Maternal Socio-demographic Determinants of Exclusive Breastfeeding Practice in Cameroon

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Abstract   **Background:** Sub-optimal breastfeeding practices in-particular exclusive breastfeeding (EBF) still prevail in many developing countries including Cameroon, despite the documented evidence on the vital role of breastfeeding on the health and development of infants. **Aim:** To identify maternal socio-demographic factors associated with exclusive breastfeeding practice amongst Cameroonian mothers of reproductive age. **Methods:** Data from a nationally representative sample of mothers (aged 15-49 years) with infants aged between 0-6 months was obtained from the 2004 Cameroon Demographic and Health Survey. Multiple binary logistic regression was used to identify and examine the maternal factors most likely to predict exclusive breastfeeding practice while controlling for potential confounders. **Results:** Only 18.1% of the mothers practiced EBF. EBF was highest (35.2%) in the 0-1 month old infants and lowest (2.4%) in 6 months old infants (p<0.001). The North region and the Northwest region had the lowest proportion (0%) and highest proportion (52.9%) of EBF practice, respectively (p<0.001). Ethnicity and religion were retained as important maternal predictors of EBF practice in the multivariate analysis (p<0.001). Decreased likelihood of EBF practice was found among mothers who were Kirdis (OR=0.23, 95%CI: 0.11-0.48), Pahouin-Betis (OR=0.56, 95%CI: 0.33-0.94) and Atheist (OR=0.30, 95%CI: 0.11-0.80). **Conclusion:** Cultural disparities and religion are the major maternal factors that influence EBF practice in Cameroon. However, further research to understand the influence of these cultural practices and beliefs, and religion on EBF practice is recommended in order to guide policy makers and public health organizations in planning appropriate and adequate interventions to improve EBF practice. Keywords: Breastfeeding, under-five mortality, Cameroon.

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1. Background

Breastfeeding has been proven a vital component for infant survival especially, in developing countries [1,2,3]. Though under-five mortality is reducing worldwide, it is still a major problem in most developing countries [4,5]. Sub-Saharan Africa is known to have the highest under-five mortality rate [4,5], with an average of 1 in every 6 babies born, dying before the age of five [4]. A study from the Lancet shows that every year, sub-optimal breastfeeding is estimated to be responsible for 1.4 million of under-five deaths in developing countries [6].

1.1. Benefits of Breastfeeding

Globally, breast milk has been proven to be the best feed for the proper development and health of the infant [7]. In addition to the very important nutritional role of breast milk to infants worldwide, evidence from several studies have shown its significant association with reduction of under-five morbidity and mortality especially, to those exclusively breast fed up to 4 and 6 months of age [8,9,10]. Existing evidence from several developing countries has revealed that exclusive breastfeeding of any duration compared to all other forms of breastfeeding is more protective against several infections and diseases during infancy [8,9,11,12,13]. However, a study from Bangladesh showed predominant breastfeeding to be as protective as exclusive breastfeeding in reducing infant morbidity [13]. Exclusive breastfeeding for 6 months has been proven the most protective especially, against gastrointestinal infections [8,9] which are among the leading causes of under-five mortality globally [4]. On the contrary, exclusive breastfeeding up to 6 months can lead to iron deficiency in susceptible infants [8,9].

To mothers worldwide, breastfeeding has been shown to improve certain health outcomes [8] such as reducing the risk of breast and ovarian cancers, type 2 diabetes mellitus and post partum depression [9,10]. The duration and type of breastfeeding practice have an impact on the

beneficial effects it provides to both mother and child [8,9,10].

1.2. Optimal Breastfeeding Recommendation

In order for mothers and infants to achieve the optimal health benefits of breastfeeding, the World Health Organisation (WHO) recommends exclusive breastfeeding for an optimum duration of 6 months [8] and continued breastfeeding with safe and nutritionally adequate complementary foods up to 24 months of age and beyond [7]. For Human Immunodeficiency Virus (HIV) infected mothers, especially those in resource-poor countries, WHO also recommends exclusive breastfeeding for 6 months and continued breastfeeding with appropriate complimentary foods until 12 months of age [14]. Despite these recommendations, the global prevalence of exclusive breast feeding still remains very low, with less than 35% of infants being exclusively breastfed as recommended [7].

1.2. Factors Affecting Adequate Breastfeeding Practice

Existing evidence has revealed that several maternal, household, and societal factors, influence adequate breastfeeding practices worldwide [2,15,16,17,18]. These factors can be classified into five major groups; socio-demographic factors, community attributes, public policies, healthcare factors and psychosocial factors [19]. Studies from several countries have shown one or more of these mother–related factors; religion [20], traditional/cultural beliefs and practices [16,20,21,22,23], age [24], education [25,26], marital status [27], wealth status [27], prenatal care [26], employment status [18,23,28], delivery in a health care setting [24,29], place of residence (urban/rural) [23,29] number of births [15,24], to influence exclusive breastfeeding practice .

1.3. Breastfeeding Situation

Based on the Demographic and Health Survey (DHS) statistics in 2004, about 94% of infants born in Cameroon are breastfed, with the prevalence higher in the rural areas (96%) compared to the urban areas (91%). Despite the high breastfeeding prevalence, Cameroon ranks amongst the countries with the lowest breastfeeding duration in the Sub-Saharan Africa, with a mean breastfeeding duration of 17.8 months [30].

Exclusive breastfeeding rates in Cameroon are still very low [4,30]. In Sub-Saharan Africa, Cameroon remains one of the countries with low rates of exclusive breastfeeding, though higher than its neighbouring Congo, Nigeria, Gabon and Chad [4]. Until 2001, breastfeeding rates for infants exclusively breastfed between 0-6 months, infants breastfed with complementary food for 6-9 months and infants breastfed up to 20-23 months were 12%, 72 % and 29%, respectively [31]. However, data in 2006 showed there had been a significant increase in the exclusive breastfeeding rate and a considerable reduction in the other two in the later years. The rates now were 21%, 64% and 21%, for infants exclusively breastfed between 0-6 months, infants breast fed with complementary food for 6-9 months and, breastfeeding up to 20-23 months respectively [4]. Considering the high infant mortality rate

in Cameroon, and established evidence on the benefits of optimal breastfeeding practice in the reduction of infant mortality, there is a need to examine factors associated with breastfeeding practices in this nation.

