EFFECT OF PROGESTOGEN-ONLY CONTRACEPTIVES ON HUMAN MILK COMPOSITION

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Abstract- Different contraceptive methods are used by breastfeeding mothers**.** To investigate the effects of progestogen - only contraceptives on human milk components, a non-randomized, follow-up study was carried out in Iran (Varamin) on 140 breastfeeding women, 51 of whom used progestogen-only contraception including progestogen-only pills (POP) or depo-medroxyprogesterone acetate (DMPA), and 89 used non-hormonal contraception methods, starting at 6 weeks after delivery. Human milk components were compared between the groups after 26 weeks. There were no statistically significant differences between groups, in terms of protein, sodium, calcium, phosphorus and potassium concentration of milk, but triglycerides in the hormonal group and magnesium in the non-hormonal group were higher than the other group ($P< 0.05$). It seems that progestogen-only methods (POP and DMPA) do not have an adverse effect on human milk composition, and are safe contraceptives during lactation.

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INTRODUCTION

A large proportion of the patients in many family planning clinics are breastfeeding women (1). The impact of breast feeding on infant health has been widely recognized, particularly in developing countries where it determines a better survival for the newborn (2). Lactation, however, is a complicated physiological process that is influenced by numerous endogenous hormones and exogenous factors (3). For any contraceptive method to be accepted by nursing mothers, it should have a) no adverse effects on the nursing, b) no adverse effects on lactation, and c) convenience and safety for the mother. Therefore, the benefits of every family planning method should be judiciously weighed against its risks to the nursing mother-infant pair (4). Breastfeeding inhibits follicular development and ovulation and has, therefore, a contraceptive effect (3,5,6). The contraceptive effect of lactation can be relied upon during the first six postpartum months, provided breastfeeding remains exclusive or nearly exclusive and the mother remains amenorrheic (7-9). This method suffers from one major limitation. The contraceptive protection it offers the nursing mother ends abruptly, without giving any physical indication of the return of fertility (4), so it can not be considered a reliable contracep-tive method and thereby exposing the nursing mother to the risk of an unplanned pregnancy. If a breastfeeding mother becomes pregnant, it is detrimental to the health and wellbeing of the mother, the infant and the newly conceived fetus.

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Therefore, although contraception should ideally begin just before ovulation resumes, in practice it is impossible for an individual woman to predict the start of normal ovulation.

In the interest of all, a contraceptive overlap is preferable to the risk of an early unplanned pregnancy (4,5,10-12). The non-hormonal methods of contraception should be the first choice for them, but because of medical or personal reasons, many women prefer hormonal contraception, and the use of hormonal method during lactation is known to be common (1). A number of studies have shown that combined oral contraceptive pills (OCPs), may adversely affect the quality and quantity of human milk (3). In contrast to combined OCPs, many studies have demonstrated that progestogen-only pills (POPs) have either a positive effect on, or do not adversely affect the quality or quantity of human milk, and are therefore a well accepted and safe contraceptive method in lactating women (3). Progestogen-only methods may also produce subtle changes in milk composition, although less than combined OCPs (13).

Studies on POPs have shown a mixture of effects on milk supply. Certain forms of progesterone exhibit a dose-dependent suppression of lactation secondary to peripheral conversion to estrogen (14). Effects of injectable progestogens on milk composition are less clear.

Different studies report increase, decrease, or no change in milk concentration or total contents of lactose, protein or lipid (13). Depo-medroxyprogesterone acetate (DMPA) may increase prolactin levels, either by acting directly on the anterior pituitary to stimulate the release of prolactin or by indirectly inhibiting the hypothalamic secretion of prolactin inhibitory factor. The effect of DMPA on lactation has been evaluated in several developing countries; a few studies demonstrated a positive effect, while most revealed no adverse effects on lactation (14).

In order to investigate the effects of progestogen-only contraceptives on lactation, this comparative study was initiated in two groups of breastfeeding women. One group used progestogen-only methods and the other group used non-hormonal contraceptives.

MATERIALS AND METHODS

This non-randomized, follow-up study was performed in Varamin, Iran, from December 1998 to November 1999 on two groups of breastfeeding women, 6 weeks postpartum. Breastfeeding mothers were recruited from public clinics after explaining the objectives of this study and obtaining their consent. The characteristics and the economical conditions of the two groups were similar at the time of admission. One group used hormonal contraceptives including POPs, taken daily (0.5mg lynestrenol), or 150mg DMPA injection administered every three months. The other group used non-hormonal methods of contraception including intrauterine devices (CuT 380A IUD), condoms, sterilization or withdrawal. They were entered into the study from 6±1 weeks postpartum, when the use of the contraceptives was initiated. To be included in the study, the women had to be exclusively breastfeeding.

The exclusion criteria were contraindications for the use of the contraceptives or conditions requiring regular use of medication. Mothers were followed at monthly intervals up to the sixth postpartum month (26 weeks after delivery). At each visit the mothers were interviewed on contraceptives used, and breast feeding practices.

The mothers were carefully instructed not to breastfeed their children 2-3 hours before milk collection. The milk samples thus represented the first meal of the day. Both breasts were emptied by mothers and the milk was carefully mixed and 10ml of it kept frozen for future analysis. The pooled human milk samples were dilapidated by centrifugation at 3000xg and 20 ^{o}C for 10min (Beck man J-21) Triglycerides; potassium, calcium and magnesium were determined by autoanalysis (Cubaz).

