

**EXCLUSIVE BREAST FEEDING AND ITS DETERMINANTS IN YAOUNDE**

**CAMEROON: A RETROSPECTIVE SURVIVAL ANALYSIS**

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**A THESIS SUBMITTED IN PATIAL FULFILMENT OF THE REQUIREMENTS  
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## ABSTRACT

Exclusive breastfeeding (EBF) of infants for the first six months of life is now considered a global public health goal that is linked to reduction of morbidity and mortality in infants especially in developing countries. These morbidities and mortalities are attributed to increased incidences of upper and lower respiratory tract and gastrointestinal tract infections in infants. The purpose of this study was to assess adherence of mothers to the six-month exclusive breastfeeding as recommended by the World Health Organisation (WHO). A retrospective survival analysis study was carried out with a simple random sample of 503 participants at the Chantal Biya Foundation, consultation and vaccination unit in Yaoundé Cameroon. Qualitative and quantitative data were collected using formal interviews and structured questionnaires respectively for duration of six months between November 2019 and May 2020. A Cox proportional hazard model was used to explore the hazard ratio of associated risk factors. A log-rank test was used to test the hypothesis of differences in survival rates for each variable of the prognostic factors. This study revealed that mean time for mothers to practise EBF was  $3.61 \pm 0.095$  months within a time range of one to six months. In addition, more than 90% of the mothers were aware of EBF requirements and procedures and attended antenatal clinics. Notwithstanding, only 38% of mothers could survive EBF (Censored) and 62% of mothers could not adhere to EBF practices or failed to practice EBF (95% CI: 0.9056-0.7701). Prognostic factors like mother's marital status were highly significant ( $P=0.003$ ; HR: 0.70; 95% CI= 0.55-0.89) whereby, married mothers practised EBF at higher rates than unmarried mothers. Mother's education level also played a significant role to the adherence of EBF practices ( $P=0.005$ ; HR: 1.43; 95% CI=1.11-1.84). Mothers who had attained higher education level significantly reported a lower rate of EBF compared to mothers with basic or no formal education. Continuous mass sensitization and enforcement measures is recommended to

be done by various health workers at ANC clinics on the importance of proper EBF. Meanwhile, policy review by policy-makers in the health sector like the Ministry of Public Health and Family Planning when designing policies for nursing mothers is recommended.

**DECLARATION**

I, Gloria Akah Okwen Ndum, do hereby declare to the Senate of Sokoine University of Agriculture that this dissertation is my original work done within the period of registration and that it has neither been submitted nor concurrently being submitted for a degree award in any other institution.

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**DEDICATION**

I dedicate this thesis to GOD ALMIGHTY who against all odds, provided me with sound health and strength throughout my research.



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## LIST OF ABBREVIATIONS

ANC	Antenatal Care
ARV	Antiretroviral drug
AVS	Additional Vaccination Service
CBF	Chantal Biya Foundation
CDC	Centers for Disease Control and Prevention
CI	Confidence Interval
CRECHS	Center Regional Ethics Committee for Human Health Research
EBF	Exclusive Breast Feeding
HIV	Human immune deficiency Virus
HR	Hazard Ratio
IYCF	Infant and Young Child Feeding
KAPP	Knowledge Attitude Practices and Perception
Kg	Kilo grams
MDG'S	Millennium Development Goals
NCD	Non-Communicable disease
NEBF	Non-Exclusive Breast Feeding
NIDs	National Immunization days
NIS	National Institute of Statistics
PLHIV	People Living with Human immune deficiency Virus
PV	P-Value
SARS	Severe Acute Respiratory Syndrome
SDG'S	Sustainable Development Goal
SE	Standard Error
SPSS	Statistical Package for social Science
SSA	Sub-Saharan Africa
SUA	Sokoine University of Agriculture
UN	United Nations
UNICEF	United Nations Children's Fund
UNIGME	United Nations Inter-agency Group for Child Mortality
	Estimation
URTI	Upper Respiratory Tract Infections
WB	World Bank
WHO	World Health Organization