Limited studies have examined several factors affecting breastfeeding practices in Cameroon. Where available these studies are restricted to local or regional data [16,32,33,34]. This study will therefore examine some maternal factors associated with exclusive breastfeeding practice, in a national representative sample of females of reproductive age, in Cameroon.

The aim of this study was to identify maternal socio-demographic factors that are associated with exclusive breastfeeding practice amongst Cameroonian mothers of reproductive age. This study further aimed to describe infant feeding practices and to determine maternal socio-demographic factors related with exclusive breastfeeding practice in this study population.

2. Methods

2.1. Study Area

Cameroon is a lower middle income country in Sub-Saharan Africa [35] with a Gross National Income (GNI) of 23.2 billion US$. It has an estimated surface area of 475,400 sq km and a population of 19.1 million, with an annual growth rate of 2.3% and an HIV prevalence rate of 5.1% among the 15- 49 year olds [36]. It is located in the Central Africa Region where, it is bordered to the West by Nigeria, East by the Central African Republic, North by Chad and the South by Congo, Gabon and Equatorial Guinea. Cameroon is a multicultural and very resourceful country with more than 230 ethnic groups; these groups could be further regrouped to about 5 major categories based on their cultural similarities. Cameroon is made up of ten administrative Regions, with the political capital city Yaoundé, being one of the densely populated cities while Douala the economic capital is foremost. Cameroon is a secular state, with Christianity and Islam being the major practised religions although, Animism is also widely practised [30].

During the year 2001,Cameroon was ranked 25th worldwide in under-five mortality rates, having 155 deaths per 1,000 live births; with infant mortality solely accounting for 96 deaths per 1,000 live births [31]. In the year 2006, there was a decrease in under-five mortality rate to 149 deaths per 1,000 live births, with infant mortality still remaining the most prevalent, with 87 deaths per 1,000 live births. Cameroon, during this period moved up to the 19th position in the world ranking [4] despite the experienced decrease in under-five mortality rate, since other countries had done better. This demonstrates that there is still more to be done compared to other developing countries' progress in reducing under-five mortality. Adequate breastfeeding practice has been shown to be one of the most cost-effective and feasible interventions in the reduction of under-five mortality [3].

2.2. Study Design and Source of Data

This study was a cross-sectional descriptive-analytic study. Data was obtained from the standard Demographic and Health Survey (DHS) [37] conducted during the year

2004 in Cameroon. Considering the fact that the details of the survey methods are published in the Cameroon DHS report [30], only a very brief description was provided here-in. Sampling in all ten regions including the most densely populated cities Douala and Youndé, involved a two-stage probabilistic sampling technique to select clusters at the first level and households at the second level. A total of 466 clusters were selected, 244 and 222 in the urban and rural areas respectively. Of these clusters, 11,584 households were finally selected; 5, 368 and 6, 216 in the urban and rural areas respectively. Final data collection was at the household level. This was performed by trained interviewers through the administration of household and individual DHS standardised questionnaires [38], with specific sections modified to suit the Cameroonian context [30]. The individual questionnaires were administered to women aged 15- 49 years in order to obtain information on socio-demographic characteristics, health behaviours, birth history and in-depth health and nutrition information on their children born within the last five years from the date of interview. The DHS survey is a highly validated survey with high quality data [37]. This survey, as mentioned by the WHO, is an important source of information on infant and young child feeding practices for many countries [39]. The data is also used by the Ministry of Public health and National Institute of Statistics (NIS) in Cameroon, and other major international organisations such as The United Nations Children's Fund (UNICEF).

2.3. Study Population and Selection Procedure

The study population was drawn from the 2004 Cameroon DHS data. This included a nationally representative sample of women of reproductive age (15-49), with living infants (0-6 months of age) born to them in the previous year, from the date of interview. A total of 926 women were selected and information was obtained on a total of 940 living infants born to them within the stated period (since some had a twin delivery). However, for women who had twin deliveries, the last infant of the twin delivery was considered as the last birth in order to obtain mother-infant pairs for adequate comparability of maternal socio-demographic factors. Subsequently, a sample of 926 mother-infant pairs was obtained. A final sample of 914 mother-infant pairs remained eligible for this study.

Inclusion criteria: All women in the survey who had living infants between 0-6 months of age, resulting from their last delivery. *Exclusion criteria*: Infants who were the first births of any twin delivery (in order to obtain mother-infant pairs), and mothers who never breastfed including those who had stopped breastfeeding their infants by the time of interview. This last exclusion was done since; the questions from which breastfeeding practice information was obtained were based on a 24-hour recall feeding practice. (See Figure 1).
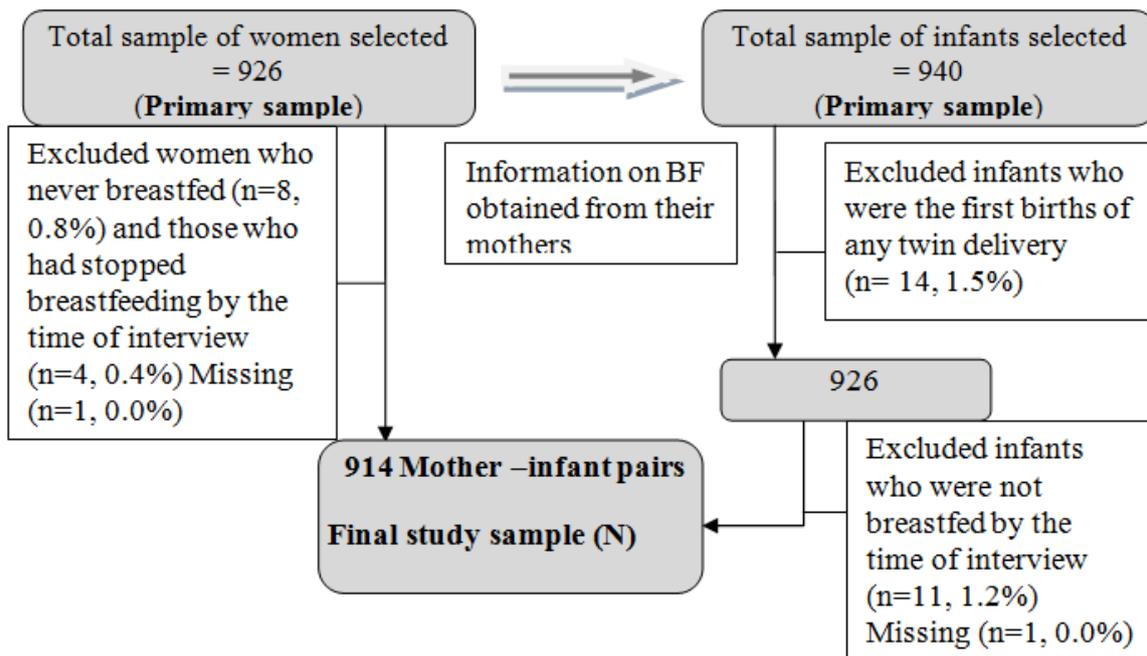

