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ENSURING NORMAL IRON LEVELS IN BREAST MILK OF PREGNANT WOMEN BY PERSONALIZED IRON SUPPLEMENTATION TREATMENT

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ABSTRACT

Since the characteristics of all body fluids depends on patient's health status, it is possible that disadvantaged and socially vulnerable mothers may have lower amounts of iron in their breast milk, and that their babies receive lower content of the mineral for their normal growth and development. Assuring a preventive treatment of the mother might solve this problem. This study aimed to demonstrate breast milk iron content from disadvantaged mothers and the effect of personalized iron supplementation program. In the current cross-sectional study, breast milk samples were obtained for ferritin analysis. Health services usually provide free folic acid and iron treatment however, treatment compliance is low. Patients were randomly divided into two groups: "A: Controls" who had free iron tablets available from the health centre; and "B: Intervention" group where patients accepted to be periodically contacted at home by a health team for personalized iron dispensation. In our study, 200 patients were included. Prophylaxis and treatment compliance were 100% and 96% for B group, while for the control was 61% and 37% (p=0.005). Higher breast milk iron levels were detected in the Intervention's mothers compared with control patients (p<0.05). It can be concluded that personalized iron prophylaxis and treatment increased breast milk iron levels. Public health policy must ensure iron dispensation for each under-served mother in order to reduce children problems associated to iron deficiency during the first year of their life.

KEYWORDS: Breastfeeding; Iron deficiency; Health policy.

INTRODUCTION

Iron deficiency is one of the major health problems among children less than 1 year old.[1] Maternal anemia leads to anemia in newborn infants.[2] Unfortunately, iron deficiency and anemia are prevalent in many countries of South America, associated to the socio-economical situation.[3]

Iron deficiency can have deleterious effects on behavior,[4-7] immune system,[8-13] mental,[5] and physical,[14] development. Prevention of anemia in newborns should therefore be a priority for public health policies.

Although substantial prevalence rates among disadvantaged children have been reported,[4] official programs attempted to correct this iron deficiency anemia by delivering iron-fortified milk and other dietary supplements available free of charge to the underprivileged population in many countries.[5] However, this point is controversial since even if official policies enhance the breastfeeding during the first 6 months of life of newborns,[15] the quality of that breast milk will depend on the mother's health and nutrition.

This study was conducted to demonstrate iron content of breast milk from mothers belonging to disadvantaged families and the effect of a personalized program for iron supplementation on those mothers.

METHODS

This cross-sectional study consisted of two phases (descriptive and analytical) with a quantitative approach in Al-Fallujah Teaching Hospital for Gynecology and pediatrics Iraq.[16]

Breast milk samples were obtained from pregnant women belonging to disadvantaged families defined by the household income, geographical proximity of the house surveyed to a local health center (LHC) and by the

Unsatisfied Basic Needs (UBN) index,[17] which is an index composed of socioeconomic indicators incorporating like house overcrowding (three or more family members per room); lack of sewerage services; unstable house construction; illiteracy in at least one member of that family; or children in the house who are not attending school.

The sample size was calculated according to routine control theory, with a confidence of 95% (alpha error = 5%) and an accuracy of 5% in a theoretical minimum of 124 dwellings, using the following formula:

$$\mathbf{n} = \frac{N * Z^2 * P(1-p)}{d^2 * (N-1) + Z^2 * P(1-p)}$$

Where n is the sample size, N is the total population, Z the value of z for confidence level (1-alpha), p is the expected proportion of iron deficiency in the population and d is the absolute accuracy.

The unit of analysis was the "pregnant women". The criteria for including participants in the study were: age (mothers who at the time of the survey were 16 years or older); pregnant women coming from the geographical area selected for the study or that lived in the region for over a year; and that voluntary accepted to participate in the study (consent agreement). Before milk sample collection, a second inclusion criteria was applied to all mothers previously included in the study. These criteria were: 1) gestational age □ 37 weeks, 2) birth weight > 2500 grams 3) infant exclusively breastfed at 2 months.