## **CHAPTER ONE**

### **1.0 INTRODUCTION**

#### **1.1 Background Information on Exclusive Breast Feeding in Cameroon**

Cameroon is a Central African country located along the Gulf of Guinea. The capital city of Cameroon is Yaoundé with an estimated population of about 2.8 million inhabitants after Douala which has more than 3 million residents (CIA, 2020). Yaoundé is the largest city in Cameroon and second most populated city in the country. The current population of Cameroon is approximately 26.4 million citizens based on a recent United Nations data (Worldmeter, 2019). Cameroon's demographic distribution shows that, about 44% of Cameroonian residents are under the age of 15 years, with a growth rate of about 2.6% and a life expectancy of about 51 years (UNICEF, 2016; EDS-MICS, 2018). Meanwhile, maternal child health improved and infant mortality rates dropped from 144 to 79 deaths per 1000 live births between 2004 and 2014 (EDS-MICS, 2018). This symbolizes the practice of development by trying to reduce the risk that may cause or raise unwanted deaths of mothers and infants. Given that Cameroon is in the transition phase between the Millennium Development Goals (MDGs) and Sustainable Development (SDGs), Cameroon's health profile for 2016 revealed a success rate of MDGs and serves as a basis for measuring progress on SDGs, recognize the work done and adapt various strategies, challenges and fill the existing gap. This provides some similarity to this study and to evaluate maternal improvement in knowledge and approval of adequate breastfeeding methods through the recommendations of health care professionals during antenatal clinics.

Although the burden of infant morbidity and mortality in most developing countries is still high, some deaths can be prevented by adequate breastfeeding practices (WHO, 2008; UNICEF, 2011). According to WHO (2010) and UNICEF (2011) with other studies conducted by Sankar *et al.* (2015) indicated that lactation is the first prized gift from mother to baby that exists to benefit the baby, mother and community. Improved lactation rates globally can save over 800,000 children under 5 years annually (Black *et al.*, 2013; Sankar *et al.*, 2015). Breast milk is the most important and safe infant food that provides children with high nutritional benefits that can improve their risk of infection and possibly reduce spending on future health care (Jones *et al.*, 2003; WHO, 2003). Lactation offers many health and developmental benefits to both infants and mothers as it is a preferred breastfeeding method to promote infant health and reduce the risk of future harm (WHO, 2004; Ruan *et al.*, 2019). Tambe *et al.* (2016) found that many mothers started to exclusively breastfeed their infants from birth and the rate significantly dropped to about two or more months later. Breastfeeding exclusively is also one of the measurement strategies to improve infant's nutritional status and survival where, exclusive breastfeeding for the first six months of life can reduce around 13% of infant mortality and achieve some public health goals and SDGs (WHO, 2003; Belachew *et al.*, 2018).

Studies have been conducted and documented on exclusive breastfeeding and its well-recognized importance but the practice is still not widespread especially in the developing world with increase on the global level still very modest with much room for improvement (Black *et al.*, 2008; Arage *et al.*, 2016). Moreover, the associated factors are different from country to country and even within the same country where a gap still exists between adequate exclusive breastfeeding practices as recommended by WHO and the United Nations Children's Fund (Arage *et al.*, 2016).

Despite the above mentioned importance of exclusive breastfeeding, some studies have reported declining trends in exclusive breastfeeding within six months of age in both the developed and developing countries (UNICEF, 2011; Chiabi *et al.*, 2014). Such trend is attributed to several causes including urbanization and modernism. Other causes include socio-cultural factors, food insecurity, poor professional counselling on breastfeeding and medical factors such as health status, people living with HIV reporting a low immunity response are considered as factors influencing exclusive breastfeeding practices (Reinsma *et al.*, 2012; Arage *et al.*, 2016).

