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Study of Factors Affecting Exclusive Breast feeding and Early Introduction of Complementary Food to Infants in the Aqaba Region of Jordan

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Abstract

Initiation of exclusive breastfeeding (EBF) at birth, followed by introduction of complementary food (CF) at six months of age, is necessary for the lifelong health of the child. In Jordan, EBF rates are not optimal. To our knowledge, there have been no studies to date on breastfeeding practices in the Aqaba region. Therefore, this study aimed to determine the factors affecting EBF and early introduction of CF in this region. A cross-sectional study was conducted with 448 Jordanian mothers who were recruited from three primary health care centers in Aqaba. They were interviewed and asked to complete a questionnaire concerning the following variables: socio-demographic information, reproductive health of the mother and infant and postpartum conditions and events of the 488 mothers recruited, we found that the number who breastfed exclusively for <6 months or =6months were 230 (51.4%) and 89(19.8%), respectively. Furthermore, introduction of CF at <6 months old occurred in 203(45.3%) infants. The effects of childbirth weight ≤2.5kg, maternal smoking, and pacifier use on the likelihood of EBF for less than 6 months were odds ratio [OR] = 1.07; P<0.022, OR=0.09; P<0.004, and OR=0.35; P<0.001, respectively. With respect to CF, early initiation of CF was associated with childbirth weight (P=0.025), type of delivery (P=0.014), and pacifier use (P=0.001).Thus, initiation of CF before 6 months of age was associated with health problems in infants (P=0.030) including allergy, diarrhea, and abdominal colic. Jordanian mothers in Aqaba had a low rate of EBF for =6 months and a high rate of early introduction of CF to their infants, both of which contravene health recommendations of global organizations.

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Introduction

Good nutrition in early life is essential to lifelong health; therefore, receiving exclusive breastfeeding (EBF) is very important to protect against diseases and prevent morbidity and mortality of infants and young children, including malnutrition and obesity.[1] For this reason, countries should have solutions to reach the target of 50% EBF through the first 6 months of life by 2025.[2] Even with EBF, the children's growth will be stunted if they do not receive sufficient quantities of quality complementary food (CF) after six months of age[3] due to the increasing difficultly of meeting their nutrient needs from breastfeeding alone. Therefore, CF should be given to infants starting at the age of 6 months, along with continued breastfeeding up to 24 months (or beyond), in order to provide optimal nutrition.[4,5] According to the World Health Organization (WHO), the period from 6–24 months of age is a critical time during which children are at high risk of under nutrition, nutrient deficiencies, and illnesses.[6] The incidence of malnutrition rises sharply during this age group in most countries, and it is difficult to compensate for deficits acquired at this age later in childhood.[4] Deficiencies of vitamin A, iron, zinc, and iodine are common and are the most known causes of morbidity and mortality, mainly between children.[7] On the other hand, the effects of poor nutrition maintain over the child's life, leading to reduced school performance and productivity, and impaired intellectual and social progress.[8] There is some evidence that approximately one-third of children less than five years old in developing countries are stunted, and large proportions are also deficient in one or more of the above micronutrients. An estimated 6% of deaths under five years old can be prevented by ensuring optimal CF. In addition, optimal breastfeeding could prevent 13% of deaths,[6],[9.] In Jordan, the Jordanian Ministry of Health and UNICEF are supporting Save the Children of Jordan and other community-based organizations in a national breastfeeding awareness campaign in all 12 governorates. Several studies and surveys have been carried out in Jordan, but these are few, and their results over the last 20 years have shown varying rates of breastfeeding. Demographic and Health Surveys conducted in 1997 and 2002 showed that the EBF rates among Jordanian infants less than 6 months old were 12% and 26.7%, respectively .Unfortunately, this rate dropped to 22% in 2007 and was 23% in 2012.[10] In 2014, a study was conducted in Jordan at six main governmental and private hospitals in Amman, Irbid, and Zarqa to investigate the prevalence and barriers of EBF among Jordanian mothers. The results of this study displayed that the adherence of EBF as recommended by the WHO was 1%.[11] On the other hand, a recent study conducted in Northern Jordan to determine the prevalence, predictors, and barriers to EBF found that 33% of the infants received the recommended durationofEBF.[12] In southern Jordan, Tamimi and colleagues noted that the rate of breastfeeding was 20.9% in a cross-sectional study of 400 working mothers.[13] However, these studies do not represent all regions of Jordan and thus cannot be generalized. In addition, to our knowledge, no previous studies have been conducted on breastfeeding in the Aqaba region. Therefore, this study aimed to determine the factors affecting EBF and early introduction of CF in this region.