Figure 1. Selection procedure

2.4. Data Analysis

The DHS data file was obtained in the Statistical Package for Social Sciences (SPSS) format. After obtaining this data file, it was thoroughly scrutinized using the DHS recode manual (Measure DHS+). This was to gain an in-depth understanding of all the variables and how they were computed (for those that were computed). The stated methods and steps were followed to re-compute all variables of interest in order to rule-out any errors in the data set. Data was cleaned, selecting all variables of interest and ensuring these variables were rightly categorised, since it is not done in the raw data set. The DHS archive administrators were contacted for clarity of data when ever any difficulties were encountered.

2.4.1. Analysis

The EBF variable was created according to the WHO category [39,40]. This category was computed using the questions that enquired on the infant's intake of any of the following items; Plain water, fruit juice, sugared liquids, other liquids, commercial formula, Tinned/powdered/

fresh animal milk, broth or soup and, semi-solid foods during the previous 24 hours. However, anyone who was not in the EBF category was considered to be partially breastfeeding (was included in either the PBF or CBF category). The infants' current ages in months were computed using the century month code (CMC) date of birth and the CMC date of interview. They were further re-grouped into four age categories; 0-1 months of age, 2-3 months of age, 4-5 months of age (vis-à-vis WHO recommendation for disaggregation of infant age groups when dealing with the exclusive breastfeeding indicator [39] and 6 months of age. The latter was to ensure the base for describing the optimal recommended duration of EBF practice in Cameroon was obtained at that point in time.

Infants' age, gender and maternal region of residence were considered in this study in order to describe maternal exclusive breastfeeding practice by age of the infants, gender and administrative region of residence in Cameroon. Maternal economic status was assessed based on the wealth index (WI) provided in the data set. Maternal ages, and number of living children per mother, were transformed into categorical variables for analysis. All other maternal variables were categorised as appropriate for analysis.

2.4.2. Outcome Variable

Exclusive breastfeeding practice**:** Proportion of mothers who exclusively breastfed their infants aged 0-6 months during the previous 24 hours.

2.4.3. Independent Variables

Current maternal age in years categorised as; 15-19, 20-24, 25-29, 30-34, and ≥35, educational level categorised as; No education, Primary education, and Secondary or higher education, marital status categorised as; Unmarried and Married/co-habiting , area of residence categorised as; Rural and Urban, employment status categorised as ; Unemployed and Employed, Ethnicity categorised into the five main regional cultural groups as; The Grass-fields ethnic groups, The Fulani/Haoussa/Kanuri, The Pahouin-Beti; The Kirdi, and The Sawa ethnic groups. Immigrants (due to their very insignificant number in this sample) and other minor ethnic groups were classified as others. Wealth status was categorised as; Poorest, Poor, Middle, Rich, and Richest. Religion was categorised as Catholic, Protestant, Muslim, Animist/new religion/others and Atheist. Number of living children was categorised as 1, 2-4, and ≥5; place of delivery was categorised as; Health care setting and Home/others; prenatal care was categorised as, Yes or No. The ten political regions of residence, the gender of the infant, and the infants' age which were categorised as previously stated, were also considered for this study.

2.4.4. Statistical Analysis

The Predictive Analytics Software (PASW) Statistic 18.0 statistical package was used for data analysis. The Pearson chi-square (χ^2) test was used to study the differences between the independent variables and EBF practice. Binary logistic regression was also used for bi-variate analysis of maternal variables, in order to examine their individual effects on EBF practice. Multiple binary logistic regression was used for multivariate analysis, to determine the main maternal factors which predicted EBF practice in this population, when all other maternal factors in this study were adjusted for. All predictors were entered in the same block. The largest category in each predictor variable was used as the reference category. For all statistical tests performed, it was ensured that the assumptions for carrying out these specific tests were met. Statistical significance was set at P-value < 0.05 and 95% Confidence Interval (CI) was used. Results are presented using percentages, Odds Ratios and 95% CIs where appropriate. An Odd Ratio (OR) above one suggests a higher likelihood for exclusive breastfeeding practice.

2.5. Ethical Consideration

This survey was approved by the Ethics Committee of the Macro International Inc., an Opinion Research Corporation Company (ORC Macro) at Calverton in the USA and by the National Ethics Committee of the Ministry of Public Health in Cameroon. All participants considered for this study granted their consent and information was collected confidentially [30]. However, the children's information was acquired from their mothers. Data for this study was obtained from the ORC Macro, with the approval for analysis. The approval for supervisors to access this data was also accorded by ORC Macro.

3. Results and Discussion

Of the 914 mother-infant pairs eligible for this study, 907 mother-infant pairs who had complete information on infant feeding practices were considered for analysis. Some variables had missing data [employment status (n=3, 0.3%), religion (n=1, 0.1%), place of delivery (n=1, 0.1%), and prenatal care (n=1, 0.1%)], which however were negligible.