Research findings conducted by Jones *et al.* (2003) shows that a child who has been exclusively breastfed has 21% lower risk of death in the first year than a child who has been artificially fed or exclusively breastfed for less than three months only at a rate of 38%. Many efforts and emphasis have been laid by the Government and various stakeholders to promote, protect and encourage good infant and maternal health through proper exclusive breastfeeding procedures. One of the main goal of the Ministry of Public Health Cameroon by EDS-MICS (2018) towards maternal and child health has been to promote EBF however, proper EBF is challenging as many infants are not exclusively breastfed.

## **1.2 Problem Statement and Study Justification**

### **1.2.1 Problem statement**

Globally, 60% of the 10.9 million deaths of new-borns and children less than 5 years old are due to poor feeding practices leading to outbreaks of infectious diseases (WHO, 2003;

Berhanu *et al.*, 2015). Studies reported by WHO (2009) and Woldie *et al.* (2014) indicated that, approximately 41% of under five deaths occurrence in Sub-Saharan Africa (SSA) is mainly due to inadequate breastfeeding in combinations with high levels of diseases which cause about 30% of diarrhoea deaths and 18% of acute respiratory deaths. Cameroon is not left out among other developing countries with high rate of infant mortality which could be attributed to inadequate EBF (EDS-MICS, 2018).

In Cameroon, 92% of children less than 6 months old are breastfed, but of these less than 50% are breastfed exclusively (UNICEF, 2016; EDS-MICS, 2018). With these current trend, the Sustainable Development Goal (SDG) aims at a new framework by 2030, to end preventable death of children under 5 years (UNIGME, 2017; Azeze *et al.*, 2019). Most countries are aiming to reduce as low as 12 deaths per 1,000 live births and under 5 mortality as low as 25 deaths per 1,000 live births. However, a child dies every five seconds globally, approximately 18,000 children every day and if current trend continues with more than 50 countries falling short of the SDG target on child survival, some 60 million children under 5 years will die between 2017 and 2030 ( UNIGME, 2017).

### **1.2.2 Study Justification**

In low income countries like Cameroon, it's realistic that EBF can significantly reduce the burden of under five deaths to strengthen government efforts in trying to improve child health and reduce infant mortality as per Sustainable Development Goals (UNICEF, 2011; UNIGME, 2017). Findings from this study were needed to provide and update information on current situation and also recommendations on what should be done to comply with six months exclusive breastfeeding as recommended by the WHO. These findings were

expected to provide valid data for policy making at the Ministry of Public Health Cameroon to protect young lives by reducing infant mortalities linked to preventable deaths. This study will also develop significant baseline information for further studies in the research field. To the best of my knowledge, limited studies have been documented on survival analysis and time to event of exclusive breastfeeding and influencing factors for mothers in Cameroon. Due to this fact, this research was designed to address this gap and document factors contributing to shortened exclusive breastfeeding in the urban city of Yaoundé Cameroon.

### **1.3 Research Questions**

#### **1.3.1 Research questions**

The following general research questions guided this study:

1. At what time do mothers stop exclusive breastfeeding before six months?
2. What are breastfeeding mothers' knowledge and perception towards exclusive breastfeeding practices in Yaoundé?
3. What are the prognostic factors influencing duration of exclusive breastfeeding in Yaoundé, Cameroon?

### **1.4 Objectives of the Study**

#### **1.4.1 Overall objective**

To investigate on adherence and determinants of exclusive breastfeeding in Cameroon.

### **1.4.2 Specific objectives**

- i. To assess and identify prognostic factors influencing the duration of exclusive breastfeeding in Yaoundé, Cameroon.
- ii. To determine the average time (in months) used by mothers to practice exclusive breastfeeding in Yaoundé, Cameroon.
- iii. To assess breastfeeding mother's knowledge and perception towards exclusive breastfeeding practices in Yaoundé.

