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Assessment of Bottle-Feeding Practices in Kassala, Eastern Sudan: A Community-Based Study

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Keywords: Bottle-feeding; Urban residence; Breastfeeding education; Child hospitalisation; Sudan

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Abstract

BACKGROUND: The World Health Organization encourages exclusive breastfeeding up to six months and avoidance of bottle-feeding. There are few published research articles on the practice of bottle-feeding and associated factors in Sudan.

AIM: The study aimed to assess the usage and factors associated with bottle-feeding practices during the first six months of life among mothers with children aged between 6 and 24 months in Kassala, Eastern Sudan.

METHODS: A community-based cross-sectional study was conducted from July to September 2017. A structured questionnaire was used to collect relevant data from interviewed mothers.

RESULTS: A total of 242 mother-child pairs participated in the study. The mean (standard deviation) of maternal age and children's age was 27.13 (5.73) years and 12.2 (6.7) months, respectively. From the total, 96/242 (39.7%) used bottle-feeding for their children in the first six months of life. In multivariable analysis, urban residence (Adjusted Odds Ratio [AOR] 1.96, 95% Confidence Interval [CI] (1.06, 3.63), not receiving breastfeeding education (AOR 1.92, 95% CI 1.07, 3.45) and child hospitalization (AOR 1.83, 95% CI 1.02, 3.28) were significantly associated with bottle-feeding.

CONCLUSION: There was a high usage of bottle-feeding and it was found to be associated with child hospitalisation. To avoid bottle-feeding, urgent actions are required to support and educate mothers regarding breastfeeding with special attention to urban-residence ones.

Introduction

According to the United Nations Children's Fund (UNICEF) [1], the first 1000 days of a human being's life (nine months of pregnancy plus the first two years of life) are considered to be a crucial period. An inappropriately fed child is more vulnerable to malnutrition and its detrimental effects such as morbidity (diarrhoea and respiratory tract infections) and mortality [2], [3], [4].

Aiming to save children's lives, the World Health Organization (WHO) developed a set of recommendations, including exclusive breastfeeding up to six months and avoidance of bottle-feeding, safe complementary foods at six months and supporting mothers to practice this [5].

Various studies evidenced better cognitive development and intelligence quotients in breastfed infants compared to bottle-feed ones [6]. Previous studies have shown that bottle-feeding was a key factor for child morbidity and mortality in different settings [7], [8], [9]. For example, in the Philippines bottle-fed infants were found to be at high risk of hospitalisation due to infections [10].

The rate of bottle-feeding differs by country ranging from 15% in Nigeria [11] to 64% in Iraq [12]. Different reasons to practice bottle-feeding were mentioned by mothers such as mother's illness, breast-related health issues as well as perceived issues (i.e. perception of insufficiency of mother's milk) [13], [14]. Whatever the reason is for choosing

bottle-feeding, following the WHO recommendations, all mothers, even those who are HIV positive (the human immunodeficiency virus), can breastfeed their children [15]. In spite of the WHO adoption of the International Code of Marketing of breast-milk substitutes, still, poor adherence exists [16], [17], [18].

Breastfeeding education has been documented in many studies as an effective tool in promoting exclusive breastfeeding and avoidance of bottle-feeding in different settings [14], [19], [20]. Such breastfeeding education and support need to be directed to all mothers regardless of their residence and working status [21], [22]. Poor breastfeeding practices, such as low rates of exclusive breastfeeding, bottle-feeding and early weaning were documented in different regions of Sudan [23], [24], [25]. Early introduction of complementary feeding (i.e. before six months of age) was reported in Sudan [23], [26].

Our study aimed to examine bottle and breastfeeding practices amongst mothers in Kassala State, Eastern Sudan. Kassala State was selected to study breastfeeding patterns based on some factors. First is that most of the available data in Sudan about breastfeeding is derived from hospital-based studies [3], [26]. Also, the determinants of bottle-feeding are poorly understood, largely because this is an understudied area. Furthermore, the target area (Kassala State) is categorised as being amongst the most vulnerable regions with high rates of acute and chronic malnutrition, and most of the previous studies on breastfeeding were carried out in relatively more stable regions in the centre of Sudan [26], [27]. Kassala is more vulnerable to humanitarian crises as documented in many previous food and security reports [28], [29]. Also, the availability of data before the crisis is of paramount importance to build on them when a crisis occurred.

