

Original Article

Determination of The Concentration of Calcium Level in Blood of Babies Kept Growing on Breastfeeding, Artificial Feeding and Mixed Feeding in Libya

Khaled Benelhaj ^{1*} , Fathia Lazrag ²

¹ Department of General Medical Science, Faculty of Dentistry, Khalije-Libya Tripoli, Libya

² Department of Physiology and Biochemistry, Faculty of Veterinary Medicine, Tripoli University, Tripoli, Libya

Corresponding Email: khalijedent@yahoo.com

ABSTRACT

Objectives: This study was designed to investigate the concentration of calcium level in blood of breast, artificial and mixed feeding babies. **Methods:** The total number of babies covered were 269 babies of different ages, however, the babies were divided into four groups, including group (I) consists of 98 male and female babies aged between (1 day -6 months), group (II) consists of 53 male and female babies aged between (7 m -12 m), group (III) consists of 59 male and female babies aged between (13 m -18 m), and group (IV) consists of 59 male and female babies aged between (19 m -2 m). **Results:** The mean concentration of serum blood calcium in breast feeding (9.25 mg/dL) was significantly lower ($P < 0.05$) than artificial feeding (9.79 mg/ dL) and mixed feeding (9.88 mg/dL). Meanwhile, the mean concentration of serum blood calcium level (8.93 mg/ dL) in babies aged between (13 m-18m) was significantly lower ($p < 0.05$) than other aged groups. However, the effect of the babies' gender on the concentration of calcium indicated that the serum calcium levels did not show any significant difference among males and females' babies. **Conclusion:** The relationship between age type of feeding and the gender show a correlation among the factors studied, therefore, it can be concluded that the babies fed on mixed milk got a benefit regarding the levels of these minerals as their serum levels are higher than the serum levels of babies fed on breast and artificial milk.

Keywords: Calcium, Breast Feeding, Mixed Milk, Artificial Milk.

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INTRODUCTION

With increasing world concern about the benefits of natural feeding to babies compared to artificial feeding, many recommendations raised internationally such WHO, UNICEF and many other

organizations, indicated that the mothers should exclusively breastfeed their infants for the first six months of life, and to be continued into and beyond the second year (WHO, 2009). As the single source of food for term infants, breast milk contains not only

adequate nutritional components: (fats, lactose, proteins, and micro nutrients (vitamins, minerals) at concentrations that support optimal growth of human infant, but also the biochemical that allow optimal development of the infant and provide protection from infection (Christopher et al., 1994 and Mary, 2001).

It has been recognized worldwide that breastfeeding is beneficial for both the mother and child, as breast milk is considered the best source of nutrition for an infant (Ku and Chow, 2010 and Lawrence et al., 2011) Economic and social benefits are also provided to the family, the health care system and the employer. The calcium and phosphorus levels are inversely proportional to each other, so when the calcium levels in the blood get rise, the phosphorus levels decrease dramatically, therefore both electrolytes required to be estimated especially during breast, artificial and mixed feeding periods, in infants and mothers. However, the calcium and phosphorus are often considered together because both are simultaneously needed together for growth and maintenance of bones and teeth.

Serum levels of calcium in breast fed infants are lower than those of infants fed on artificial milk (Gertner, 1990, Anderson, 1992, Annemieketal., 1994, Pamela, et al., 1999, Lylia, 2006 and Chandrani, 2010) in addition to that, breastfeeding promotes health and helps to prevent disease, whereas artificial feeding is associated with more deaths from diarrhea in infants in both developing and developed countries (Fomon and Samuel, 2001) and WHO, 2003).

MATERIALS AND METHOD

Study design and patient setting

The design used in this study was completely randomized design (CRD). A total number of 269

