ORIGINAL ARTICLE ÖZGÜN ARAŞTIRMA

Determinants of Formula Milk Supplementation at a Baby Friendly University Hospital During Hospital Stay

Bebek Dostu Bir Üniversite Hastanesinde Hastanede Yatış Süresince Formül Süt Takviyesinin Belirleyicileri

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Abstract

Introduction: While the World Health Organization (WHO), the American Academy of Pediatrics (AAP) and the United Nations Children's Fund (UNICEF) recommend exclusive breastfeeding in the first 6 months of life, the AAP recommends continuity of breastfeeding beyond the age of 1 and WHO beyond the age of 2 years. We aimed to determine the rate, causes and contributing risk factors of early formula milk supplementation (FMS) both in hospital setting during early postpartum and post-discharge follow-up in a baby friendly hospital.

Materials and Methods: The study was done retrospectively by collecting the recorded data of mothers and their healthy infants that were born in a private baby-friendly hospital from January 2020 to January 2021.

Results: FMS rate during hospital stay was 13.78% (n=128). C/S delivery is significantly higher in formula milk supplemented group. While breast milk insufficiency was determined as the most common cause for FMS, as a result of logistic regression analysis, pregnancy with assisted reproductive technique, multiple pregnancy, birth weight less than 2500 g, gestational age less than 37 weeks, maternal/obstetrical diseases, gestational diabetes mellitus and smoking mother were determined as potent factors on FMS.

Conclusion: The negative effects of possible risk factors can be significantly reduced if adequate support is given to the mother by health professionals after birth, the hospital's written breastfeeding policy is followed, FMS is not given other than medical indications and breastfeeding counseling continues after discharge.

Keywords
Human milk, exclusive breastfeeding, formula milk supplementation, neonate

Öz

Giriş: Dünya Sağlık Örgütü (DSÖ), Amerikan Pediatri Akademisi (AAP) ve Birleşmiş Milletler Çocuklara Yardım Fonu (UNICEF) yaşamın ilk 6 ayında sadece anne sütü ile beslenmeyi tavsiye ederken; AAP, 1 yaş sonrasına WHO ise 2 yaş sonrasına kadar emzirmeye devam edilmesini önermektedir. DSÖ ve UNICEF, tüm dünyada emzirme oranlarını artırmak için Bebek Dostu Hastane Girişimi adlı küresel bir program geliştirdi, bu programın 6. adımı, yeni doğanlara tıbbi olarak gerekli olmadıkça anne sütü dışında yiyecek verilmemesini sağlamaktır. Bu çalışma ile, bebek dostu bir hastanede doğum sonrası hastane izlemi sırasında ve taburculuk sonrasında formül süt destek oranını, nedenlerini ve katkıda bulunan risk faktörlerini belirlemeyi amaçladık.

Gereç ve Yöntem: Çalışma, Ocak 2020 ile Ocak 2021 tarihleri arasında bebek dostu sertifikalı özel bir üniversite hastanesinde dünyaya gelen ve anne yanında izlenen sağlıklı bebeklerin ve annelerin kayıtlı verileri toplanarak yapılmış retrospektif bir çalışmadır.

Bulgular: Hastanede kalış süresi boyunca formül süt ile desteklenme oranı %13,78 (n=128) idi. Sezeryan yolu ile doğanlarda formül süt destek gereksinimi anlamlı

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daha yüksekti. Lojistik regresyon analizi sonucunda formül süt destek gereksinimi için en sık neden olarak anne sütü yetersizliği belirlenirken, yardımcı üreme tekniği ile gebelik, çoğul gebelik, 2500 gramın altında doğum ağırlığı, gebelik yaşı 37 haftadan küçük olmak, maternal obstetrik hastalık öyküsü, gestasyonel diabetes mellitus ve annede sigara kullanımı diğer etkili faktörler olarak belirlendi.

