It is particularly

rich in phospholipids and cholesterol. Low density lipoprotein cholesterol is formed by conversion of VLDL-C to LDL-C. The later contains much less triglyceride and high concentration of cholesterol and cholesterol esters than VLDL-C. Primary function of LDL-C is to provide cholesterol to peripheral tissue. High level of LDL-C associated with increase deposition of cholesterol in arterial wall and high incident of heart disease. Very low density lipoprotein cholesterol (VLDL-C) is made by liver, by combination of cholesterol, triglyceride and apoprotein [19, 20].

Breast and Ovarian Cancer

Cancer is the leading cause of death in economically developed countries and the second leading cause of death in developing countries (anything abt breast cancer). Breast tissue consists of mammary glands and ducts that made up of epithelial tissue, in addition to adipose, connective tissue and vessels of the lymphatic and blood system. Development of breast begins during puberty. It is generally quite an advanced by menarche and final differentiation only occurs during pregnancy and lactation. After menopause, hormone level decline and breast cells do not continue to divide [21]. Cancer Antigen 125 (CA125) is a surface antigen associated with epithelial ovarian cancer. In serum, CA125 is associated with a high molecular weight glycoprotein. There is a lack of adequate information and research in regard to the benefits of breastfeeding for women's health. However, a positive relationship between breastfeeding and reduced incidence of disease such as breast cancer and certain type of ovarian cancer has been described [22, 23]. The risk of breast cancer in young women fell with increasing duration of breastfeeding (three months or longer) and with number of baby breastfed [24]. Breastfeeding associated with slight reduction the risk of breast cancer. The reduction estimated to be 4.3% for every one-year breastfeeding. Women who do not breastfeed have a 1.6 times greater risk of developing ovarian cancer than who breastfeed [25, 26].

Random blood sugar

The blood sugar concentration is the amount of glucose (sugar) present in the blood of a human or animal. Glucose is the primary source of energy for the body's cells, while blood lipids (in the form of fats and oils) are primarily a compact energy store. Glucose is transported from the intestines or liver to body cells via the bloodstream, and available for cell absorption via the hormone insulin that produced by the body primarily in the pancreas. Lactation, even for a short duration has a beneficial effect on glucose and lipid metabolism in women with gestational diabetes. Breastfeeding may offer a practical, low-cost intervention that helps reduce or delay the risk of subsequent diabetes in women with prior gestational diabetes [27].

Testosterone

While testosterone is generally considered to be a male hormone, it is also produced in the female by the ovary (REF). Although the level of testosterone in the female is only 10% of the level in men, it rapidly declines during menopause along with estrogen and progesterone. Some of the general effects of low testosterone in women are decreased sex drive (libido), decreased energy and decreased muscle mass (ref). Mothers who find it difficult to breastfeed their child might have had high level of testosterone, a male hormone during their pregnancy [28]. Researchers at The Norwegian University of Science and Technology (NTNU) department of cancer research and molecular medicine have recently found a correlation between the level of male hormones (androgens) in pregnant women and how much the women breastfeed after birth. Pregnant women who have higher levels of androgens breastfeed less, this are a direct effect of hormones that simply limit nursing ability by reducing milk production in the breast. For example, there is a clear link between testosterone and breastfeeding ability. In fact, until 1980, when more suitable drugs were introduced, testosterone was used to stop milk production in circumstances where it was desirable [29].

Serum Calcium and Phosphorus

Calcium plays a key role in many physiologically important processes. A significant decrease in plasma calcium can rapidly lead to death. A chronic increase in plasma calcium can lead to soft tissue calcification and formation of stones. Phosphate, also called phosphorus, also plays a variety of important roles in the body, although its concentration is not as tightly regulated as that of calcium. Many of the factors involved in regulating calcium also affect phosphate [30]. During pregnancy and lactation, mothers require significant amounts of calcium to pass on to the developing fetus and suckling neonate, respectively [31].

The aim of this study was to compare some biochemical and immunological parameters of exclusively breastfed and formula-fed term healthy mothers.

Material and method

The study was involved 100 mothers, of which 50 of them are breast-feeding and 50 are non-feeding mothers. This research was conducted in Raparin Pediatric Teaching hospitals in Erbil city from the period of June 2013 to December 2013. The age of mothers ranged from 29-33 years and the babies' age ranged from 5-7 month.

About 4-6 ml of fasting venous blood sample were taken from all women under all aseptic precautions. The blood sample was collected into plain universal tubes allowed to clot and then centrifuged at 3000 rpm for 15 minutes to separate the serum. The serum was used within the same day for some tests and the remaining was stored in -20 Co freezers and used later to complete other tests.

Determination of serum lipid profile

Serum lipid concentrations was determined in both patients and control groups by colorimetric method using the commercial kit Biolabo-France. Total cholesterol and triglycerides were measured enzymatically, whereas the high-density lipoprotein cholesterol (HDL-C) was estimated by precipitation technique [31]. According to Friedewald equation [32], very low-density lipoprotein cholesterol (VLDL-C) and low-density lipoprotein cholesterol (LDL-C) were calculated as: VLDL-C = TG/5 and LDL-C= TC - (VLDL-C + HDL-C).