### **1.5 Significance of the Study**

Our study impact was developed from Cameroon's national strategy of sustainable development goals which aims at ensuring healthy lives and promoting wellbeing of all age groups through improved nutrition and food security for an emerging nation before 2035 (EDS-MICS, 2018). Provide updated data to UNICEF Cameroon for child health under exclusive breastfeeding practices. Above all, provide useful information in decision-making at the Ministry of Public Health and other national-level offices. This study will help funding agencies and development organizations, policies and programs to improve breastfeeding practices and support the right of children to survive, grow and develop in good health.

## CHAPTER TWO

### 2.0 LITERATURE REVIEW

#### 2.1 Operational Definitions of Key Concepts

**Censoring:** A participant is referred to as ‘censored’ if they did not suffer the outcome of interest or who did not have the event during the specified period of study, otherwise information about their survival time is incomplete before the end of a study (Schober and Vetter, 2018).

**Cox Proportional Hazard Regression Model:** A semi parametric regression model for the analysis of survival data which allows testing for difference in survival time of two or more groups of interest (Kleinbaum *et al.*, 2011).

**Exclusive Breastfeeding:** Is the procedure whereby, infants receive only breast milk, no other liquids or solids inclusively not even water for the first six months with the exception of oral rehydration solutions, syrups of vitamins and minerals or medication (WHO, 2004).

**Failure:** Refers to the occurrence of unwanted event of interest during a survival study (Schober and Vetter, 2018).

**Inadequate Breastfeeding:** This is the process whereby; an infant does not obtain any or enough breast milk as recommended by the WHO resulting to poor health and sometimes weight lost. (WHO, 2004).

**Kaplan Meier Analysis:** It measures the survival time from a certain date to time of death, failure or other significant event of interest (Kleinbaum *et al.*, 2011).

**Log Rank Test:** This compares the survival times of two or more groups (Kleinbaum *et al.*, 2011).

**Survival Analysis:** Set of methods for analysing data where the outcome variable is the time until the occurrence of an event of interest (Kleinbaum *et al.*, 2011; Schober and Vetter, 2018).

**Survival Function  $s(t)$ :** It gives for every time the probability of surviving or not experiencing the event up to that time **or** the probability that a subject survives longer than time  $(t)$  ( Kleinbaum *et al.*, 2011).



**Survival Time:** It could be defined as time in days, weeks, months and years until a person develops the event of interest (Kleinbaum *et al.*, 2011).

## 2.2 Background on Breast Feeding

Based on recommendations from the WHO and the United Nations Children's Fund, infants are required to receive only breast milk for six months coupled with lactation and other complementary food for up to two years or beyond (Abba *et al.*, 2010; Montee and Jeewon, 2014). Knowledge of breastfeeding recommendations is very important as it may greatly influence breastfeeding practices (Wallenborn *et al.*, 2017). Studies conducted by Yalcin *et al.* (2016) in 27 Sub Saharan African countries with a sample size estimate of 25,084 infants less than six months, documented an exclusive breastfeeding rate of 36.0%. Black *et al.* (2008) and Gejo *et al.* (2019) documented that, breastfeeding is relatively low especially in the first six months of life leading to about 1.4 million deaths and 10% of disease burden in children under 5 years of age.

Globally, it is proven that less than 50% of women endorse exclusive breastfeeding based on findings from WHO and UNICEF (2017) which documented a global EBF prevalence rate of 41% below the global target. However, Cameroon is not left out as the prevalence of EBF still stands as low as the rest of the world. Breast milk expression method was a procedure introduced by WHO for mothers to express and provide babies with food in times of need in their absence. Expressed breast milk can last for up to four to six hours at room temperature, six to seven days under refrigerated conditions of 4°C to 6°C and for six months frozen at a temperature below -4°C (WHO, 2004). This is one of the best methods adopted to meet up with exclusive breastfeeding for busy career and working mothers.

Moreover, despite this recommended methods most working mothers still weave it off thereby under rating its existing benefits to meet up with EBF goals.