Sonuç: Doğumdan sonra sağlık profesyonelleri tarafından anneye yeterli destek verilirse, hastanenin yazılı emzirme politikasına uyulursa, tıbbi endikasyonlar dışında formül süt desteği verilmezse ve taburcu olduktan sonra da emzirme danışmanlığına devam edilirse olası risk faktörlerinin olumsuz etkileri önemli ölçüde azaltılabilir.

Introduction

Breastfeeding has important short and long-term outcomes for both infant and mother. It is demonstrated that breastfeeding reduces the mortality and morbidity of the infant; lowers the rates of respiratory and gastrointestinal tract infections. In the long-term, breastfed infants has lower risk for obesity and type 2 diabetes mellitus (1,2). It is also important for preserving gut microbiota, even brief exposure to infant formula changes the microbiom and makes the infant vulnerable to allergic diseases (3,4). Together with these benefits for the infant, breastfeeding also decreases maternal ovarian and breast cancer and the risk of type 2 diabetes mellitus and cardiovascular disesases. It is also associated with less postpartum hemorrage and faster weight loss (1). Due to these variety of benefits The World Health Organization and United Nations Children's Fund (WHO/UNICEF) recommend exclusive breastfeeding during the first six months of life and to continue the breastfeeding beyond the age of two with complementary foods (5). WHO and UNICEF developed a global program called Baby-Friendly Hospital Initiative (BFHI) in 1991 which consists of 10 steps that hospitals should apply to support breastfeeding (6). Studies demonstrate that exposure to more steps of the BFHI is associated with longer duration and exclusivity of breastfeeding (4,7,8). One of the most important step of BFHI is not to provide any food or fluids other than breastmilk unless medically indicated. Supplementation with formula during post partum hospital stay shortens breastfeeding duration two to threefold (9). Early supplementation with infant formula during hospital stay may affect the lactation and breastfeeding duration negatively. The key point of breastfeeding success during and beyond hospital stay is not to give any food or fluids other than breastmilk. So in our study we aimed to determine the rate, causes and contributing risk factors of early formula milk supplementation (FMS) both in hospital setting during early postpartum and post-discharge follow-up in a baby friendly hospital.

Materials and Methods

The study was done retrospectively by collecting the recorded data of mothers and their healthy infants that were born in a private baby-friendly hospital from January 2020 to January 2021. Nine hundred twenty nine mother-infant dyads included in the study. Infants that were taken into neonatal intensive care unit for any reason were excluded. Our hospital has a written infant feeding policy which is constituted based on BFHI programme. Healthy professionals working in the nursery care and responsible for the care of neonates are aware of this feeding policy and are regularly trained on lactation counseling. All mothers have been educated about benefits of breastfeeding besides lactation practice both during pregnancy and after delivery. There is a nurse for every mother-infant dyad for evaluating, helping and supporting breastfeeding during hospital stay. Also there is a lactation consultant giving counselling about breastfeeding before and after dischage by both telephone and/or talking face-to-face. There are two subgroups according to feeding type; exclusively breastfed group (group 1); infants were fed with only breast milk and formula milk supplemented group (group 2); infants received FMS as well as breast milk in any time during hospital follow-up and at discharge. The parameteres recorded about the mother were age, parity, smoking habit, special conditions related to pregnancy [gestational diabetes mellitus (GDM), hypothyroidism, preeclampsia], pregnancy with assisted reproductive technique (ART), breastfeeding education before delivery. The parameters recorded about neonates were gestational age, gender, mode of delivery, gestational weight, appropriate for gestational age, small for gestational age (SGA), large for gestational age (LGA), FMS, the way of FMS (cup-feeding, bottle feeding, spoon