3.1. Characteristics of the Study Population

As shown in Table 2, the majority (55.6%) of the mothers were in their twenties, with more of them (29.8%) found in the 20-24 years of age group. The least represented mothers (11.2%) were in the ≥35 years of age group. Most of the mothers (42.9%) had at least primary education, with about a quarter of them having had no education. Of these mothers, 88.5 % were either married or co-habiting, while (11.5%) were unmarried. Most of the mothers (61.7%) were residing in the rural areas. A majority of the mothers (84.2%) had received prenatal care, and only 58.9% of them delivered their babies in a healthcare setting. Slightly above half the mothers had 2-4 living children, followed by mothers with only one living child (25.7 %), who was the current child. Close to a quarter of the mothers had ≥5 living children. Most of the mothers (63.4%) were employed. In this case, they were either self-employed or working for an employer. The poorest and the poor, and the richest and the rich, constituted 45% and 30.6% respectively, while 24.4% were of middle wealth status. A significant proportion of mothers were Christians (66.1%) with more of them being Catholic Christians (34.1%). Muslims constituted 20.9%, Animists and mothers of other religions constituted 5.3%,

and 7.6% were Atheists. Ethnicity was grouped into six ethnic groups and was distributed as follows; Grass-fields ethnic groups (35.7%), Fulani/Haoussa/Kanuri (10.0%), Pahouin-Beti (19.4%), Kirdi (21.9%), Sawa ethnic groups (8.2%) and others (4.7%). Also, Table 3 shows there were slightly higher female infants (51.4%) than male (48.6%), and apart from the 6 months of age infant category which had the lowest proportion (13.9%) all other categories were almost equally distributed.

3.2. Infant Feeding Practices

Infant feeding practices of the study population are presented in Figure 2. As presented, the proportion of mothers who practiced EBF and PBF were 18.1% and 6.7% respectively, thus, making an overall FBF rate of 24.8%. Breastfeeding with complementary foods was practiced by 75.2% of these mothers. The proportion of mothers who practiced partial BF as defined in this study was 81.9%.
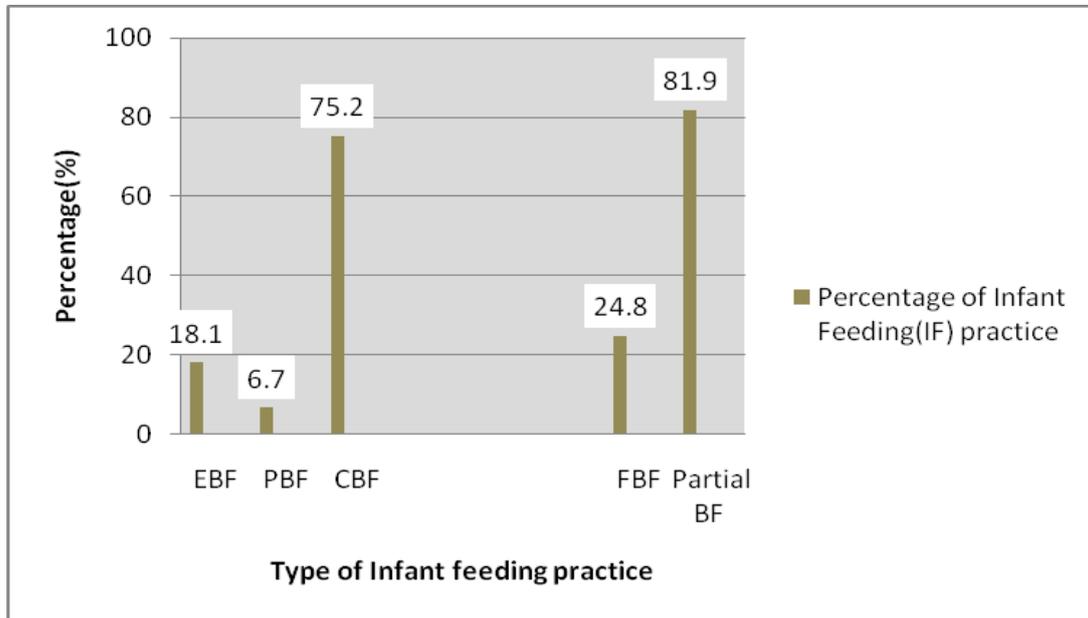

Figure 2. Proportion of mothers (%) from the final sample (n=907) carrying out various IF practices

3.3. EBF Practice by Age and Gender of the Infant and Mother's Region of Residence

The proportion of mothers exclusively breastfeeding their infants as described by the age and gender of the infant and, region of residence is shown in Table 1. As shown, there was a steady decrease in EBF practice and a steady increase in partial breastfeeding practice as the infant grew older. The highest EBF practice rate of 35.2% was experienced in the 0-1 month of age category and the lowest EBF practice rate of 2.4% in the 6 months of age category. The differences across these groups were statistically significant (χ^2 (3) =84.58, P< 0.001). A slightly higher proportion of mothers who had male infants (18.8%) were practicing EBF compared to mothers who had female infants (17.4%). This difference was insignificant. There were also significant differences in EBF practice across the 10 political regions of residence (χ^2 (9) =85.92, P< 0.001). The North region had the least EBF practice of 0.0% whilst the North-West region had the highest EBF practice of 52.9%. The following regions; South and Far – North, Adamawa, Centre, East and West, and the South –West and Littoral as respectively grouped, had no wide variation in EBF practice. None of these regions had up to 30% of EBF practice.

3.4. Maternal Factors Influencing EBF Practice

Table 2 and Table 3 show factors associated with EBF practice from the Pearson chi-square test and simple binary logistic regression, respectively. As shown, maternal level of education, ethnicity, religion, place of delivery and prenatal care were significantly associated with EBF practice. Table 3 examines the individual effects of these predictors on EBF practice. As shown, mothers with no education had a 67% less likelihood of EBF practice (OR=0.33, 95%CI: 0.19-0.57) than those with primary education. Mothers of the Fulani/Haoussa/Kanuri and Kirdi ethnic groups, had 69% (OR=0.31, 95%CI: 0.15-0.65) and 80% (OR=0.20, 95%CI: 0.11-0.37) less likelihood of EBF practice respectively, when compared to those of the Grass-field ethnic groups. Muslims and Atheist had 50 % (OR=0.50, 95%CI: 0.29-0.84) and 69% (OR=0.31, 95%CI: 0.12-0.81) less likelihood of EBF practice respectively, when compared with the Catholic Christians. Mothers who did not deliver their babies in a health care setting were 51% less likely to practice EBF (OR=0.49, 95%CI: 0.28-0.86) compared to their counterparts who did. Lastly, mothers who did not receive prenatal care were 51% less likely to practice EBF (OR=0.49, 95%CI: 0.32-0.70) than those who did.