Serum glucose determination

Serum glucose concentration was estimated by glucose-oxidase colorimetric method [33] by using a kit supplied by Biolabo (France).

Determination of serum tumor marker (CA 125 and CA 15-3) and testosterone level

The serum CA 125 and CA 15-3 levels and testosterone concentration were determined by chemiluminescent immunometric methods in each group via an automatic hormone analyzer (Roche Modular Analytics Hitachi E 170, Japan).

Determination of serum calcium and phosphorus

Kits for quantitative determination of Calcium and phosphate in human serum were supplied by Biolabo (France). Manufacturer instruction was followed.

Data Analysis

Statistical analysis was performed using Microsoft Office Excel 2007. Mean and standard deviation were calculated separately for each group. Unpaired (two-tailed) Student's t-test was applied for analysis of means of various parameters between the two groups.

Results and Discussion

Table (1) shows lipid profile, random blood sugar, serum phosphors and serum calcium level in breastfeeding and non-breastfeeding mothers. Cholesterol, triglyceride and VLDL-C were respectively decreased insignificantly in breastfeeding mothers compared with non-breastfeeding mothers. Cholesterol and triglyceride, important lipid constituents of cell, are essential to carry out several vital physiological functions [34]. Results coincide with [35] which showed that decreased serum cholesterol, TG, and VLDL-C are associated in feeding mothers. HDL-C level increased insignificantly in breastfeeding mothers, this result comes in agreement with [36] this research showed that breastfeeding results in an increase of the HDL-C level in mother. HDL-C seems to help carry the "bad cholesterol", or LDL-C, out of our bodies. Level of LDL-C decreased significantly in breastfeeding mothers. This result is similar to what previously described by [37]. Moreover, Sugar level decreased significantly in breastfeeding mothers, similar to findings of [38]. Breastfeeding affects the level of the sugar that reduces the risk of the diabetes and high blood sugar. The level of calcium and phosphor increased insignificantly, this result is similar to [39]. Calcium and phosphor have important role in build strong bones and teeth and essential for cell membrane and healthy metabolism. The literature states that, during breast-feeding, mothers` calcium is obliged to increase to meet her growing baby's needs. In addition, certain hormonal changes during breast-feeding may contribute to bone-density loss.

Table (1): Biochemical test (cholesterol, triglyceride, HDL-C, LDL-C, VLDL-C, sugar, calcium and phosphorus) levels among breastfeeding and non-breastfeeding mothers.

Group	Parameter							
	Cholesterol mg/dl	Triglyceride mg/dl	HDL-C mg/dl	LDL-C mg/dl	VLDL-C mg/dl	Sugar mg/dl	Calcium mg/dl	Phosphorus mg/dl
Breastfeeding	119.48	95.37	44.21	56.01	19.07	86.60	8.15	4.45
Non-breastfeeding	136.81 ↑	112.8 ↑	40.83	71.90 ↑	22.55 ↑	103.35 ↑	7.90 ↓	4.02 ↓
T-Calculate	N.S	N.S	N.S	Significant	N.S	Significant	N.S	N.S

T-Tabulate = 2.66 P-value < 0.01

Figure (1) shows Ca15-3 and Ca125 levels of breastfeeding and non-breastfeeding mothers. The Ca15-3 level decreased insignificantly in breastfeeding mothers. This result is in agreement with [40] confirming that breastfeeding more than of 12 months was associated with reduced risk of breast and ovarian carcinoma by 26% and 37%, respectively. The Ca125 level increased insignificantly, this result is similar to result of [41] which indicate a marked reduction in the risk of developing epithelial ovarian cancer was associated with ever having breastfed.

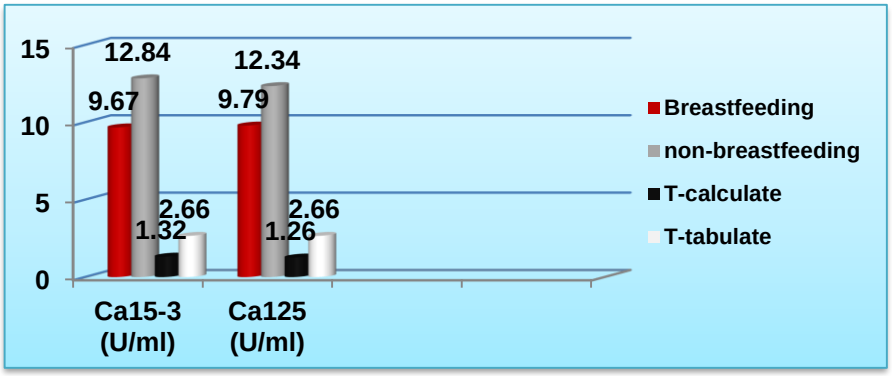

Figure (1) Tumor marker (Ca15-3 and Ca125) levels among breastfeeding and non-breastfeeding mothers

Figure (2) shows testosterone level, which decreased insignificantly in breastfeeding mothers, high testosterone can lead to breastfeeding difficulty due to reduced glandular tissue. This result is in agreement with [42] that showed supraphysiologic serum levels of testosterone, reduces milk production in postpartum women. Testosterone alone reduces serum prolactin. However, when given in combination with estrogen and progestin, serum prolactin levels are not markedly reduced. Testosterone was previously used for therapeutic reasons to suppress lactation, usually in combination with an estrogen.