Materials and Methods

Subjects and Study Design

This cross-sectional descriptive study was conducted in the Aqaba region in southernmost Jordan, an area where no previous breastfeeding studies have been conducted. Data were collected consecutively only from Jordanian mothers who visited the maternal and child health sections of the three primary health care centers in Aqaba affiliated with the Jordanian Ministry of Health. The mothers visited these centers for follow-up and to receive vaccinations during the first two years of the infants' lives. The study was conducted between March 2017 and September 2018. The selected mothers ranged in age from 18 to 48 years old, had given birth to a healthy newborn infant by normal vaginal delivery or cesarean section, and had one child aged less than 2 years at the time of study. Infants with genetic diseases that interfere with breastfeeding were excluded. A total of 448 mothers-infant pairs were randomly included in this study. Ethical approval (number SREC/10719) was obtained from the Department of Nutrition, College of Agriculture, Mutah University prior to the start of the study. Before the start of interviews, all mothers provided written informed consent indicating their desire to participate in this study.

Questionnaire

Three female trained dietitians were responsible for identifying mothers who met the eligibility criteria

using a pre-tested questionnaire with closed-ended questions that was based on a design from previous studies[14,15] and modified to meet our objectives. The questionnaire included questions on 1) socio-demographic information (family size, age, weight, height, and body mass index [BMI] of the mothers, family income, mother's occupation, and the parents' educational levels); 2) reproductive health of the mothers and the infants (type of delivery, contraceptive use, mother's diseases, mother smoking, number of births of mother, age of infant at birth, gender, and infant's weight after birth); and 3) postpartum conditions and events(the newborn infant stay with mother in the same room or in a separate room, frequency of breastfeeding, number of BFs at night, use of a pacifier, whether mothers were informed about the importance of BF or not, time of introduction of infants to CF, and health problems after introduction of the first CF). The questionnaires took approximately 20–25 minutes to complete. Mothers were encouraged to ask questions or request clarifications. Questionnaires and informed consent forms were written in Arabic.

Statistical Analyses

Data collected from the questionnaires were entered and analyzed using SPSS software version 22 (IBM Corp., Armonk, NY, USA). Descriptive statistics were performed using frequencies and proportions for categorical variables. The chi-squared test was used to detect significant differences among these variables, and statistical tests with p-values ≤ 0.05 were considered statistically significant. A binary logistic regression analysis—calculating the odds ratio (OR) and its 95% confidence interval (CI)—was then carried out to find the association between independent variables (demographic characteristics, reproductive health characteristics of mothers and infants, and breastfeeding practices and patterns) and EBF for infants <6 months of age, and also with the introduction of CF to infants at <6 months of age. Logistic regression categorized the participants into the two following groups: 1) mothers who exclusively breastfed for 6 months (i.e., completed WHO-recommended EBF; we called this the reference group); and 2) mothers who exclusively breastfed for less than 6 months (i.e., did not complete recommended EBF). Mothers were also categorized into two groups based on when they introduced their infants to CF as follows:1) mothers who introduced to their infants at <6 months of age;and2)mothers who introduced CF to their infants at ≥6 months of age (reference group). Mothers who fed their infants only formula and mothers who fed their infants a combination of breast milk and formula were not included in the bivariate analyses.

Results

From the total study sample (n=448), the mean family size was 4.04±2.2 persons and the mean age, weight, and BMI of the mothers were 29.7±6.2 years, 69±11.9 kg, and 25.7±4.0 kg/m^2, respectively. The number of male infants was 235(52.5%), and 213(47.5%) were female. The mean weight of the infants at birth was 3.1±0.6 kg. The feeding patterns of the infants are shown in Table1. In summary, the total number of infants was 448,334(74.6%) of whom breastfed only, and 114(25.4%) of whom received formula only. The number of infants who breastfed for <6 months was 230 (51.4%), while 89(19.8%) of the infants had continued breastfeeding for =6months. One hundred and twenty-nine (28.8%) mothers provided mixed feeding (breast milk and formula). The number of infants introduced to CF at <6 months of age was 203(45.3%), while 245(54.7%) were introduced to CF after 6 months of age.