Therefore, the conduct of such a study at the community level, in an area characterised by both food insecurity and unstable security, is of great importance for the identification of the factors leading to bottle-feeding, which will ultimately provide the basis for future community-based interventions.

The study aimed to assess the usage and factors associated with bottle-feeding practices during the first six months of life among mothers with children aged between 6 to 24 months, at the community level in Kassala, Eastern Sudan.

Methods

A community-based cross-sectional study was conducted in Kassala, Eastern Sudan from July to September 2017. A two-stage random cluster study was used. Stage one, simple random sampling of the localities was performed to identify households randomly. Similarly, stage two involved random sampling of the household in identifying participants (any mother with a child aged between 6 to 24 months). Kassala has an estimated population of 453,159 inhabitants, of whom 55% live in urban areas, with 33,604 and 52,853 households in urban and rural areas, respectively [30]. Houses were mapped to select a representative sample. A structured questionnaire was used to collect relevant data from interviewed mothers. Two female medical officers were trained by the investigators to collect the data. The questionnaire was tested among 10 mothers (not included in the final sample), and the necessary corrections were completed before the field work. The inclusion criteria were as follows: willingness to participate in the study, having a child aged between 6 and 24 months (in case the mother had more than one child in this age group, she was interviewed about the youngest child) and availability at the time of data collection. The study excluded any mother who did not fulfil all of the inclusion mentioned above criteria.

The usage of bottle-feeding rate (%) was estimated based on the WHO definition for bottle-feeding: ‘any liquid (including breast milk) or semi-solid food from a bottle with nipple/teat’ [31]. In this study, the proportion of children aged between 6 and 24 months who were fed with a bottle during the first six months were considered as users of bottle-feeding, while others were excluded from this category. The first six months was specifically chosen because it is a period in which the infant should be exclusively breastfed [31].

A sample of 242 mother-child pairs was calculated based on the difference of the proportions of desired factors (education factor) which was assumed to be 61% vs 39% in the bottle user vs non-user. This sample has 80% power with a precision of 5% and assuming that 10% would not respond or have incomplete data.

Data were entered and analysed using the Statistical Package for Social Sciences (SPSS) version 20.0 for Windows (IBM Corp, New York, United States). The results were illustrated in tables and text by calculating the mean (M) and standard deviation (SD) for continuous variables, frequencies and percentages for categorical variables to describe the participants’ responses. T-test and Chi-square test were used to analyse continuous and categorical data, respectively. Bivariate analysis was applied with bottle-feeding practice as the dependent variable (user/non-user of bottle-feeding) and the other variables (e.g. child gender, age, birth order, education, residence (rural/urban), mode of delivery (vaginal/caesarean birth), breastfeeding education (received/not received), child hospitalization (yes/no)) as the independent variables. Furthermore, variables with a P-value of < 0.25 were entered in multivariable analysis to control confounding variables [32], [33].

Odds Ratio [OR], Adjusted Odds Ratio [AOR] (Backward LR) and 95% Confidence Interval [CI] were calculated and a variable with a P-value < 0.05 was considered as statistically significant.

Results

A total of 242 mother-child pairs participated in the study (Table 1). The M and SD of mothers' age and children's age was 27.13 (5.73) years and 12.2 (6.7) months, respectively. Maternal age ranged from 13 to 45 years, and 20/242 (8.3%) were ≤ 18 years. Child's order ranged from 1 to 9 (2.40 ± 1.42), and 70/242 (28.9%) mothers were primiparous. From the total, 96/242 (39.7%) used bottle-feeding during the first six months of their child's life, 99/242 (40.9%) lived in a rural area, 186/242 (76.9%) were housewives, and 164/242 (67.8%) had education less than secondary level.