Notwithstanding, more sensitization has to be done to create awareness on the importance of exclusive breastfeeding and breast milk expression to ensures that infants achieve optimal growth development and good health in the future. According to Cameroon's National Institute for Statistics (NIS) the prevalence of Exclusive Breastfeeding was reported at 28.03% in the year 2014 (EDS-MICS, 2018) with an average of 82.8% of pregnant women receiving prenatal care. Tambe *et al.* (2016) revealed an increase in the prevalence rate to 45.2%. Exclusive lactation rates in other developed countries varies as follow: Sweden (53%), Norway (50%), Nederland (25%), Canada (24%), Britain (21%), United States of America (20%) and Poland recording the lowest EBF rate of (10%) according to reports from WHO and UNICEF (2017).

### **2.3 Global Trend of Exclusive Breast Feeding**

Despite the numerous benefits for mother and baby as a result of practicing EBF, the trend of EBF still remains low across the globe (UNICEF, 2011). The rate is as low as 41% globally according to UNICEF and WHO (2017), 39% in developing countries and 31% in Sub Saharan Africa (SSA) findings documented by Black *et al.* (2008). It is proven that EBF trends varies greatly across the African continent as a recent study conducted by Agho *et al.* (2019) between 13 West African countries revealed the following prevalence rate below the global target (50%). This 50% global target is designed to considerably reduce infant mortality and morbidity rate. Agho *et al.* (2019) documented the following EBF rates between 13% and 47% below the global 50% target in ten West African

countries. The EBF rates varied as follows; Benin 2018 (44%) Burkina Faso 2010 (25%), Cote D'Ivoire 2012 (13%), Gambia 2013 (47%), Ghana 2014 (52%), Guinea 2012 (21%), Liberia 2013 (55%), Mali 2013 (34%), Niger 2012 (24%), Nigeria 2013 (17%), Senegal 2017 (44%), Sierra Leone 2013 (32%) and Togo 2014 (58%).

Amongst these 13 West African Countries Ghana, Liberia and Togo recorded breast feeding rates within global target (Agho *et al.*, 2019). Other studies conducted in the past by Bhattacharjee *et al.* (2019) in other African countries mapping out the trend of exclusive breastfeeding between 2000 and 2017 revealed the following EBF rates: Ethiopia (58.2%), Tanzania (52.6%), DRC (45.9%), Kenya (37.6%), and Namibia (40.9%) were approaching the 2025 EBF prevalence target. However, some other countries like Namibia, south-western DRC and Kenya were found to have lower prevalence (<50%) below the 2025 global target. Day in and day out, UNICEF works in 190 countries and regions to reach out to infants and young children most in need and at greater risk of life and long-term care. UNICEF has a goal focus to protect the right of every child everywhere among which, they highly recommend nursing mothers to breastfed for the first six months of life with nutrition and complementary feeding up to two years as the most potent anti-malnutrition in young children. This promotes healthy growth and development of new-borns and infants around the world (UNICEF, 2011). According to UNICEF if more efforts are provided countries might meet up to the global target of at least 50% prevalence rate of EBF by 2025 and a target of 70% by 2030.

## 2.4 Importance of Exclusive Breast Feeding

There has been growing evidence of the significant impact of early initiation of breastfeeding preferably within the first hour after birth on reducing overall neonatal mortality. Colostrum intake is part of the necessary requirements of EBF from birth (WHO, 2008; Tambe *et al.*, 2016). According to WHO and UNICEF (2008, 2011) breast milk is regarded as a sufficient diet that provides all essential nutrients a baby requires such as vitamins and minerals. This implies no other liquid or food is needed for the first six months of an infant's life. Breast milk carries antibodies from the mother that help combat diseases, protecting babies from gastro internal tract infections and acute respiratory infections (WHO, 2009). It also provides a healthy weight balance thereby, reducing children's risk of becoming overweight or obese and improve cognitive development in infants (Montee and Jeewon, 2014; Ngongalah *et al.*, 2018). Colostrum intake is the first natural essential nutrient for babies to strengthen their immunity and transfer rich antibodies. Therefore it should be given within the first hour of birth a process referred to as early initiation of breastfeeding according to WHO and UNICEF (2009, 2010).