Table 2 presents demographic characteristics as predictors for EBF for <6 months; the majority of the mothers conducted EBF for <6 months (230; 72.1%). The most striking result to emerge from these data is that the chi-squared test and OR analyses did not show any significant differences (P>0.05) between EBF for < 6 months and the age of the mother, family size, mother's education, father's education, mother's work, family income, or BMI categories. Therefore, these demographic characteristics do not affect EBF of<6 months.

With regard to the effect of the reproductive health of the mothers and infants on EBF for <6 months, Table 3 shows no significant differences between EBF duration and current birth, gender, age of the infant, delivery type, chronic disease(s) of the mother, and contraceptive use. Interestingly, significant differences (P<0.05) were observed between mothers who exclusively breastfed their infants for <6 months and mothers who exclusively breastfed their infants for = 6 months in relation to childbirth weight and maternal smoking. The ORs

were 1.07 (95% CI: 0.51–2.23) for childbirth weight ≤2.5kg, 0.65 (95% CI: 0.29–1.47) for childbirth weight 2.6–3.0 kg, and 0.39 (95% CI: 0.17–0.91) for childbirth weight ≥3.6kg compared to infants with normal birth weight. Maternal smoking had a strong effect on the likelihood of EBF for <6 months, with an OR of 0.09 (95% CI: 0.01–0.69) and P-value <0.01 compared to non-smokers.

Table 1: Feeding patterns of infants in the studied sample (n=448)

Feeding type for infants	Frequency	%
Breast feeding only	334	74.6
Formula feeding only	114	25.4
Breastfeeding duration		
< 6 months	230	51.4
= 6months	89	19.8
Mixed feeding (breast milk and formula)	12928.8	
Introduction of CF to infants		
< 6 months	203	45.3
≥ 6 months	245	54.7

Table 2: Association of demographic characteristics with EBF for <6 months

	EBF duration (Total=319)			
characteristics	**< 6 months n (%) 230 (72.1)**	**= 6 months n (%) 89 (27.9)**	**P-value (x^2)**	**OR(95%CI)**
Age category (years)			0.703 (2.18)	
≤ 18	6 (2.6)	3 (3.4)		1.21(0.27-5.31)
19-24	51 (22.2)	16 (18.0)		0.76(0.35-1.625)
25-29	79 (34.3)	27 (30.3)		0.83(0.42-1.622)
30-34	43 (18.7)	22 (24.7)		1.24(0.60-2.55)
≥ 35	51 (22.2)	21 (23.6)		1
Family size			0.572 (0.319)	
≤ 5	170 (73.9)	63 (70.8)		1
> 6	60 (26.1)	26 (29.2)		0.85(0.49-1.47)
Mother's education			0.771 (1.12)	
Illiterate	1 (0.4)	0 (0.0)		0
Read and Write	11 (4.8)	6 (6.7)		1.34(0.46-3.85)
Intermediate	107 (46.5)	38 (42.7)		0.87(0.52-1.45)
University degree	111 (48.3)	45 (50.6)		1
Father's education			0.882 (0.66)	
Illiterate	3(1.3)	1(1.1)		0.85(0.08-8.44)
Read and Write	15 (6.5)	8(9.0)		1.36(0.53-3.46)
Intermediate	107(46.5)	39(43.8)		0.93(0.55-1.56)

University degree	105(45.7)	41(46.1)		1
Mother works			0.610 (0.26)	
Yes	66(28.7)	23(25.8)		0.86(0.49-1.50)
No	164(71.3)	66 (74.2)		1
Income of family (JD)			0.524 (2.24)	
< 200	13(5.7)	3 (3.4)		0.66(0.16-2.63)
200-500	99(43)	35 (39.3)		1.01(0.51-2.02)
500-800	72(31.3)	35 (39.3)		1.39(0.69-2.80)
>800	46(20)	16 (18)		1
BMI category(Kg/m^2)			0.272 (3.90)	
Underweight	3 (1.3)	1 (1.1)		1.09(0.11-10.8)
Normal	105 (45.7)	32 (36)		1
Overweight	86 (37.4)	44 (49.4)		1.67(0.98-2.87)
Obese	36 (15.7)	12 (13.5)		1.09(0.51-2.34)

x^2: chi-squared test; CI: confidence interval; EBF: exclusive breast feeding; OR: odds ratio; JD: Jordanian dinar; BMI: body mass index.