For all pregnant women, folic acid (5 mg folate pill/day) and iron (200mg pill of ferrous sulphate once or twice day) treatment was available. However, the sample was randomly divided into two groups: Group A (100 women) received free medicines from the Health Center near their homes; Group B (100 women) who accepted to be contacted monthly by a member of the health team in order to personalize free iron dispense for treatment during all pregnancy period until 45 days after delivery. This treatment was always dispensed by the same health professional either through the health center, or in case that patient did not attend his periodical consultation, drugs were dispensed at the patient's home.

For sample collection, mothers were instructed to first clean their breasts with a sterile disposable towel soaked with water, then allowing the area to air dry. Breast-milk samples were collected at 2nd month postpartum. Samples were collected during the morning 2 hours after the previous breastfeeding. Milk expression was done from only one breast, between from 9:00 am to 11:00 am under supervision of her obstetric specialist. All mothers received explicit instructions regarding the handling of a glass jar. After discarding an initial 4 mL of milk, an aliquot of 10 ml was collected by manual plastic disposable pump into clean sterile tested plastic jar containers and transferred to iron-free polyethylene tubes. Milk samples were preserved at 4°C until they were analyzed for iron content by absorption spectrophotometry. None of the mothers had mastitis or febrile illness during the period of study. Samples were finally transferred into screw-cap, plastic tubes and frozen at -20 °C until analysis. For laboratory iron analysis, samples were thawed, mixed thoroughly, and processed with a tri-enzyme digestion procedure before microbiological assay at room temperature and then at sub-boiling temperature for 6–9 hours. Iron concentration was determined by absorption spectrometry. The analyzed reference values were within 95–105% of the certified value.

Statistical analysis

Student's t test was used for variable analysis which was performed by using SPSS 20 program. Statistical significance was set at $P < 0.05$. All values in the text were expressed as mean ± SDs.

RESULTS

Both groups in the study (A control, B intervention) were compared in maternal age, maternal median serum hemoglobin level, gestational age and new born birth weight (Table 1).

Table (1): Patient's features.

Parameter	Group A (control n=100)	Group B (personalized medicine dispense n=100)	P value
Maternal age (minutes)	24.5± 8.3	25.6± 6.7	0.303 NS
Median serum hemoglobin level (g/dl)	12.1 ± 1.3	11.9 ± 1.4	0.296 NS
Gestational age (weeks)	39±4.1	39± 6.5	0.999 NS
Newborn weight	3402±544	3385± 546	0.825 NS
Time to cut the umbilical cord (minutes)	3.4±3.2	3.8± 2.5	0.325 NS
NS: non-significant			