feeding), the reasons for FMS, pacifier usage in the hospital. Medical indications for FMS were breast milk insufficiency, excessive weight loss and presence of neonatal hypoglycemia in the first 24 hours of life. Breast-milk insufficiency decision based on nurse observation who promoted and supported breasfeeding and daily weight loss of the infant (daily weight loss >3%). Blood glucose follow-up was not performed for all babies, it was performed when there was a risk like being SGA, LGA and infant of gestational diabetic mother or if the infant had clinical signs suggesting hypoglycemia as hypoactivity and/or tought to be fed insufficiently. Blood glucose level was checked in the first and fourth hours of life if the infant had any risk factor or at any time when the doctor suspected from hypoglycemia. Blood glucose level less than 47 mg/dL is accepted as hypoglycemia. SGA is defined as birth weight below the 10th percentile, LGA is defined as birth weight above the 90th percentile. Also we questioned about the status of taking lactation counselling after discharge. The family could receive counseling by phone or face-to-face at any time after discharge. The study was approved by the Ethics Committee of Acıbadem University Hospital on the date of 21.04.2021 with decision number of 2021-08/20.

Statistical Analysis

Data were recorded and analysed using NCSS (Number Cruncher Statistical System) 2007 Statistical Software programme (Utah, USA). Descriptive statistical methods (mean, median, interquartile range, standard deviation) are used for analysing continuous variables. Distrubition of the variables are evaluated by Shapiro-Wilk test. Independent t-test was used to compare paired groups of normally distributed variables. Mann-Whitney U test was used to compare paired groups of non-normally distributed variables and chi-square test was used to compare qualitative data. Logistic regression analysis was used to determine the factors that affect formula milk supplementation. Statistical significance was defined as a $p<0.05$.

Results

Nine hundred twenty nine mother-infant dyads included in the study. The rate of the male infants was 50.8% (n=472). The mean gestatitional age was 38.75±1.13 weeks, birth weight was 3286.20±430 gr. The rate of C/S delivery was 64.6%. The rates of pregnancy with ART and multiple pregnancy were 13.78 % and 6.47%, respectively. The mean age of all mothers was 33.45±4.65. The mean age of mothers having pregnancy with ART was 36.60±5.60. The mean age of mothers having pregnancy with ART was significantly older than the mean age of mothers with spontaneous pregnancy. Pregnancy with ART and multiple pregnancy is significantly higher in formula milk supplemented group. The mean age of mothers was significantly higher in formula milk supplemented group. Nine percent of the mothers had GDM, 5.27% had hypothyroidism, 0.65% had preeclampsia. GDM rate in mothers of group 2 infants was significantly higher than the GDM rate in mothers of group 1 infants (p=0.016). Two percent of the mothers reported smoking during pregnancy. Formula milk supplementation rate during hospital stay was 13.78% (n=128). The most common cause for supplementation was breastmilk insufficiency, the other causes and the rates were listed in Table 1. FMS was given by cup- feeding to 85.6% infants (n=109), by bottle to 14.84% infants (n=19). According to our written infant feeding policy, pacifier and bottle-feeding is not recommended due to adverse effect on breastfeeding. Pacifier and bottle-feeding were used at the request of the family in 2 and 19 cases, respectively. If there is no medical indication for longer hospital stay, the infants delivered by vaginally and by C/S are discharged at 24 hours and 48 hours of life, respectively. Weight

Table 1. The reasons for formula milk supplementation

	n (128)	%
Breast milk insufficiency	63	48.05
Weight loss	28	21.88
Hypoglycemia	22	17.19
Mastectomy	1	0.78
Family request	14	10.94

Table 2. Demographic and nutritional characteristics of the newborn infants who were exclusively breast-fed (group 1) and who were fed both by breast milk + formula after birth (group 2)