Table 1: Socio-demographic characteristics of the studied participants in Kassala, Eastern Sudan (N = 242)

Variables		Total	Bottle feeding practice users (N=96)	Non-users (N=146)		
		Mean (SD)	Mean (SD)	Mean (SD)	Odds Ratio (95% Confidence Interval)	P-value
Maternal age, years		27.13 (5.73)	26.56 (5.63)	27.50(5.78)	0.97 (0.93, 1.02)	0.213
Birth order		2.40 (1.42)	2.41 (1.41)	2.40 (1.45)	1.01 (0.84, 1.20)	0.962
Number of children < 5 years		1.74 (0.73)	1.74 (0.73)	1.75 (0.73)	0.99 (0.69, 1.41)	0.942
Number of breastfeeding per day		7.31 (3.29)	7.59 (3.33)	7.12 (3.26)	1.04 (0.97, 1.13)	0.277
		N (%)	N (%)	N (%)	OR (95% CI)	*P*-value
Child gender	Male	131 (54.1)	51 (53.1)	80 (54.8)	1.07 (0.64, 1.79)	
	Female	111 (45.9)	45 (46.9)	66 (45.2)		0.799
Residence	Urban	143 (59.1)	61 (63.5)	82 (56.2)	1.36 (0.80, 2.31)	0.249
	Rural	99 (40.9)	35 (36.5)	64 (43.8)		
Living with extended family	Yes	125 (51.7)	51 (53.1)	74 (50.7)	0.91 (0.54, 1.52)	0.710
	No	117 (48.3)	45 (46.9)	72 (49.3)		
Mode of delivery	Caesarean delivery	42 (17.4)	20 (20.8)	22 (15.1)	1.48 (0.76, 2.90)	0.247
	Vaginal delivery	200 (82.6)	76 (79.2)	124 (84.9)		
Place of delivery	Institutional	132 (54.5)	52 (54.2)	80 (54.8)	1.03 (0.61, 1.72)	0.924
	Home	110 (45.5)	44 (45.8)	66 (45.2)		
Received breastfeeding education	No	99 (41.2)	49 (51.6)	50 (34.5)	2.02 (1.19, 3.43)	0.009
	Yes	141 (58.8)	46 (48.4)	95 (65.5)		
Faced breastfeeding difficulties	Yes	47 (19.8)	22 (23.9)	25 (17.2)	0.66 (0.35, 1.26)	0.291
	No	190 (80.2)	70 (76.1)	120 (82.8)		
Maternal education	< Secondary level	164 (67.8)	62 (64.6)	102 (69.9)	1.27 (0.74, 2.20)	0.390
	≥ Secondary level	78 (32.2)	34 (35.4)	44 (30.1)		
Paternal education	< Secondary level	138 (57.0)	56 (58.3)	82 (56.2)	0.92 (0.54, 1.54)	0.739
	≥ Secondary level	104 (43.0)	40 (41.7)	64 (43.8)		
Maternal medical disorders	Yes	20 (8.3)	8 (8.3)	12 (8.2)	0.99 (0.39, 2.51)	0.975
	No	222 (91.7)	88 (91.7)	134 (91.8)		
Maternal occupation	Housewives	186 (76.9)	71 (74.0)	115 (78.8)	1.31 (0.71, 2.39)	0.386
	Employed	56 (23.1)	25 (26.0)	31 (21.2)		
Paternal occupation	Governmental or private employed	121 (50.0)	51 (53.1)	70 (47.9)	0.81 (0.49, 1.36)	0.430
	Other than governmental or private employed	121 (50.0)	45 (46.9)	76 (52.1)		
Child hospitalization	Yes	79 33.3%	39 42.4%	40 27.6%	1.93 (1.11, 3.36)	0.018
	No	158 66.7%	53 57.6%	105 72.4%		
Weaned her child	Yes	54 (22.5)	20 (21.3)	34 (23.3)	1.12 (0.60, 2.10)	0.716
	No	186 (77.5)	74 (78.7)	112 (76.7)		

More than half of the mothers 132/242 (54.5%) of the children were institutional deliveries with a caesarean rate of 42/242 (17.4%), and 99/242 (41.2%) of the mothers did not receive breastfeeding education sessions.