Table 3: Association of RH characteristics of mothers and infants with EBF for < 6 months

	EBF duration (Total=319)			
characteristics	**< 6 months n (%) 230 (72.1)**	**= 6 months n (%) 89 (27.9)**	**P-value (x^2)**	**OR(95%CI)**
Current birth			0.559 (2.06)	
1st	62 (27)	27 (30.3)		1
2nd	62 (27)	22 (24.7)		0.95(0.50-1.80)
3rd	47 (20.4)	13 (14.6)		0.77(0.39-1.51)
4th or more	59 (25.7)	27 (30.3)		0.60(0.28-1.29)
Gender			0.774 (0.08)	
Male	123 (53.5)	46 (51.7)		0.93(0.57-1.51)
Female	107 (46.5)	43 (48.3)		1
Age of infant (month)			0.441 (1.63)	
≤8th	8 (3.5)	1 (1.1)		0
9th	217 (94.3)	6 (6.7)		1.34(0.46-3.85)
≥10th	5 (2.2)	38 (42.7)		0.87(0.52-1.45)
Father's education			0.882 (0.66)	
Illiterate	3(1.3)	1(1.1)		0.85(0.08-8.44)
Read and Write	15 (6.5)	8(9.0)		1.36(0.53-3.46)
Intermediate	107(46.5)	39(43.8)		0.93(0.55-1.56)
University degree	105(45.7)	41(46.1)		1
Mother works			0.610 (0.26)	
Yes	66(28.7)	23(25.8)		0.86(0.49-1.50)
No	164(71.3)	66 (74.2)		1

University degree	105(45.7)	41(46.1)		1
Mother works			0.610 (0.26)	
Yes	66(28.7)	23(25.8)		0.86(0.49-1.50)
No	164(71.3)	66 (74.2)		1
Income of family (JD)			0.524 (2.24)	
< 200	13(5.7)	3 (3.4)		0.66(0.16-2.63)
200-500	99(43)	35 (39.3)		1.01(0.51-2.02)
500-800	72(31.3)	35 (39.3)		1.39(0.69-2.80)
>800	46(20)	16 (18)		1
BMI category(Kg/m^2)			0.272 (3.90)	
Underweight	3 (1.3)	1 (1.1)		1.09(0.11-10.8)
Normal	105 (45.7)	32 (36)		1
Overweight	86 (37.4)	44 (49.4)		1.67(0.98-2.87)
Obese	36 (15.7)	12 (13.5)		1.09(0.51-2.34)

x^2: chi-squared test; CI: confidence interval; EBF: exclusive breast feeding; OR: odds ratio; JD: Jordanian dinar; BMI: body mass index.

The effect of postpartum conditions and events of mothers and infants associated with EBF for <6 months are presented in Table 4. The use of a pacifier for infants during the first 6 months showed a significantly higher effect (OR: 0.35; 95% CI: 0.18–0.65; P<0.01) on EBF for <6 months when compared with infants who did not use a pacifier. The most surprising aspect of the data in Table 4 is the time of introduction of infants to CF, where there was a strong association (OR: 0.20; 95% CI: 0.10–0.35, P<0.001) between the introduction of CF before 6 months of infant age and EBF for <6 months. On the other hand, EBF was not affected by rooming-in, mother knowledge about breastfeeding importance, number of BFs at night and frequency of breastfeeding.