Sodium and potassium were determined by flame photometer (Corning-480). Protein was determined by Biureh method.

Women were free to withdraw from the study or to discontinue or change their contraceptive at any stage. Reasons for withdrawing from the study were moving away, not returning for visits, and other reasons such as pregnancy. After code sheathing of the data, we entered them into the computer.

Data analysis was performed by *t* test and chi-square with the use of SPSS.

RESULTS

Altogether, 175 mother-infant pairs participated in the study (95 women in the non-hormonal group and 80 in the hormonal group), but 35 participants were excluded from the statistical analysis (19 women were lost to follow-up, 11 other subjects changed or stopped using their initial contraceptive method, 2 participants had personal problems, and infants of 3 mothers had diseases).

Of the 140 remaining subjects available for analysis, there were 51 subjects in the hormonal group (45 women used POPs and 6 used DMPA) and 89 in the non- hormonal group (47 used IUDs, 20 condoms, 11 sterilization and withdrawal).

There were no significant differences between the human milk composition of the two groups with regard to the mean human milk concentrations of calcium, phosphorus, sodium, potassium, and protein, but triglyceride levels were significantly higher in the hormonal group ($P< 0.05$) and magnesium level was higher in non-hormonal group ($P< 0.05$, Table 1).

Table 1. Quantitative analysis of human milk of hormonal and non-hormonal groups*

Parameter	Hormonal group	Non-hormonal group	*t*
Triglycerides (mg/dl)	504.54 ± 213.48	429.23 ± 181.36	2.21†
Protein (g/dl)	2.47 ± 1	2.4 ± 1.45	0.32
Sodium (mg/dl)	10.35 ± 6.61	10.04 ± 4.15	0.34
Calcium (mg/dl)	21.29 ± 5.76	21.45 ± 7.12	0.13
Phosphorus (mg/dl)	5.61 ± 1.22	5.53 ± 1.39	0.35
Potassium (mg/dl)	11.22 ± 2.1	11.2 ± 6.3	0.03
Magnesium (mg/dl)	3.74 ± 0.536	4.07 ± 1.42	-1.96†

*Data are expressed as mean ± SD.

† Statistically significant difference between groups ($P< 0.05$).

DISCUSSION

The study was implemented to investigate the effect of the use of progestogen-only contraceptives during lactation, on human milk composition. The results reported here are reassuring, as no adverse effects of hormonal methods were found on human milk composition.

Lipids comprise the major energy-yielding fraction of human milk, 97-98% of which are triglycerides (15-16). Mature human milk contains about 50% of its energy as fat. This fat is necessary for the tremendous growth of the brain, retina and other tissues (17), but appears to be the most variable of the macronutrients, both within and between individuals and in response to maternal nutrition (16). Lawrence *et al*. found that the fat concentration of milk was higher in the afternoon and evening than during the night (17). It is lowest in the morning, rises steeply to a maximum value midmorning and then declines steadily throughout the rest of the day (15).

Data from samples taken every 3 hours showed a variation in milk concentration of nitrogen, lactose and fat; also foremilk differs from hind milk (17). Fat content changes during a given feeding and increases at the end of the feeding (15-17). A major concern is whether the variability of human milk contents is related to the mother's diet. Parity has been cited as a major influence on fat content, with primiparous women having more fat than multiparous women in their milk (17).

In defining the constituents of human milk, it is important to recognize that the composition varies with the stage of lactation, the time of day, the sampling time during a given feeding, maternal nutrition, individual variation, techniques of sampling, storage and measurement. Samples obtained by pumping may vary from those obtained by the sucking infant. According to the results of this study, triglycerides in the human milk of the hormonal group were higher than the non-hormonal group ($P< 0.05$).In a study in Hungary, combined and progestin only pills did not significantly alter total milk lipid, while treatment with the combined pill was followed by significant increase in the proportion of milk lipid in a study performed in

Thailand, and in the group treated with DMPA the milk lipid decreased significantly in comparison with the control group (18).

Another study in Thailand showed no significant differences in the triglyceride contents of human milk between Exluton and IUD groups, which seem to be in contrast with our findings. Inter-individual variations and changes in composition during the course of lactation further complicate the matter, and the different interpretations of human milk contents may have been due to different sampling methods. Also in the Thai study, women in the non-hormonal group had a higher age and parity.

In this study, magnesium of human milk in the non-hormonal group was higher than the hormonal group, but the study in Thailand showed no statistical difference between the two groups (18). Emmett *et al.* found no effect of maternal nutritional status on the milk concentration of calcium and magnesium (16).

Dietary intake of magnesium appears to have no effect on human milk magnesium levels (19). However, the magnesium concentration in the milk of young lactating teenagers tended to be lower than that of older women.

Studies of human lactation are complex involving many intervening variables including dietary intake, nutrient bioavailability, stage of lactation and other factors that need more study. It should be mentioned that the effect of diet in the population under study could be considered as a confounding factor; however, in this study diet was not taken into account since economical conditions seemed equal and the large number of subjects included in the study tended to minimize this effect.

In conclusion, it seems that progestogen-only methods (POP and DMPA) do not have any detrimental effects on breast milk composition, and are safe contraceptives during lactation.

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