Nonetheless, in the multivariate analysis, only ethnicity and religion remained important predictors of EBF practice when all other factors were adjusted for in the model. As presented in Table 4, the Kirdis and the Pahouin-Betis had 77 %(OR=0.23, 95%CI: 0.11-0.48) and 44 % (OR=0.56, 95%CI: 0.33-0.94) less likelihood of EBF practice respectively, compared to the Grass-fielders. Mothers who were Atheist had a 70% less likelihood of EBF practice (OR=0.30, 95%CI: 0.11-0.80) than those who were Catholic Christians.

Table 1. Maternal socio-demographic characteristics of the sample (n=907) and proportion of exclusive breastfeeding practice

Variable	n	(%)	EBF (%)	P-value [a]
Maternal age (years)				
15-19	173	19.1	15.6	
20-24	270	29.8	20.4	
25-29	234	25.8	18.4	0.266
30-34	128	14.1	21.1	
≥35	102	11.2	11.8	
Educational level				
No education	230	25.4	7.8	
Primary	389	42.9	20.3	0.000
Secondary or higher	288	31.8	23.3	
Current marital status				
Unmarried	104	11.5	22.1	0.256
Married/Co-habiting	803	88.5	17.6	
Employment status				
Unemployed	329	36.3	19.8	
Employed	575	63.4	17.2	0.340
Missing	3	0.3		
Place of residence				
Urban	347	38.3	20.5	0.143
Rural	560	61.7	16.6	
Ethnicity				
Grass-fields ethnic groups	324	35.7	25.9	
Fulani/Haoussa/Kanuri	91	10.0	9.9	
Pahouin-Beti	176	19.4	19.3	0.000
Kirdi	199	21.9	6.5	
Sawa ethnic groups	74	8.2	20.3	
Others	43	4.7	20.9	
Religion				
Catholic	309	34.1	20.1	
Protestant	290	32.0	22.8	
Muslim	190	20.9	11.1	0.002
Animist/Others	48	5.3	20.8	
Atheist	69	7.6	7.2	
Missing	1	0.1		
Number of living children				
1	233	25.7	16.7	
2-4	463	51.0	20.1	0.253
≥5	211	23.3	15.2	
Place of delivery				
Health care setting	534	58.9	22.1	
Home/others	372	41.0	12.1	0.000
Missing	1	0.1		
Prenatal care				
Yes	764	84.2	19.5	
No	142	15.7	10.5	0.012
Missing	1	0.1		
Wealth status				
Poorest	210	23.2	13.8	
Poor	198	21.8	16.7	
Middle	221	24.4	20.8	0.096
Rich	157	17.3	16.6	
Richest	121	13.3	24.8	
Total	907	100	18.1	

[a] P-value calculated using Pearson chi-square (χ^2) test.

Table 2. Proportion of EBF practice by infants' ages (months), gender, and region of residence

Variables	n (%)	EBF %		P-value [a]
		Yes	No	
Infant's age				
0-1	227 (25.0)	35.2	64.8	
2-3	274 (30.2)	20.8	79.2	0.000
4-5	280 (30.9)	8.6	91.4	
6	126 (13.9)	2.4	97.6	
Infant's gender				
Male	441 (48.6)	18.8	81.2	0.574
Female	466 (51.4)	17.4	82.6	
Region of residence				
Adamawa	65 (7.2)	15.4	84.6	
Centre	126 (13.9)	17.5	82.5	
East	79 (8.7)	15.2	84.8	
Far North	126 (13.9)	11.9	88.1	
Littoral	119 (13.1)	25.2	74.8	0.000
North	91 (10.0)	0.0	100	
North-West	68 (7.5)	52.9	47.1	
West	120 (13.2)	14.2	85.8	
South	59 (6.5)	10.7	83.1	
Southwest	54 (6.0)	22.2	77.8	
Total	907(100)	18.1	81.9	

[a] Calculated from the Pearson chi-square (χ^2)test.

4. Discussion

This study revealed that exclusive breastfeeding practice in Cameroon is still very low (18.1%), when compared with figures from other developing countries like; Ethiopia-49% [27] and Iran-44% [23]. This low prevalence was found to be attributed to the ethnicity and religion of the mother.

The fact that only 18.1% of the mothers exclusively breastfed their infants could imply that, the EBF rate in Cameroon may possibly be much lower than the 21% rate reported by UNICEF [4]. It is still very surprising that in this country with high infant mortality, only 2.4% of mothers were practicing exclusive breastfeeding at 6 months as recommended by the WHO [8]. The decreasing trend of EBF practice with infants age observed in Cameroon is not surprising given that, studies from developing countries like; Nigeria [24], Ethiopia [27], Malawi [29], Zambia [15], Vietnam [25] and Iran [23], and other European Nations [2] have shown similar trends. Predominant breastfeeding was only 6.7%, indicating that most mothers (75.2%) introduced complementary foods at a very early age of the infant. This could be explained by cultural differences [34] and the fact that a majority of these mothers were working mothers and would not get the opportunity to breastfeed their infant as often as required. Consequently, introduction of commercial formula and other complementary foods are started earlier than recommended. This is in conformity with a study in Nairobi that found that working mothers had started giving their infants complementary foods as early as at 1 month of age [28]. However, because it may not be so easy to get mothers to exclusively breastfeed as recommended, PBF could be encouraged in order to reduce the very high CBF practice, since PBF is shown to offer similar benefits of EBF [13]. The gender of the infant showed no significant difference in EBF practice. This was also found in studies from Ethiopia [27] and Vietnam [25].