random samples (male and female babies) attended out-patient clinic of The Tripoli University Hospital (TUH), Misurata Central Hospital (MCH) and some vaccination as center in Tripoli (Alhoria) and Misurata (Aljazeera) during the period 2012-2013. Subjects were, were divided according to: number of male and female babies at different age used to study the concentration of calcium level in serum of breast feeding, artificial feeding and mixed feeding babies. Group(a): consist of 98 babies aged between 1 Day – 6 months whom (59) male baby and (39) female baby, Group (b) consists of 53 babies aged between 7 months -12 months of whom (29) male baby and (24) female baby, Group (c): consists of 59 babies aged between 13 months -18 months whom (23) male baby and (36) female baby. Group (d) consists of 59 babies aged between 19 months -24 months whom (39) male baby and (20) female baby. The number of male and female babies per type of feeding used to study the concentration of calcium level in serum of breast feeding, artificial feeding and mixed feeding babies. Group (I) breastfeeding group: consisted of 265 babies whom (132) male babies and (133) female babies aged between (1 day- 24 months) old. Group (II) artificial feeding group: consisted of 265 babies whom of them are (153) male babies and (112) female babies aged between (1 day – 24 months) old. Group (III) mixed feeding group: consisted of 265 babies whom (139) male babies and 126 female babies aged between (1 day – 24 months) old. All information about the babies ages, gender, types of feeding and number of times of feeding were taken from mother's by specially designed Questionnaire (Q), at out-patient clinic of Tripoli University Hospital (TUH), Misurata Central Hospital (MCH) and vaccination centers in Tripoli (Alhoria) and Misurata (Aljazeera) during the period (2012-2013).

Experimental Methods

1. Hematological technique

A total of 2 ml of venous blood were withdrew from the hands of babies using butter fly needle into plain tube (without coagulant) vacutainer. The tubes were kept 2 hours to clot, then the serum was collected for calcium and phosphorus analysis using flame photometer system (Siemens dimension RL Max, Germany) in laboratories of Tripoli University Hospital (TUH) and Misurata Central Hospital (MCH).

2. Statistical analysis

Data were analyzed using SAS software. ANOVA test were used to compare the variants and a p value of less than 0.05 was considered statistically significant.

RESULTS

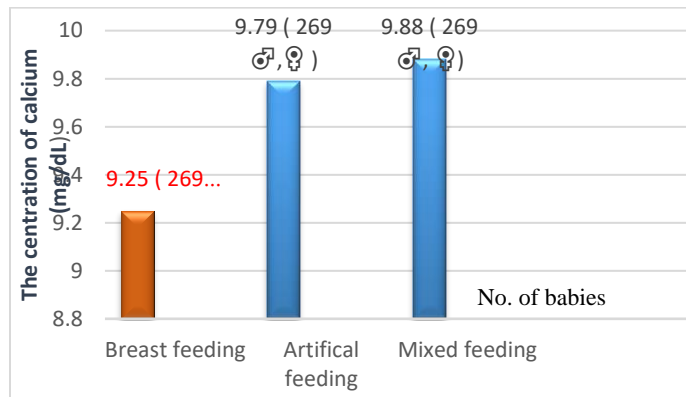
1. Effect of type of feeding on the levels of calcium in babies.

The mean concentration of serum calcium in breast feeding was lower (9.25 mg/dL), compared to artificial feeding milk (9.79 mg/ dL) and mixed feeding (9.88 mg/ dL). Table 1 and fig 1. shows the mean concentration of calcium(mg/dL) in the serum of breast feeding, artificial feeding and mixed feeding babies.

Table 1. The mean concentration of calcium(mg/dL) in the serum of breast feeding, artificial feeding and mixed feeding babies.

Number of babies	Breast feeding	Artificial feeding	Mixed feeding
269	9.25±0.09 ^b	9.79±0.09 ^a	9.88±0.07 ^a

Different alphabetical superscripts indicate significantly different ($P < 0.05$).



2. The effect of age on serum concentration of calcium and of breast, artificial and mixed feeding babies.

The mean concentration of calcium in breast feed babies aged between (1 day – 6 months) was (9.04 mg/ dL) and this was significant low than the babies aged between (7–12 months) (9.52 mg/ dL), however, the level of calcium recorded in the babies aged between (13-18 months) was (8.93 mg / dL) and this was the lowest concentration recorded in the breast feeding group, whereas the highest level recorded in the age of (19-24 months) (9.66 mg/ dL). The results depicted in table 2 and fig. 2.

Table 2. The concentration of calcium in serum of breast feeding, artificial and mixed feeding babies at different age intervals.

Age	No. of babies	calcium levels (mg/dL) Breast Feeding	calcium levels (mg/dL) Artificial Feeding	calcium levels (mg/dL) Mixed Feeding
1d - 6m	98	9.04±0.9 ^b	9.24±0.09 ^b	9.62±0.06 ^b
7m - 12m	49	9.52±0.73 ^a	10.1±0.04 ^a	10.07±0.04 ^a
13m - 18m	59	8.93±0.72 ^b	10.01±0.04 ^a	9.95±0.04 ^a
19m - 24m	59	9.66±0.12 ^a	9.83±0.07 ^a	10.07±0.04 ^a

d=day m=months total number=265. Different superscripts indicate significantly different ($P < 0.05$).