Table 4: Associations of postpartum conditions and events of mothers and infants with EBF for < 6 months

	EBF duration (Total=319)			
characteristics	**< 6 months n (%) 230 (72.1)**	**= 6 months n (%) 89 (27.9)**	**P-value (x^2)**	**OR(95%CI)**
Staying infant with mother (Rooming-in)			0.404 (0.69)	
In the same room	193(83.9)	78(87.6)		1
In the same room	37(16.1)	11(12.4)		0.73(0.35-1.51)
The pacifier use			0.001* * (11.2)	
Yes	80 (34.8)	150 (65.2)		0.35 (0.18-0.65)
No	150 (65.2)	75 (84.3)		1
Mother knowledge about breastfeeding importance			0.160 (1.97)	
Yes	180(78.3)	63(70.8)		0
No	50(21.7)	26(29.2)		1.48(0.85-2.58)

Frequency of breastfeeding			0.657 (0.19)	
As per request	189(82.2)	75(84.3)		14 (15.7)
As programmed	41(17.8)	14 (15.7)		1
Number of BF at night			0.082 (9.60)	
0 times	11(4.8)	1(1.1)		0.14(0.01-1.15)
1-3times	161(70)	51(57.3)		0.49(0.29-0.83)
≥4times	58(25.2)	37 (41.6)		1

x^2: chi-squared test; CI: confidence interval; EBF: exclusive breast feeding; OR: odds ratio
**Statistically significant at level P< 0.01

The last three tables of the study concern numerous variables (demographics, the reproductive health of the mothers and the infants, and postpartum conditions and events of the mothers and the infants) and their effects on the early introduction of CF to infants at <6 months of age. Table 5 shows that the demographic variables were not associated with introduction of CF to infants at <6 months of age.

Table 5: Association of demographic characteristics with introduction of CF to infants at < 6 months of age

characteristics	EBF duration (Total=319) < 6 months n (%) 203 (45.3)	EBF duration (Total=319) = 6 months n (%) 245 (54.7)	P-value (x^2)	OR(95%CI)
Age category(years)			0.173 (6.37)	
≤ 18	11(5.4)	5(2)		0.56(0.17-1.82)
19-24	36(17.7)	52(21.2)		1.79(0.93-3.46)
25-29	65(32)	79(32.2)		1.46(0.82-2.58)
30-34	39(19.2)	58(23.7)		1.63(0.92-2.91)
≥ 35	52(25.6)	58(23.7)		1
Family size			0.455 (0.55)	
≤ 5	153(75.4)	177(72.2)		1
> 6	50(24.6)	68(27.8)		1.17 (0.76-1.79)
Mother's education			0.312 (3.56)	
Illiterate	1(0.5)	0(0)		0
Read and Write	15(7.4)	10 (4.1)		0.83(0.30-2.30)
Intermediate	91(44.8)	113(46.1)		1.11(0.70-1.76)
University degree	96(47.3)	122(49.8)		1
Father's education			0.122 (5.79)	
Illiterate	4(2)	1(0.4)		0.25(0.02-2.68)
Read and Write	18(8.9)	12(4.9)		0.51(0.20-1.30)
Intermediate	93(45.8)	112(45.7)		0.83(0.52-1.33)
University degree	88(43.3)	120 (49)		1
Mother works			0.808 (0.05)	
Yes	60(29.6)	75(30.6)		1.05(0.70-1.57)
No	143(70.4)	170(69.4))		1

Income of family (JD)			0.524 (2.24)	
< 200	13(6.4)	9(3.7)		0.44(0.17-1.14)
200-500	75(36.9)	91(37.1)		0.78(0.46-1.30)
500-800	77(37.9)	86(35.1)		0.71(0.43-1.19)
>800	38(18.7)	59(24.1)		1
BMI category(Kg/m²)			0.971 (0.23)	
Underweight	3(1.5)	4(1.6)		0.86(0.18-3.96)
Normal	86(42.4)	99(40.4)		1
Overweight	82(40.4)	104(42.4)		0.95(0.20-4.37)
Obese	32(15.8)	38(15.5)		0.89(0.18-4.27)

x^2: chi-squared test; CF: complementary food; CI: confidence interval; OR: odds ratio; JD: Jordanian dinar; BMI: body mass index.

The significant differences between the reproductive health characteristics of the mothers and infants and early introduction of CF to infants are highlighted in Table 6. It is apparent from this table that childbirth weight had an association (P<0.05) with the introduction of CF to infants at <6 months of age. It was observed that the ORs were 0.67 (95% CI: 0.36–1.23) for childbirth weight ≤2.5kg, 0.65(95% CI: 0.34–1.21) for childbirth weight 2.6–3.0 kg, and 0.47(95% CI: 0.25–0.91) for childbirth weight ≥3.6 kg. Moreover, the same associations (P< 0.05) were observed for delivery type; mothers who delivered by cesarean section were more likely to wean their infants early than those who delivered normally (OR: 1.68; 95% CI: 1.11–2.55).