Table 3. Crude odd ratios (OR) for the maternal factors affecting EBF practice

Variable	Crude OR [a]	95% CI	Adjusted OR	95% CI
Maternal age (years)				
15-19	0.72	0.44-1.20		
20-24	Reference			
25-29	0.88	0.57-1.37		
30-34	1.05	0.62-1.75		
≥35	0.52	0.27-1.02		
Educational level				
No education	0.33	0.19-0.57***	0.27	0.11-1.47
Primary	Reference		Reference	
Secondary or higher	1.19	0.82-1.72	1.01	0.67-2.72
Current marital status				
Unmarried	1.33	0.81-2.19		
Married/Co-habiting	Reference			
Employment status				
Unemployed	1.18	0.84-1.68		
Employed	Reference			
Place of residence				
Urban	1.29	0.92-1.82		
Rural	Reference			
Ethnicity				
Grass-fields ethnic groups	Reference		Reference	
Fulani/Haoussa/Kanuri	0.31	0.15-0.65**	0.49	0.18-1.38
Pahouin-Beti	0.68	0.44-1.07	0.56	0.33-0.94*
Kirdi	0.20	0.11-0.37***	0.23	0.11-0.48***
Sawa ethnic groups	0.73	0.39-1.35	0.57	0.29-1.11
Others	0.76	0.35-1.64	0.83	0.36-1.92
Religion				
Catholic	Reference		Reference	
Protestant	1.17	0.79-1.74	1.32	0.87-2.01
Muslim	0.50	0.29-0.84*	0.84	0.40-1.76
Animist/Others	1.02	0.50-2.22	1.69	0.75-3.81
Atheist	0.31	0.12-0.81*	0.30	0.11-0.80*
Number of living children				
1	0.80	0.53-1.21		
2-4	Reference			
≥5	0.71	0.458-1.11		
Place of delivery				
Health care setting	Reference		Reference	
Home/others	0.49	0.28-0.86*	0.38	0.12-1.03
Prenatal care				
Yes	Reference		Reference	
No	0.49	0.33-0.70***	0.32	0.28-1.35
Wealth status				
Poorest	0.61	0.37-1.01		
Poor	0.76	0.46-1.25		
Middle	Reference			
Rich	0.76	0.44-1.29		
Richest	1.25	0.742-2.12		

[a] Calculated from the bi-variate binary logistic regression analysis. All OR values greater than one predict a higher likelihood of exclusive breastfeeding practice.
*P < 0.05, **P <0.01, *** P < 0.001.

Table 4. Adjusted odd ratios (OR) for the maternal factors influencing EBF practice

Variable	Adjusted[a] OR	95% CI
Ethnicity		
Grass-fields ethnic groups	Reference	
Fulani/Haoussa/Kanuri	0.49	0.18-1.38
Pahouin-Beti	0.56	0.33-0.94*
Kirdi	0.23	0.11-0.48***
Sawa ethnic groups	0.57	0.29-1.11
Others	0.83	0.36-1.92
Religion		
Catholic	Reference	
Protestant	1.32	0.87-2.01
Muslim	0.84	0.40-1.76
Animist/New religion/Others	1.69	0.75-3.81
Atheist	0.30	0.11-0.80*

Model χ^2 (26) = 69.65, P<0.001
[a] Adjusted for maternal age, educational level, current marital status, employment status, place of residence, number of living children, place of delivery, prenatal care, wealth status, religion and ethnicity.
All OR values greater than one predict a higher likelihood of exclusive breastfeeding practice.
*P < 0.05, *** P < 0.001.

More so, this study found that there existed significant variation in EBF practice across the ten regions of Cameroon. The North region had the lowest proportion of 0%. This is a region mostly inhabited by Muslims. The null proportion of EBF practice here could be explained by the fact that most Muslim mothers in this region have been found to introduce animal milk to their infants before the age of three days and millet pap between their first and second months of life [34]. The highest EBF practice proportion of 52.9% found in the North-West region could be explained by the fact that during this survey most of the eligible infants for this study in this region were between 0-3 months of age as shown in the data. These results should be interpreted with caution, since the sample sizes in these regions were very small when compared to the actual number of eligible inhabitants.

Some factors found to influence EBF practice in a Cameroonian population included; maternal education, place of delivery, prenatal care, religion and ethnicity.

Nevertheless, the former three were not retained in the multivariate analysis, suggesting that they might have been subjected to confounding. Therefore, only ethnicity and religion are considered maternal socio-demographic determinants of EBF practice in Cameroon. This is congruent to findings from other countries which showed that traditional/cultural practices and beliefs [16,20,22,23] and religion [20] influence EBF practice. The findings of this study suggest that Atheist mothers are less likely to EBF when compared to mothers who were Catholic Christians. This could be explained by the current situation in Cameroon, were most Christian denominations have several women associations such as the Catholic Women's Association (CWA) of the Catholic denomination, which is not only used as a forum for religious discussions but also for health, social issues and empowerment of the women. Experts in health and other domains of social interest are often invited to organise seminars on such issues, for which breastfeeding is usually not left out. This demonstrates that breastfeeding support groups are of invaluable importance in order to promote adequate BF practices. Therefore, public health officials should consider such an intervention in hospitals and communities so that those who do not belong to any religious affiliation also get adequate information.

Moreover, belonging to the Kirdi or Pahouin-Beti ethnic group also had a negative effect on EBF practice, when compared to the Grass-fielders. This could be explained by the existence of cultural disparities and traditional beliefs regarding infant feeding practices, which were not examined in this study. However, studies from the North [34] and North-West [16] regions of Cameroon including those from Gambia [22] and Nigeria [21] support the fact that Cultural/ traditional beliefs and practices influence EBF practice. More so, in Cameroon, the Gbaya tribe classified in the Kirdi group [41] and the Pahouin-Beti ethnic group are documented to have high infant mortality compared to the Bamilekes (tribe included in the grass-fields category) [42]. This is shown to result from unhealthy cultural practices of the former and the fact that the latter do not adequately utilise pre-postnatal health services [42]. The above reasons could directly influence EBF practices in these populations. Nonetheless, further research on the different cultural/traditional practices in these ethnic groups is recommended, in order to exactly identify those practices which are a barrier to appropriate breastfeeding practices as recommended by the WHO.