Some mothers do neglect its impact and often times out of ignorance and negligence deprive their baby from colostrum intake. Some natural circumstances do occur like decease of the mother during birth and poor immunity state of mother at child birth or breast milk contamination link to other internal or external factors may disrupt or deprive some infants from these natural benefits. Tambe *et al.* (2016) revealed that 88.8% of babies in Cameroon consume colostrum at birth. Due to this gap it becomes essential that we advise, encourage and support mothers to continue breastfeeding exclusively as

previous studies by Victorial *et al.* (2016) found that, breastfeeding can impact a wide range of maternal and child outcomes such as high level of health immunity. Governments, family members and community health workers all have a role to play in the survival of new-borns through the uptake of exclusive breastfeeding (WHO, 2010).

## **2.5 Impact of Non-Compliance to EBF on Health, Mortality, and Cognitive**

### **Development**

The World Health Organization and UNICEF have for many years emphasized on the importance of maintaining the practice of exclusive breastfeeding and revitalizing the trend in decline. A number of factors can influence the increase and duration of breastfeeding in Cameroon, particularly in the urban City of Yaoundé. Such features include: age, race, ethnicity, educational level, employment status and marital status. The 27th World Health Assembly held in 1974 had reported that, the general decline in breastfeeding is also related to a number of factors. These factors include the production of synthetic breast milk and its substitutes (WHO, 2008). Promoting sound feeding practices is one of the main programmed areas that the Department of Nutrition for Health and Development in Cameroon focuses on by providing counselling courses and guidance for the protection, promotion and support of infant and young child feeding (EDS-MICS, 2018).

The most important determinant of a child's development and healthy growth is associated to adequate breastfeeding since breast milk supplies all the nutrients a baby requires for healthy growth and development (UNICEF, 2011; Montee and Jeewon, 2014). Azeze *et al.* (2019) indicated that exclusive breastfed babies are 14 times more likely to survive than babies who did not receive only breast milk for their first six months of life. Non-

compliance to adequate lactation practices is a public health thread and concern with major cause of deaths and morbidity in infants and young children (CDC, 2017). According to Black *et al.* (2008) and Gejo *et al.* (2019) failure to exclusively breastfeed for the first six months of life can result in 1.4 million deaths and 10% of disease burden in children younger than 5 years. When an infant is inadequately breastfed, the child becomes more exposed to risk factors and health complications such as frequent gastrointestinal infections, poor brain development, unhealthy weight balance coupled with lower and upper respiratory tract infections (WHO, 2010; CDC, 2017). One of the greatest burdens to the Government is non-exclusive breastfeeding as this increases future health care spending on infants (Tambe *et al.*, 2016).

Exclusive breastfeeding is a well acknowledged and cause effective intervention against malnutrition related illnesses in children. Considering the fact that EBF have been identified as the single most beneficial and cause effective strategy against infant mortality, stringent measures have to be put in place to promote these practices (CDC, 2017).

## **2.6 Barriers to Exclusive Breast Feeding**

It is generally assumed that, one of the so many constraints that account for low level of EBF across Africa and the world is occupation as the main predisposing factor. Breastfeeding mothers with linked up employment opportunities sparingly practice breast milk expression in order to meet up with the goal of exclusive breastfeeding. As a result of this, it automatically widens the gap for suboptimal feeding considering the fact that most career or busy employed nursing mothers spend at least eight hours at their various work places. Income earning also goes as a bosting factor for artificial milk purchase to fill in

the gap of non-exclusive breastfeeding. Notwithstanding, some breastfeeding mothers still answer yes to the WHO recommendations call of EBF due to its health and nutritional benefits despite their educational level and employment status. With this gap this finding recommends that efforts should be invested on improving maternal level of education on EBF benefits prior to deliveries.