Demographic and clinical characteristics	Group 1 (n=801) exclusively breast milk fed infants	Group 2 (n=128) breast milk + formula fed infants	p
Gestational age (wk), mean ± SD	38.65±1.03	37.57±1.55	**0.0001**
Birth weight (gr), mean ± SD	3366±1320	3055±575.27	**0.0001**
Prematurity (GA <37 wk), n (%)	91 (11.36)	61 (47.66)	**0.0001**
Low birth weight (<2500 gr), n (%)	18 (2.25)	27 (21.9)	**0.0001**
SGA infant (n, %)	37 (4.62)	15 (11.72)	**0.004**
Male (n/%)	407/86.20	65/13.80	0.995
Female (n/%)	394/86.20	63/13.80	
CS delivery, n (%)	487 (60.80)	113 (88.28)	**0.0001**
Pregnancy with ART, n (%)	77 (60.20)	51 (39.84)	**0.001**
Singleton pregnancy, n (%)	786 (98.37)	81 (63.28)	**0.0001**
Infant from multiple pregnancy, n (%)	13 (1.63)	47 (36.72)	
Maternal age (year), mean ± SD	33.24±4.52	34.73±5.25	**0.001**
High maternal age (≥35 years), n (%)	65 (18.70)	282 (81.3)	**0.001**
Prenatal birth education, n (%)	666 (83.25)	109 (85.16)	0.589
Maternal/obst. diseases, n (%)			
Preeclampsia	3 (60)	2 (40)	0.163
Gestational diabetes	66 (77.60)	19 (22.40)	**0.016**
Hypothyroidism	41 (83.70)	8 (16.30)	0.595
Maternal smoking, n (%)	10 (58.80)	7 (41.20)	**0.005**
Weight loss at discharge (% birth wight), mean ± SD	5.37±2.4	6.41±2.59	**0.0001**
Postnatal lactation counceling, n (%)			
Face-to-face	134 (84.30)	25 (15.70)	0.434
By phone	360 (83.90)	69 (16.10)	0.059

FMS: Formula milk supplementation, ART: Assisted-reproductive technique, GDM: Gestational diabetes mellitus, NSVD: Normal spontaneous vaginal delivery, C/S: Cesarean delivery, GW: Gestational week, AGA: Appropriate for gestational age, SGA: Small for gestational age, LGA: Large for gestational age, SD: Standard deviation

loss relative to birth weight at discharge was mean 3.46±1.68% in vaginally delivered neonates and 6.64±2.04% in C/S delivered neonates. C/S delivery is significantly higher in group 2 neonates. When group 1 and 2 neonates were compared, FMS was significantly higher in those with gestational age <37 weeks, birth weight <2500 gr and SGA neonates. The investigated factors that should affect FMS are summarized in Table 2. To determine the factors affecting the need for FMS, Backward Stepwise Logistic regression analysis was performed with variables: Pregnancy with ART, multiple pregnancy, maternal age, birth weight <2500 gr, gestational age <37 weeks, GDM, smoking, C/S delivery and % weight loss at discharge. The results were summarized in Table 3.

Discussion

In our study, we investigated the reasons for providing FMS and the risk factors that increase FMS during postnatal hospital follow-up in our baby-friendly certified hospital. While breast milk insufficiency was determined as the most common cause for FMS, as a result of Backward Stepwise Logistic regression analysis, pregnancy with ART, birth weight less than 2500 g, GDM, smoking mother and multiple pregnancy were determined as potent

Table 3. Risk factors for formula milk supplementation of newborn infants during hospital stay		
Risk factors	OR (95% CI)	p
Prematurity (GW<37 weeks)	0.79 (0.38-1.64)	0.531
Low birth weight (<2500 gr)	0.17 (0.07-0.44)	**0.0001**
% weight loss at discharge	1.1 (0.97-1.23)	0.129
Infant of a multiple pregnancy	0.09 (0.04-0.23)	**0.001**
Maternal age	1 (0.95-1.06)	0.935
Pregnancy with ART	0.36 (0.2-0.65)	**0.001**
Maternal smoking	0.13 (0.05-0.35)	**0.0001**
CS delivery	0.57 (0.28-1.16)	0.121
Gestational diabetes	0.43 (0.22-0.83)	**0.012**