Table 6: Association of RH characteristics of mothers and infants with introduction of CF to infants at < 6 months of age

	Introduction of CF to infants (Total=319)			
characteristics	**< 6 months n (%) 203 (45.3)**	**= 6 months n (%) 245 (54.7)**	**P-value (x^2)**	**OR(95%CI)**
Current birth			0.983 (0.16)	
1st	55(27.1)	68(27.8)		1
2nd	55(27.1)	63(25.7)		0.92(0.55-1.53)
3rd	39(19.2)	46(18.8)		0.95(0.54-1.66)
4th or more	54(26.6)	68(27.8)		1.01(0.61-1.68)
Gender			0.297 (1.08)	
Male	101(49.8)	134(54.7)		1
Female	102(50.2)	111(45.3)		0.82(0.56-1.19)
Age of infant (month)			0.477 (1.47)	
≤8th	6(3)	11(4.5)		1.52(0.55-4.18)
9th	189(93.1)	228(93.1)		1
≥10th	8(3.9)	6 (2.4)		0.62(0.21-1.82)
Childbirth weight (Kg)			0.025* (5.21)	
≤ 2.5	56(27.6)	50(20.4)		0.67(0.36-1.23)
2.6-3	57(28.1)	69(28.2)		0.65(0.34-1.21)
3.1-3.5	68(33.5)	85(34.7)		1
≥3.6	22(10.8)	41(16.7)		0.47(0.25-0.91)

Delivery type			0.014 * (6.04)	
Caesarean section	48(23.6)	84(34.3)		1.68(1.11-2.55)
Normal	155(76.4)	161(65.7)		1
Chronic disease(s) of mother				0.188 (1.73)
Yes	14(6.9)	10(4.1)		0.57(0.25-1.32)
No	189(93.1)	235(95.9)		1
Contraceptive use			0.735 (0.61)	
No	106(52.2)	126(51.4)		1.10(0.66-1.82)
Hormonal	40(19.7)	43(17.6)		1.24(0.71-2.15)
Not hormonal	57(28.1)	76(31)		1
Mother smoking			0.288 (1.12)	
Yes	31(15.3)	29(11.8)		0.75(0.43-1.28)
No	172(84.7)	216(88.2)		1

RH: Reproductive health; x^2: chi-squared test; CF: complementary food; CI: confidence interval; OR: odds ratio

* Statistically significant at P< 0.05

Finally, the results obtained from the binary logistic regression analysis of postpartum conditions and events of the mothers and the infants predicting the early introduction of CF to infants are presented in Table 7. Overall, these results indicate that mothers who used a pacifier showed a high association with early CF introduction (OR of 0.39; 95% CI: 0.26–0.58; P < 0.001) compared to mothers who did not use a pacifier. A strong association (P=0.030) between first introduction of CF and health problems in infants was found for mothers who first introduced CF to their infants before 6 months of age compared with after 6 months (OR: 0.55; 95% CI: 0.32–0.94).

Table 7: Association of postpartum conditions and events of mothers and infants with introduction of CF to infants at < 6 month of age

	Introduction of CF to infants (Total=448)			
characteristics	**< 6 months n (%) 203 (45.3)**	**= 6 months n (%) 245 (54.7)**	**P-value (x^2)**	**OR(95%CI)**
Staying infant with mother (Rooming-in)			0.448 (0.57)	
In the same room	172(84.7)	201(82)		1
In the same room	31(15.3)	44(18)		1.21(0.73-2.00)
The pacifier use			0.001** (21.7)	
Yes	98(48.3)	66(26.9)		0.39(0.26-0.58)
No	105(51.7)	179(73.1)		1
Frequency of breastfeeding			0.722 (0.12)	
As per request	169(83.3)	207(84.5)		1.09(0.66-1.81)
As programmed	34(16.7)	38(15.5)		1
Number of BF at night			0.399 (1.83)	
0 times	12(5.9)	12(4.9)		0.67(0.28-1.62)
1-3times	138(68)	155(63.3)		0.76(0.50-1.15)