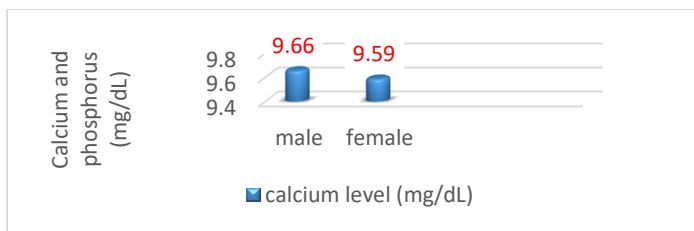
3. The effect of gender of babies on the concentration of calcium

The mean concentration of calcium in male babies was (9.66 mg/dL) and this was almost equal to the female girls (9.59mg/dL). Table 3 and fig 3 shows the mean concentration of calcium in serum of male and female babies.

Table 3. The mean concentration of calcium in serum of male and female babies.

Gender	No. of babies	Calcium(mg/dL)
Male babies	424	9.66±0.07 ^a
Female babies	371	9.59±0.07 ^a

Different superscripts indicate significantly different ($P < 0.05$).



4. The Correlation between type of feeding, age and gender on serum concentration of calcium in babies.

This study did not find any link between type of feeding, age and sex among the babies.

Table 4. Show the statistical results

Relationship	N-1	Sum of squares	Means(mg /dL)	P value	Pr > P
Type of feeding *Age	6	4.05	0.67	0.31	0.933
Gender* Age	3	10.04	3.34	1.53	0.206
Type of feeding Gender*	2	7.33	3.66	1.67	0.188
Type of feeding *Gender*	6	12.38	2.06	0.94	*0.465

Age					

* No, significantly different ($P < 0.05$).

DISCUSSION

The building of healthy skeleton in growing bodies is required adequate normal physiological concentration of calcium, however, in babies the source of calcium is obtained only from the milk they feed. Breast feeding was recommended by many health organizations for the first 6 months of life, (15) because it provides the babies with the most nutritional requirements and also buildup the immunity that help protect babies against childhood illnesses and chronic diseases (16). Serum levels of calcium in breast fed infants are lower than those of infants fed on most formulae, where calcium levels are low, (1) , (2) , (18) , (11) and (3) , but disagreement with the reported by (6) .

In the current study the concentration of calcium in breast feeding blood babies was lower than the artificial and mixed feeding blood babies and this is may be due to mother's factor or absorption of calcium in the gut of the new-born which is dependent not only on the concentration ions in milk but also on other factors, especially fats and vitamin D. Breast milk contains 200–300 mg/L of calcium with no pronounced change during lactation. However, it has been estimated that the calcium intake of exclusively breastfed infants meets the calcium requirements during the first 6 months of life, if the efficiency of absorption remains at 70% (3)

The age of babies did not positively correlate with levels of calcium in all type of feeding where the levels of both electrolytes were not consistent among the feeding groups and, however, remained within the physiological values. The low concentration of calcium in babies aged between (13 months – 18 months) in breast feeding isn't agreement with the

observation in study carried out in Libya (11) who reported that breast milk has low calcium rate and in turn breast feeding babies will develop low concentration of calcium. The overall concentration of calcium in the serum of mixed and artificial feeding were higher than that the breast feeding and such results in agreement with the study of (9) and (1). The of low concentrations of calcium in breast feeding compared to mixed and artificial feeding may be attributed to many factors including, mother factor who has low vitamin D (14) and (13) or low calcium intake of mother, such factors can be corrected by supplementation doses of artificial milk to breast feeding babies and this was evident in the mixed feeding babies whom their concentration of calcium and phosphorus was almost similar to artificial and higher than breast feeding babies. Generally, the levels of calcium in all feeding groups studied were within the normal physiological levels and far from hypocalcemia which defined as a total serum calcium concentration less than (8.5 mg/ dl), therefore, it is recommended that the mothers who feed their babies breast milk should be routinely check up their blood calcium level and vitamin D concentration during pregnancy and either during lactation period.

CONCLUSION

The main source of calcium is obtained only from the milk ,however, breast feed milk is well recommended worldwide because it provides the babies with the most nutritional requirements and also buildup the immunity that help protect babies against childhood illnesses and chronic diseases, therefore , babies of poor nutritional mothers should they feed their babies extra milk rich in calcium to avoid any deficiency of calcium during early important growing period.

Disclaimer

The article has not been previously presented or published, and is not part of a thesis project.

Conflict of Interest

There are no financial, personal, or professional conflicts of interest to declare.

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