OR: Odds ratio, CI: confidence interval. OR, 95% CI and p values were estimated using multivariable (logistic regression models), FMS: Formula milk supplementation, ART: Assisted-reproductive technique, GDM: Gestational diabetes mellitus, C/S: Cesarean section

factors on FMS. Rates of breastfeeding initiation vary widely around the world; the ratio is nearly 99% in Norway, Denmark and Japan, 90% in Germany and 74.6% in United States (10). According to Turkey Demographic Health Survey 2013 results, the ratio is around 70% with the efforts of healthcare professionals in our country (11). There is no significant change in 2018 survey results; 71.3% of neonates are breastfed within the first hour of life and unfortunately 41.7% of neonates are given fluids or foods other than breast milk in the first three days of life (12). In our study, each neonate was started to be breastfed as soon as possible, 86.22% of the neonates were exclusively breastfed at discharge while 13.78% of neonates were both breastfed and formula milk supplemented. In hospital FMS may affect milk production. Formula milk is usually supported in larger amounts than required, so an infant supplemented with formula milk, suckles less and prolactin secretion in the mother reduces. FMS decreases breastfeeding, the amount of milk removed and production of milk (13). Determinant factors in FMS during hospital stay are investigated in many studies. One of the associated factor is delivery mode. FMS is hihger among C/S delivered neonates during postnatal hospital stay in a study performed in New York hospitals (14). In the study of Chen et al. (15), it was found that the rate of FMS during hospital follow-up was 3.5 and the delay in breastfeeding initiation was 6.5 fold higher in C/S delivered neonates. Similarly, 88.28% of FM supplemented neonates were delivered by C/S in the present study. C/S delivery delays the initiation of breastfeeding; possible causes are seperation of mother-infant dyads for postoperative care (16,17), feeling more pain than those who delivered by vaginally, exposure to anesthesia during C/S delivery, difficulty to find a comfortable position for breastfeeding due to abdominal incision (15). So elective C/S delivery should be avoided, mother-infant meeting should be arranged as soon as possible after delivery, FMS should be prevented during hospital stay unless there is a medical indication. Kalmakoff et al. (18) reported that contrary to many studies, they did not detect C/S delivery as a risk factor for FMS. They thought that this may be related to providing mother-infant contact as soon as possible and stated that in the study period 95% of neonates achieved skin to skin contact in an hour after delivery. So health professionals play a significant role for initiating and maintaining breastfeeding. Ragusa et al. demonstrated that private hospitals with hotel comforts did not increase the percentage of breastfeeding. They found that the only variable that affected exclusively breastfeeding among various hospitals was the presence of midwifes trained lactation counseling in nursery (17,19). Higher exclusive breastfeeding rates at discharge in our private university hospital although it has hotel comforts, comparison to national data may be the presence of trained health professionals including attending pediatricians in human lactation and infant care who provides support one to one before and after birth and also post discharge. Parry et al. (20) demonstrated that while C/S delivery, assisted vaginal delivery (forceps/suction) and birth weight less than 3250 gr increased FMS, initiation of breastfeeding in the delivery room decreased it. In the same study, it was observed that those who were fed only breast milk