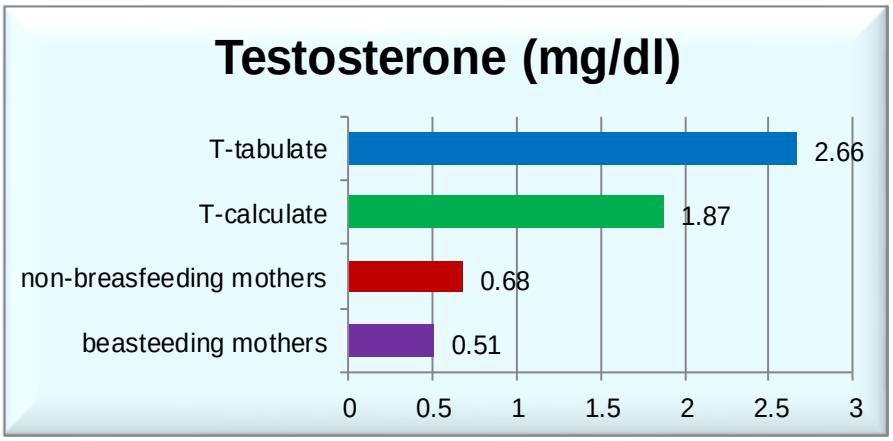

Figure (2) Testosterone levels among breastfeeding and non-breastfeeding mothers

Conclusion

Breastfeeding mother have significantly lower LDL-C and random blood sugar compared to formula feeding with improving HDL-C/LDL-C ratio. This suggests that there is the need to encourage mothers to exclusively breastfeed to prevent increasing levels of both LDL-C and blood sugar.

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دراسة لبعض القياسات الفسيولوجية والبيوكيميائية في المرأة مع الرضاعة الطبيعية وعدم الرضاعة الطبيعية في مدينة أربيل

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الملخص

تم أخذ عينات الدم من مائة امرأة في حالات صحية جيدة (29–33 سنة). النساء تم تقسيمهن الى مجموعتين: المجموعة الأولى تضمنت 50 امرأة مرضعة لمدة 6 أشهر، و المجموعة الثانية ضمت 50 امرأة و اللاتي قد توقفت عندهن إنتاج الحليب بسبب الرضاعة غير الطبيعية (الصناعية). المجموعتين تم مقارنتهما من خلال مستوى الدهون وسكر الدم العشوائي و كالسيوم وفسفور المصل و علامات التورم وهرمون التيستوستيرون مع احتمالية (P-value < 0.01). كان كولسترول البروتين الدهني منخفض الكثافة (LDL-C) ونسبة السكر في الدم العشوائي (RBS) أقل بكثير في مجموعة الرضاعة الطبيعية (P-value < 0.01). وكان مجموع متوسطات الـ LDL-C مساوياً ل 56.01 ± 0.35 و 71.90 ± 0.43ملغم / ديسيلتر في المجموعات 1 و 2 على التوالي. كولسترول البروتين الدهني عالي الكثافة (HDL-C) كانت أعلى في مجموعة الرضاعة الطبيعية بالمقارنة مع الأمهات اللاتي لاترضع طبيعياً (44.21 ± 068 ملغم / ديسيلتر مقابل 40.83 ± 0.14 ملغم / ديسيلتر) ولكن الفرق غير معنوي إحصائيا. ومن الجدير بالذكر فإن الكولسترول والدهون الثلاثية وكولسترول البروتين الدهني منخفض الكثافة جدا (VLDL-C) في المصل كانت منخفضة معنويا في مجموعة الرضاعة الطبيعية (95.37 ± 1.02 ملغم/ ديسيلتر) بالمقارنة مع مجموعة الرضاعة الغير طبيعية (112.8 ± 1.02 ملغم/ ديسيلتر). ومع ذلك، الأمهات المرضعات لديها نسبة مئوية أقل من علامات التورم (CA) 3–15 و125 الأمهات الرضاعة غير الطبيعية (9.67 ± 0.071 وحدة / مل و 9.79 ± 0.079 وحدة/ مل مقابل 12.84 ± 0.13وحدة / مل و 12.34 ± 0.14 وحدة / مل على التوالي)، ولكن الفرق لم يكن معنويا إحصائيا.