4.1. Limitations of Study

Given the cross sectional design of this survey, BF practice information could only be acquired from the questions concerning a 24 hour–recall infant feeding practice. Therefore, EBF practice information was only obtained from mothers who were still breastfeeding at the time of interview. Several misclassifications might have occurred since a mother who has been exclusively breastfeeding her infant but for some reasons gave her infant water or some other liquids the previous day is considered not exclusively BF. Also, a mother who usually gave her infant water or some other complementary foods and for some reason did not give her infant any the previous day will be considered exclusively BF. More so,

the cross sectional design and method of data collection, could have led to selection bias, plus recall bias and misreporting of information by the participants respectively, which may possibly affect study results.

The proportion of women practicing EBF could be lower when questions regarding all other food intakes are included. In this study only questions which enquired on the infants intake of Plain water, fruit juice, sugared liquids, other liquids, commercial formula, Tinned/powdered/ fresh animal milk, broth or soup and, semi-solid foods were considered.

Ethnicity was regrouped into the five main regional-cultural groups, though some individual tribes have slightly different cultures and beliefs. These groups however share major characteristics. Only, the major ethnic groups listed in the DHS data set were included in the categorisation. The category classified as others was made up of African and non African immigrants as well as other minor tribes of Cameroon, who have absolutely different cultures and beliefs.

Animist and people of other religions were placed in the same category due to their very small proportions which were likely to cause flaws in the analysis when left independent.

Moreover, the employment rate in this population was very high as a result of the fact that, mothers who were self-employed farmers were considered as employed. Regarding Marital status, those who were never married, divorced, widowed or separated were classified as unmarried. This might not have been good since the latter three have had a partner experience which could influence their current behaviours. However, due to the very wide variation in these proportions compared to the married category, they were grouped as one.

Finally, the study sample though representative on the national, regional and urban /rural levels, was not very representative in terms of size. Thus, it is highly recommended that all study results be interpreted with caution.

5. Conclusions

The very low prevalence of EBF practice in Cameroon calls for adequate interventions. Cultural disparities and affiliation to religion are shown to be the major maternal socio-demographic factors that influence EBF practice in Cameroon. However, further research to understand the influence of these cultural practices/beliefs and religion on EBF practice is suggested in order to guide policy makers and public health organizations in planning appropriate and adequate interventions to improving EBF practice.

6. Recommendation for Further Research

Firstly, a national cohort of regionally representative pregnant women drawn from all ten regions for follow-up throughout a 24-month period in each region will be better for concrete national results on any infant feeding practice which could be comparable across regions, and for further use on improving national infant feeding policies. Another recommendation is for a qualitative research on the various cultural practices/ beliefs of the major cultural

groups, and on the religious beliefs and practices of the different religion groups, to indentify which of these practices influence EBF.

Cognisant of the fact that Cameroon is a developing country with the poor comprising the majority of the population (reflected in the data), it will be inappropriate to consider only inadequate breastfeeding practices as the major cause of the high under-five mortality. In order to significantly reduce under-five mortality in Cameroon, it is recommended that an integrated approach comprising of; adequate infant and young child feeding practices with emphasis on EBF, integrated management of childhood illnesses plus, immunisation, vitamin A supplementation, deworming, adequate antenatal care plus, and advocacy for behavioural change be highly considered.

List of Abbreviation Used

BF- Breast Feeding
CBF- Breastfeeding with complementary foods
CI – Confidence Interval
CMC- Century Month Code
DHS- Demographic and Health Survey
EBF- Exclusive Breast Feeding
FBF – Full Breast Feeding
GNI -Gross National Income
HIV -Human Immunodeficiency Virus
NIS -National Institute of statistics
OD- Odds Ratio
ORC Macro- Opinion Research Corporation Company Macro International Inc.
ORS – Oral Rehydrated solution
PAWS- Predictive Analytics Software
PBF – Predominant Breast Feeding
SPSS- Statistical Package for Social Sciences
UNICEF – United Nations Children's Fund
US$ - United States Dollar
WHO- World health organization
WI – Wealth Index

Competing Interests

The authors declare that they have no competing interests.

Authors Contribution

FEEF conceived the study, did the literature review and drafted the first manuscript. BO contributed in developing the methodology and reviewed the manuscript draft. DA contributed in statistical analysis and reviewed the final manuscript. CDIO assisted in data cleaning, analysis and review of the final draft of the manuscript. EP contributed in the writing the discussion and review of the final manuscript. AY assisted in conceptualization of the study, supervised the work and reviewed the final manuscript. All authors read and approved the final manuscript.

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References

[1] Kuate Defo B. Effects of infant feeding practices and birth spacing on infant and child survival: a reassessment from retrospective and prospective data. J Biosoc Sci. 1997 Jul; 29(3):303-26.

[2] Yngve A, Sjostrom M. Breastfeeding in countries of the European Union and EFTA: current and proposed recommendations, rationale, prevalence, duration and trends. Public Health Nutr. 2001 Apr; 4(2B):631-45.

[3] Knowledge into action for child survival. The Lancet. 2003; 362(9380):323-7.

[4] UNICEF. The state of the world's children 2008 [Child survival]. New York; 2007.

[5] UN. The mellenium development goals report 2008. New York; 2008.

[6] Black RE, Allen LH, Bhutta ZA, Caulfield LE, de Onis M, Ezzati M, et al. Maternal and child undernutrition: global and regional exposures and health consequences. The Lancet. 2008 Jan 25; 371(9608):243-60.

[7] WHO/UNICEF. Global strategy for infant and young child feeding. Geneva; 2003.

[8] WHO. Optimal duration of exclusive breastfeeding. Report on an expert Consultation. Geneva; 2001.

[9] Kramer MS, Kakuma R. Optimal duration of exclusive breastfeeding. Cochrane database of systematic Reviews. 2002(1).

[10] James DC, Lessen R. Position of the American Dietetic Association: promoting and supporting breastfeeding. J Am Diet Assoc. 2009 Nov; 109(11):1926-42.