≥4times	53(26.1)	78(31.8)		1
Health problems after introduce the first CF			0.030* (4.70)	
Yes	37(18.2)	27(11)		0.55(0.32-0.94)
No	166(81.8)	218 (89)		1
If yes, which type of health problems			0.038 * (8.44)	
Allergy	1(0.5)	0(0)		
Diarrhea	14(6.9)	5(2)		ND
Abdominal colic	22(10.8)	22(9)		
Others	0(0)	0(0)		

x^2: chi-squared test; CF: complementary food; CI: confidence interval; OR: odds ratio; ND: not determined.
* Statistically significant at P< 0.05; **statistically significant at P< 0.01

Discussion

The present study was designed to determine the associations of many factors (demographic characteristics, reproductive health characteristics, and breastfeeding practices of mothers and infants) with EBF and early introduction of CF in the Aqaba region of Jordan. Although the number of infants who fed on breast milk (regardless of duration) was 334 (74.6%), only 89 (19.8%) were exclusively breastfed (Table1). The latter percentage was low compared to other studies conducted in Jordan. For example, Sunaa (2012) found that the percentage of Jordanian infants who were breastfeed was 76%. Of those, 36% were exclusively breastfed.[16] Also, Khasawneh and colleague showed that the proportion of women exclusively breastfeeding at 6 months was 33%.[12] In 2018, the Jordan Department of Statistics reported that only about 25.5% of mothers exclusively breastfed their children for the first 5 months of age.[17] On the other hand, our study showed that 25.4% of the mothers fed their infants formula, were is a serious indicator. According to the Jordanian Department of Statistics, the proportion of infants who have not been breastfed from 0–5 months of age has increased from 10% in 2002 to 13% in 2012, and reached 19.5% in 2018.[10,17] Our findings were in agreement with Sunaa (2012)'s and Khasawneh and colleague (2017)'s, who found the same percentage (24%) of infants who receive bottle-feeding.[12,16]

One of the issues that emerged from our findings was that the mothers' compliance with WHO recommendations was poor. These recommendations include introducing CF to infants at the age of 6 months, and we found that nearly half of all infants (45.3%) received their first solid food before 6 months of age. This finding was reasonably consistent with the results of Scott and colleagues (2009), who found that 44% of infants had received solid food before 17 weeks of age.[18] On the other hand, in 2011, Kuo found that a high proportion (62%) of parents reported the introduction of solids to their infants at 4–6 months of age.[19] The majority of the infants (83.5%) in the United Arab Emirates received solid food before 6 months of age.[15] Furthermore, in Bahrain, about 62% of infants were introduced to solid foods between 3 and 6 months of age.[20] On the other hand, in a study of when solid food is introduced to healthy infants in five European countries, researchers found that only 37.2% of formula-fed infants and 17.2% of breast fed infants had received solid food by the age of 4 months.[21] Recently, White and colleagues (2017) used data from the UNICEF global database to report on CF at the global and regional levels. Nearly a third of infants aged 4–5 months were already fed CF, whereas nearly 20% of 10–11-month-old infants had not consumed CF. Also, in this database, just about half of infants 4–5 months of age, and 15% of infants 2–3 months of age, in East Asia and the Pacific and Latin America and the Caribbean were already consuming CF.[8] Regarding childbirth weight, our study found that mothers giving birth to infants with a birth weight of ≤2.5 kg were more likely to not exclusively breastfeed for a full 6 months compared with infants with a normal birth weight of 3.1–3.5 kg. This finding is in agreement with several

studies, where EBF was more common for infants with normal birth weights than low birth weights (LBW).[22-26] However, some studies showed the opposite. For example, Flacking and colleagues (2003) showed that almost all LBW infants (<2500) received breast milk at discharge from a neonatal unit and 36%were still breastfeeding at 6 months of age.[27] In southern Vietnam, Le found that LBW infants were more likely to receive EBF during their hospital stay in urban populations compared to those in semi-rural populations.[28] Therefore, our interpretation is that health care for LBW infants in Jordan hospitals may be not sufficient to support or encourage breastfeeding for this vulnerable group, namely the allowing the discharge of LBW infants from the neonatal unit and not encouraging their mothers to continue breastfeeding exclusively. Also, the region of Aqaba is considered to be semi-rural, so there is little awareness or interest in the importance of breastfeeding. Unfortunately, we do not have studies available in Jordan to support these interpretations, so these hypotheses should be evaluated in future studies.