for the first 24 hours of life had longer breastfeeding duration than those who received any amount of formula milk. In the study of Boban and Zakarija-Grković (21), it was determined that 62.8% of neonates were given formula milk supplementation during hospital follow-up and while formula milk was supplemented by cup-feeding in %97 of neonates, bottle was used in 3% of neonates. The most common cause for FM supplementation was breast milk insufficiency (49.8%); other causes were crying neonate (35.5%), feeling pain/weakness following c/s delivery (11.5%), weight loss (10.6%), and nipple soreness (10.1%). In the study of Chantry et al. (9), the rate of providing FMS during hospital follow-up was 47% among women who were first-time mothers and intended to breastfeed their babies exclusively. The most common reasons were insufficient breast milk and inadequate suckling of infants. In the same study, it was determined that when FMS was given with a bottle instead of other alternative methods during hospital follow-up, the rate of exclusive breastfeeding between 30 and 60 days of life was significantly lower. In our study, the rate of FMS during hospital follow-up after birth was 13.78%, and was mostly given with a cup in accordance with the recommendations of the WHO and UNICEF. The most common causes for supplementation were breastmilk insufficiency (47.66%), weight loss (21.88%) and hypoglycemia (17.19%). In the literature, maternal obesity, gestational age below 40 weeks according to some studies and less than 37 weeks in others and birth weight below 2500 grams have been identified as risk factors for FMS (4,18,22). Being born at 37-39 weeks of gestation was reported as a risk factor for breastfeeding failure, even in countries with high breastfeeding initiation rates (23,24). This situation should be considered in pregnant women who will be decided to have labor induction or elective C/S before 39 weeks and the potential negative effects on breastfeeding should be shared with the mothers. Similarly, in our study, FMS was found to be significantly higher in neonates born with gestational age below 37 weeks, birth weight less than 2500 grams, and SGA. Neonates born with ART are more exposed to obstetric complications and perinatal adverse outcomes such as C/S delivery, premature birth, low birth weight and perinatal mortality (25). Fisher et al. (26) reported that anxiety and breastfeeding difficulties were more common in mothers who became pregnant with ART. Monti et al. (27) determined that anxiety and emotional fragility were higher in women who became pregnant with ART and this situation increased the risk of depression and affected the mother-infant relationship negatively. The study of Castelli et al. (28), which investigated the maternal factors that negatively affect the decision of breastfeeding among women who became pregnant with ART, identified 3 factors; long duration of infertility (longer than two years), C/S delivery and formula-fed mothers as newborns. In the same study, the mean age of mothers at birth was 32.7±4.5 years, and the rate of delivery by C/S was 42%. In our study, the mean age of mothers who conceived spontaneously was 32.94±4.28 years, while the mean age of mothers who became pregnant with ART was 36.60±5.60 years (p=0.0001). Also, C/S delivery (n=108, 84.37%) and FMS were significantly higher in ART pregnant women (p=0.0001). The reasons for the higher rate of FMS in ART pregnancies may be that most of them are first-time mothers therefore, they have no previous breastfeeding experience and are more anxious about baby care and also the rate of C/S delivery is higher. One of the factors that may affect exclusively breastfeeding is smoking (13,29,30). In our study, FMS was significantly higher in neonates of smoking mothers. Smoking mothers may have little desire to ask for support to breastfeed because they may think that it is not healthy to breastfeed in their case and have a fear to get negative reaction from doctors and other health professionals. GDM has long and short term effects on both mother and infant. Fetal exposure to GDM is related to macrosomia, shoulder dystocia and neonatal hypoglycemia in short term and obesity, high blood pressure and impaired glucose tolerance in long-term period (31-33). Potential benefits of breastfeeding for mothers with GDM are improved glucose tolerance, improved insulin sensitivity and reduction of type 2 diabetes incidence; benefits for children are listed as reduced body mass index in early infancy and childhood and reduced prevelance of type 2 diabetes (31). Altough several advantages of breastfeeding, women with GDM have low breastfeeding rates than women without GDM. One of the studies demonstrated that women with GDM breastfed less compared to counterparts without GDM at hospital discharge (34). Haile et al. (35) also reported lower exclusive breastfeeding rates at hospital

discharge among US women with GDM. In another study researchers found a significant association between GDM and FMS in the first 2 days of life (36). The possible reasons for lower breastfeeding rates among women with GDM may be listed as maternal obesity, higher prevelance of C/S delivery, neonatal hypoglycemia and inadequate support from health professionals. Similarly, in our study FMS is significantly higher in neonates of diabetic mothers.

Study Limitations

One of the limitations of the study is that it is retrospective, and another is that we do not have any information about how the infants were fed after discharge, and how long they were exclusively breastfed.

Conclusion

As a result, in our study, the main risk factors affecting the requirement for FMS in hospital setting after delivery were found to be low birth weight, C/S delivery, pregnancy with ART, maternal GDM and smoking. The negative effects of possible risk factors can be significantly reduced if adequate support is given to the mother by health professionals after birth, the hospital's written breastfeeding policy is followed, FMS is not given other than medical indications and breastfeeding counseling continues after discharge.

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Ethics

Ethics Committee Approval: The study was approved by the Ethics Committee of Acıbadem University Hospital on the date of 21.04.2021 with decision number of 2021-08/20.

Conflict of Interest: No conflict of interest was declared by the authors.

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