[11] Kandala NB, Magadi MA, Madise NJ. An investigation of district spatial variations of childhood diarrhoea and fever morbidity in Malawi. Soc Sci Med. 2006 Mar; 62(5):1138-52.

[12] Koyanagi A, Humphrey JH, Moulton LH, Ntozini R, Mutasa K, Iliff P, et al. Effect of early exclusive breastfeeding on morbidity among infants born to HIV-negative mothers in Zimbabwe. Am J Clin Nutr. 2009 May 1; 89(5):1375-82.

[13] Mihrshahi S, Oddy W, Peat J, Kabir I. Association between infant feeding patterns and diarrhoeal and respiratory illness: A cohort study in Chittagong, Bangladesh. International Breastfeeding Journal. 2008; 3(1):28.

[14] WHO. HIV and infant feeding.Revised principles and recommendations . Rapid advice. Geneva; 2009.

[15] Chisenga M, Kasonka L, Makasa M, Sinkala M, Chintu C, Kaseba C, et al. Factors Affecting the Duration of Exclusive Breastfeeding Among HIV-Infected and -Uninfected Women in Lusaka, Zambia. J Hum Lact. 2005 Aug 1; 21(3):266-75.

[16] Kakute PN, Ngum J, Mitchell P, Kroll KA, Forgwei GW, Ngwang LK, et al. Cultural barriers to exclusive breastfeeding by mothers in a rural area of Cameroon, Africa. J Midwifery Womens Health. 2005 Jul-Aug; 50(4):324-8.

[17] Merewood A, Patel B, Newton KN, MacAuley LP, Chamberlain LB, Francisco P, et al. Breastfeeding Duration Rates and Factors Affecting Continued Breastfeeding Among Infants Born at an Inner-City US Baby-Friendly Hospital. J Hum Lact. 2007 May 1; 23(2):157-64.

[18] Otoo GE, Lartey AA, Perez-Escamilla R. Perceived Incentives and Barriers to Exclusive Breastfeeding Among Periurban Ghanaian Women. J Hum Lact. 2009 Feb 1; 25(1):34-41.

[19] Yngve A, Sjöström M. Breastfeeding determinants and a suggested framework for action in Europe. Public Health Nutrition. 2001; 4:729-39.

[20] Shaikh U, Ahmed O. Islam and Infant Feeding. Breastfeeding Medicine. 2006; 1(3):164-7.

[21] Davies-Adetugbo AA. Sociocultural factors and the promotion of exclusive breastfeeding in rural Yoruba communities of Osun State, Nigeria. Social Science & Medicine. 1997; 45(1):113-25.

[22] Semega-Janneh IJ, Bohler E, Holm H, Matheson I, Holmboe-Ottesen G. Promoting breastfeeding in rural Gambia: combining traditional and modern knowledge. Health Policy Plan. 2001 Jun 1; 16(2):199-205.

[23] Olang B, Farivar K, Heidarzadeh A, Strandvik B, Yngve A. Breastfeeding in Iran: prevalence, duration and current recommendations. Int Breastfeed J. 2009; 4:8. Doi: 10.1186/1746-4358-4-8.

[24] Lawoyin TO, Olawuyi JF, Onadeko MO. Factors Associated With Exclusive Breastfeeding in Ibadan, Nigeria. J Hum Lact. 2001 Nov 1; 17(4):321-5.

[25] Duong DV, Lee AH, Binns CW. Determinants of breast-feeding within the first 6 months post-partum in rural Vietnam. Journal of Paediatrics and Child Health. 2005; 41(7):338-43.

[26] Tiwari R, Mahajan PC, Lahariya C. The determinants of exclusive breast feeding in urban slums: a community based study. J Trop Pediatr. 2009 Feb; 55(1):49-54.

[27] Alemayehu T, Haider J, Habte D. Determinants of exclusive breastfeeding practice in Ethiopia. Ethiop J Health Dev. 2009; 23(1):12-8.

[28] Lakati A, Binns C, Stevenson M. The Effect of Work Status on Exclusive Breastfeeding in Nairobi. Asia Pac J Public Health. 2002 Jan 1; 14(2):85-90.

[29] Kamudoni P, Maleta K, Shi Z, Holmboe-Ottesen G. Infant Feeding Practices in the First 6 Months and Associated Factors in a Rural and Semiurban Community in Mangochi District, Malawi. J Hum Lact. 2007 Nov 1;23(4):325-32.

[30] INS, ORC Macro. Enquête Démographique et de Santé du Cameroun 2004. Calverton,Maryland,USA; 2004

[31] UNICEF. The state of the world's children 2003 [child survival] New York; 2002.

[32] Garrett NR. A study of feeding practices in hospitalized Cameroonian children. J Natl Med Assoc. 1981; 73(7):625-33.

[33] Garrett NR, Ada V. Infant feeding, beliefs and practices: a study of Cameroonian health care personnel. J Trop Pediatr. 1982 Aug; 28(4):209-15.

[34] Einterz EM, Bates ME. Early childhood feeding practices in northern Cameroon. Trans R Soc Trop Med Hyg. 1994 Sep-Oct;88(5):575-6.

[35] World Bank list of economies (April 2010). [cited May 3 2010]; Available from: http://siteresources.worldbank.org/DATASTATISTICS/Resources/CLASS.XLS

[36] The World Bank .Cameroon Data and statistics. [cited May 3 2010].

[37] Measure DHS: Demographic and health surveys overview. [cited December 15 2009]; Available from: http://www.measuredhs.com/aboutsurveys/dhs/start.cfm.

[38] ORC Macro. Model "B" Questionnaire with commentary for low contraceptive prevalence countries. MEASURE DHS +Basic Documentation No.2. Maryland, USA; 2001.

[39] WHO. Indicators for assessing infant and young child feeding practices .Part 1 Definitions. Washington ,DC; 2007.

[40] WHO. Indicators for assessing breastfeeding practices. Geneva; 1991.

[41] Kouega J-P. The Language Situation in Cameroon. Current Issues in Language Planning. 2007; 8(1):3-93.

[42] Defo BK. Areal and socioeconomic differentials in infant and child mortality in Cameroon. Social Science & Medicine. 1996; 42(3):399-420.