Another important finding was that mothers who smoked were less likely to practice EBF for = 6 months, which is consistent with the findings of several other studies.[29-33] In most of these studies, it was assumed that physiological and psychosocial factors explain the low rates of EBF among smokers compared to non-smokers. One of the explanations found in these studies is that mothers who smoke did not rely on EBF because they feared for the health of their infants due to the harmful effects of smoking, and also believed their milk production was low. On the question of pacifier use, our study found that the use of pacifiers was associated with EBF for less than 6 months. Referring to several studies on this issue, we found that general recommendations for the use of pacifiers for infants vary worldwide. The WHO recommends in its ten steps to successful breastfeeding that not using a pacifier can increase the likelihood of breastfeeding for a longer duration.[34] In a systematic review and meta-analysis conducted in 2017 by Buccini and colleagues on pacifier use and interruption of EBF, their results aligned with the WHO recommendations on pacifier use, as they found it was associated with risk of poor breastfeeding outcomes.[35] A recent study in Brazil on the same issue showed that reducing pacifier use may be an effective intervention to promote EBF.[36] On the other hand, the American Academy of Pediatrics (AAP) recommends pacifier use to avoid Sudden Infant Death Syndrome, but only after breastfeeding has been well-established (at approximately 3–4 weeks of age),as early use may decrease the regular feedings needed to build a mother's milk supply.[37]

Timely introduction of CF remains an important factor for healthy infant growth. Our study indicates that many mothers introduce CF to their infants before 6 months of age, which significantly affects the likelihood of EBF for 6 months. As mentioned earlier, it is a matter of concern that approximately 49.6% of the mothers in this study introduced CF before 6 months, which is contrary to WHO recommendations. When we looked at the factors that were associated with this behavior, we found that the childbirth weight, delivery type, and pacifier use were the most significant. To the best of our knowledge, no studies have been conducted in Jordan to determine the relationships between these factors and their effects on the introduction of food to infants before 6 months of age, so the results of this study can serve as a reference for comprehensive future studies looking at these and other factors.

A number of studies have concluded that the early introduction of CF for infants <6 months of age was due to several reasons, including perceptions of the mother that the infant is still hungry, and that milk is inadequate, which affects the development of the child.[12,38,39] It may also be due to physiological and health reasons, such as a short period between pregnancies, breast problems, or infants weaning themselves.[15,40] In this study, early introduction of CF was found to cause health problems for infants, with mothers reporting that 18.2% (P= 0.030) of their infants suffered from health problems including diarrhea (7%) and abdominal colic (11%). This provides clear evidence to the importance of not introducing CF before 6 months of age, when the digestive system of infants is not yet able to adequately digest and absorb complex and solid foods, such as starches, protein, and fat, because the infants do not have enough saliva or digestive enzymes.[41] In addition, before the age of 6

months, infants can only suck and swallow because their neuromuscular systems are not sufficiently developed to enable full chewing movements.[6,42]

However, our findings are limited by the cross-sectional design of our study, which depends on retrospective reporting of information about breastfeeding practices and CF, as mothers may not recall information accurately and therefore introduce bias. Also, mothers were recruited from only three out of four maternal and child health centers in Aqaba, meaning that the study sample is not representative of all city residents. Because Jordanian society differs in its customs according to geographical and socio-economic factors, we cannot generalize our results. Therefore, other prospective and longitudinal studies should be conducted to confirm the factors that diminish the likelihood of WHO-recommended EBF and early introduction of CF among Jordanian mothers.

In conclusion, EBF prevalence in our study was low compared to those in other studies, and most infants less than 6 months of age had already received CF. Childbirth weight, maternal smoking, and use of a pacifier were the barriers and determinants of EBF for infants. In addition, mothers who delivered by cesarean section, childbirth weight, and pacifier use were found to be determinants for the introduction of CF before 6 months of age. Taken together, these findings show poor compliance with the recommendations of international health bodies concerned with maternal and child health, such as the WHO, UNICEF, and AAP. Therefore, a key health policy priority in Jordan should be to provide for the long-term care of infants by requiring hospitals to become more baby-friendly, thereby ensuring optimal effects of the baby-friendly hospital initiative and higher rates of EBF for prolonged durations.

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Conflict of Interest

The authors do not have any conflict of interest.

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