Out of the 242 mothers, 54/242 (22.5%) had already weaned their children. The most common reasons mentioned by the mothers who had already weaned their children (N = 54), were pregnancy 11/54 (20.4%), appropriateness of the child's age for weaning 30/54 (55.5%), other reasons 13/54 (24.1%) such as child illness, mother illness, and return to work. Of those who did not wean yet (N = 188), 10/188 (5.4%) were planning to wean their children even before they reached the age of one year.

In multivariable analysis, urban residence (AOR 1.96, 95% CI 1.06, 3.63), not receiving breastfeeding education (AOR 1.92, 95% 1.07, 3.45) and child hospitalization (AOR 1.83, 95% CI 1.02, 3.28) were significantly associated with bottle-feeding during the first six months of the child's life (Table 2).

Table 2: Multivariable logistic regression analyses of factors associated with the use of bottle feeding among mothers with children aged between 6 to 24 months in Kassala, Eastern Sudan

Variables		Crude Odds Ratio (95% Confidence Interval (CI)	P-value	Adjusted Odds Ratio (95% CI)	P-value
Maternal age, years		0.96 (0.91, 1.01)	0.119	0.96 (0.91, 1.01)	0.111
Residence	Urban	2.03 (01.09, 3.79)	0.026	1.96 (1.06, 3.63)	0.032
	Rural (reference)				
Mode of delivery	Caesarean	1.80 (0.89, 3.64)	0.100	1.82 (0.90, 3.67)	0.095
	Vaginal (reference)				
Received breastfeeding education	No	1.83 (0.999, 3.33)	0.05	1.92 (1.07, 3.45)	0.029
	Yes (reference)				
Child hospitalization	Yes	1.84 (1.02, 3.29)	0.041	1.83 (1.02, 3.28)	0.042
	No (reference)				

Discussion

The usage of bottle-feeding in this study was 39.7% among all studied children. This is higher than the rates previously reported in central Sudan 20.5% [11], Nigeria 15% [19], Ethiopia 19.6% [26], Ghana 30.1% [34], and Namibia 35.7% [35]. Higher prevalence of bottle-feeding was reported in various studies, for example in Yemen 55% [36], and in Iraq 64% [12]. The high rates of bottle-feeding could be attributed to the degree of security instability in Eastern Sudan, or bottle-feeding experience gained in the past from donations (i.e. infant formula and other mother's milk substitutes) at the time of the previous humanitarian/refugee crisis in the area, and/or different methodologies as this is a community-based one. Therefore, in emergencies breastfeeding should be encouraged (i.e. psychosocial support) as much as possible and bottle-feeding should be avoided to save children's lives [37].

The current results showed that the risk of

bottle-feeding use amongst urban children was almost twice as much, compared to children in rural areas 1.96 (1.06, 3.63). In line with the current results, infants born to families residing in urban areas of Namibia [35], and Western Nepal [21], were at higher risk of bottle-feeding, 1.67 (1.26, 2.22) and 2.14 (1.37, 3.33), respectively. This could be attributed to the greater availability in urban areas of infant formulas at pharmacies as well as the promotion of these products by pharmaceutical companies through media, which is also abundant in urban areas. Therefore, the previous studies called for adoption and enforcement of the international code of marketing of breast-milk substitutes [17], [18]. Variations between rural and urban mothers regarding breastfeeding practices have been documented in many countries, including Sudan [38], [39]. Also, the work circumstances of mothers in urban areas are likely to motivate them to use bottle-feeding [22]. In particular, returning to work was documented as one of the weaning causes in the current study.

The results revealed that 99/242 (41.2%) of the mothers did not receive breastfeeding education sessions from healthcare personnel during pregnancy and/or after delivery, and these mothers had almost two times 1.92 (1.07, 3.45) the risk of bottle-feeding compared to mothers who received breastfeeding education. The prevalence of bottle-feeding among mothers who received and did not receive breastfeeding education were 46/141 (32%) and 49/99 (50%), respectively. This indicates that the prevalence of bottle-feeding practice is less likely to be among the breastfeed educated mothers by 18%. Previous studies have shown that breastfeeding education is effective in promoting exclusive breastfeeding and avoidance of bottle-feeding in different settings [14], [19]. Such education should be given to all mothers by healthcare workers to ensure reliability and most importantly, accuracy.