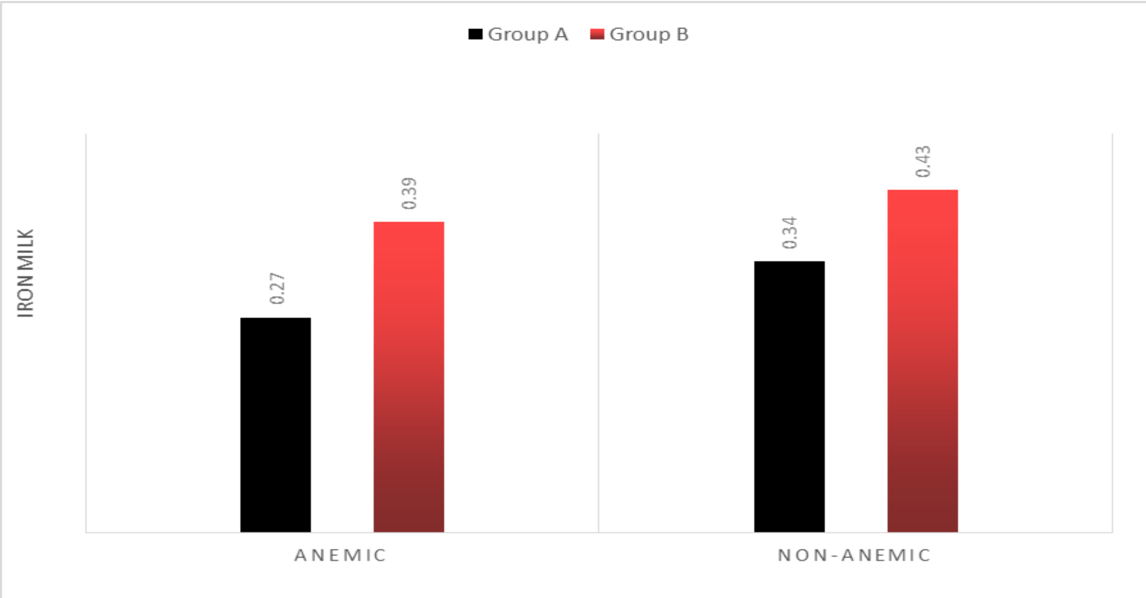
Free iron tablets (each tablet: 200 mg of iron sulphate - 60mg of elemental iron-) and folic acid tablets (each tablet: 1 mg of folate) were available all the time in health centers (HC). Any health team member could give free iron/folate prophylaxis or treatment to the patients, either if they demanded so (group A –"control group") or if patients received medicines in a personalized dispensed way by their responsible person in the health center or at home (group B). In this last case, Public health service labeled the medicine containers with each patient's first and last name. Iron and folate prophylaxis was given to 100% of mothers belonging to Intervention group (group B), while in anemic patients, treatment compliance was 96% for the same group. For the control group "A", prophylaxis and treatment compliance were 61% and 37% respectively (statistical differences between A and B groups were p 0.005 and 0.005 for prophylaxis and treatment respectively). Comparing control's mothers (group A), with mothers that received personalized treatment during their pregnancy (group B), it was observed that the last group had higher iron levels in their breast milk (Table 2), (Table 3).

Table (2): Iron levels in anemic patients during their last trimester of pregnancy.

Parameter	Group A* (n=55)	Group B** (n=35)	P value
Iron milk levels (mg/L)	0.27± 0.21	0.39± 0.22	0.011
*Controls patients; ** Intervention group			

Table (3): Breast milk iron levels.

Parameter	Group A (control n=100)	Group B (personalized medicine dispense n=100)	P value
Iron milk levels (mg/L)	0.34±0.21	0.43±0.21	0.002



DISCUSSION

Even in mothers who had anemia during their last trimester of pregnancy, personalized regular iron dispense assured higher breast milk iron levels than those of the control group. Iron deficiency is frequent in children under 1 year old in many developing countries like Iraq. Assuring iron prophylaxes and treatment to mothers during the pregnancy period may reduce this health problem. Especially in Iraq, the access to iron treatment is guaranteed by the Ministry of Health which provides the Health Centres with enough iron for all population. However, although medicine is available, treatment is still not assured since patients must have access to health centers to obtain the treatment. This situation was previously demonstrated by,[18] providing a medicine is not enough; an alternative strategy to obtain better treatment compliance is then needed. Personalized attention might improve health care performance as the other group has been shown previously.[19] It is well known that severe anemia, present in the early gestation period, along with concomitant maternal malnutrition, may be associated with anemia in newborns.

Nowadays, because of the convenience of mothers, commercial milk formulations have been used (and abused) to feed their newborns. However, official recommendations are in favor of maintaining exclusive breastfeeding until six months of life, as it does clearly provide immunological benefits for the children. It is therefore very important to ensure the best possible quality and highest iron content as possible of breast milk. The present study demonstrated that iron content in breast milk is impaired when mothers have iron-deficiency during the pregnancy period. Even if mothers had anemia during pregnancy, our data showed that a program that assures a personalized iron treatment, improves breast milk iron content. An official program that guarantees iron prophylaxis and treatment to pregnant women will increase breast milk iron levels reducing children problems associate to iron deficiency during the first year of their life.

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