Furthermore, capacity-building regarding breastfeeding practices needs to be improved in Sudan, even among healthcare personnel [40]. Inadequate training of healthcare personnel was also reported in many other African countries including Ethiopia [41] and Nigeria [42]. Therefore, continuous breastfeeding education, ongoing support and encouragement from trusted family members or peers and healthcare personnel are essential for successful breastfeeding in future generations [43], [44].

In the present study, bottle-fed children were at higher risk of 1.83 (1.02, 3.28) of being hospitalised. Likewise, with the present results, previous studies [10], [26] documented the association between bottle-feeding and child morbidity. In Sudan, poor breastfeeding practice, including bottle-feeding has been associated with child morbidity and poor outcomes, i.e. deaths [2], [3], [4]. The risks of bottle-feeding for the children are as a result of contamination at any stage of food preparation, handling, storage and feeding [9], [24]. For example, among bottle-fed infants in Khartoum, 110 bacterial species including E. coli were isolated from bottle contents [45]. Even in certain circumstances where the bottle is used to deliver expressed mother's milk, there is still a risk from unsanitary methods of milk expression, with even worse consequences where fluid, other than expressed mother's milk, is delivered [9], [24]. Also, nipple confusion may happen when an infant has learned how to suck on the bottle and then struggles to adjust to sucking from the mother's breast [46]. Not only the contents of the bottle but also the material from which the bottle is made (e.g. plastic) can release toxic chemicals such as bisphenols, as it has been reported in recent studies including African countries (Cameroon and Nigeria) [47], [48]. Further research is required to overcome the limitations above and to investigate bottle content and composition (risk of exposure to bisphenols and other harmful substances).

The time at which bottle-feeding was introduced within the first six months and the reasons for bottle-feeding were reported to be addressed in the future intervention programs. Among the 96 mothers who introduced bottle-feeding in the first six months, it is clear that the first month 26/96 (27.1%), the fourth month 25/96 (26.1%), the fifth month 22/96 (22.9%), and other months 23/96 (23.9%) in descending order, were the most chosen times to introduce bottle-feeding, according to participant perception. Among the aforementioned 96 mothers, the most common reasons for bottle-feeding were insufficient breast milk 36/96 (37.5%), hot weather 20/96 (20.8%), maternal illness 14/96 (14.6%), work-related issues 12/96 (12.5%), child illness 9/96 (9.4%), and other reasons 5/96 (5.2%). The results of this study are in line with others in that the perception of insufficient mother's milk was reported by many authors as the main reason for bottle-feeding [13], [14]. Cultural reasons were also reported in the literature as mothers feel ashamed to breastfeed in front of strangers due to lack of privacy [14]. Identifying the reasons for bottle-feeding is of paramount importance for designing future breastfeeding education messages.

Unlike the current results, other factors such as maternal age [19], [26] mode of delivery [21], [49], parental education [11] and parents occupation [26] were reported to be significantly associated with bottle-feeding.

Our study tackled breastfeeding practices in an area which is characterised as a vulnerable area and provides valuable information which can be used to improve current breastfeeding practices. Our study has some limitations that need to be taken into consideration, including the possibility of recall bias. The study focused on one geographical area of Sudan (Kassala), so the results of this study cannot be generalised to the rest of the country. Moreover, the study failed to assess the feeding pattern of children

who were hospitalized and later died as the literature evidenced a strong correlation between bottle-feeding and child mortality.

In conclusion, the study showed high usage of bottle-feeding among mothers with children aged between 6 and 24 months in Kassala, Eastern Sudan. To avoid bottle-feeding and to improve child survival, urgent actions are required to support, promote, and educate all mothers regarding breastfeeding with special attention to those in urban residencies.

Ethics

The study was approved by the Research Board at the Faculty of Medicine, University of Gadarif, Sudan. Written informed consent was obtained from all the enrolled mothers.

Authors' contributions

AAH, ZT and IA designed the study and participated in the manuscript drafting. MAA, ZT and AAA collected the data. AAH, AAA and IA conducted the statistical analyses. All authors read and approved the final manuscript.

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