Other factors hindering EBF are, some expecting mothers give birth through Caesarean section and premature delivery which may not stimulate enough milk production at birth. This therefore, triggered some mothers to involuntarily practiced mixed feeding. More so, reasons included present health status of some mothers living with HIV with low level of immunity whom out of will or advice practise artificial feeding. With reference to past studies conducted in some sub Saharan African countries mothers who were HIV positive recorded a low level of EBF rate which ranges from 19% to 48% with an average time of exclusive breastfeeding at four months of life (Kafulafula *et al.*, 2013). Meanwhile, recent studies carried out by Muhammed and Seid (2019) found that EBF is associated with lower risk of Human Immunodeficiency Virus transmission compared to mix feeding whereas, most mothers have been contradicting this theory and acting otherwise.

## CHAPTER THREE

### 3.0 RESEARCH METHODOLOGY

#### 3.1 Study Area

This study was conducted in the urban city of Yaoundé in Cameroon. Yaoundé is located in the southern part of the country with an elevation of 726 meter (2,382 ft.) above sea level and a total surface area of 180 km<sup>2</sup> (70 sq. m) with geographical coordinates 3°52'N 11°31'E. The city is known for its attractive touristic sites with an average population of 2.8 million inhabitants (CIA, 2020). It is the second largest city in the country with a weather condition of four seasons; a light rainy season from May to June, a short dry season from July to October, a heavy rainy season from October to November and a long dry season from December to May. The average temperature of Yaoundé city typically varies from 66°F to 87°F and rarely below 62°F or above 91°F.

Specifically, data collection was carried out at the consultation and vaccination unit of the Chantal Biya Foundation Yaoundé (CBF). The CBF is located within the central town of Yaoundé which is bordered to the North by the Cameroon Red Cross and to the south by Centre Pasteur of Cameroon, East by the Catholic University of Cameroon and West to the Yaoundé Centre hospital. The CBF was chosen for data collection as it is the facility which receives all age groups, sociocultural backgrounds with a massive turn out at the vaccination unit representing a greater part of the Yaoundé population leading to a massive recruitment in sample size for the study. Yaoundé being the political capital of Cameroon due to urbanization there is an increase in number of birth rate despite many other challenging factors which could account to the relevant aspect of the study.



### **3.2 Study Design and Sample Size**

A retrospective survival analysis study was adopted in order to determine time to occurrence of an unwanted event of interest (stop of EBF). The prognostic factors, defined as factors which contribute to abrupt cessation or stoppage of EBF were determined. During survival analysis, the outcome variable was defined as the duration in months, from birth to the occurrence of cessation of EBF before the recommended six months. Censoring was considered when the child under consideration reached six months without experiencing the event of interest. Working retrospectively, the event of interest to monitor was if exclusive breastfeeding actually stopped before six months and the individual survival time recorded until when the event occurred.

Inclusion criterion was breastfeeding mothers between the age group of 15-45 years old with babies' less than one year old turning out for vaccination at the CBF. Babies less than one year old was the ideal working age group of (six to ten months) in order to minimize recall bias during data collection. The vaccination unit was the ideal location since, babies had a routine vaccination dose to be administered at various age groups where data collection was of interest. Reference questionnaires piloting, participants were interviewed based on when they stop practicing exclusive breastfeeding in order to determine survival time of exclusive breastfeeding within the recommended time frame of six months.

### **3.3 Sample Size Calculation**

$$S = Z^2 * P * (1-P) / M^2$$

Where:

S = Sample for infinite population

Z = Z score based on confidence level assumed to be 95% (1.96)

P = Population proportion (Prevalence) to be 45.2% which is (0.452)

M = Marginal error at 5% (0.05)

$$S = (1.96)^2 * 0.452 (1-0.452)/0.05^2$$

$$S = 3.8416 * 0.247696/0.0025 = 380.62$$

S for infinite population is 380.62 participants

Estimated sample size = 381 participants

An extra 32% was added to the sample size summing up to 503 participants which data was collected to have a greater statistical power to detect difference.

### **3.4 Survival Analysis Approach**

Survival analysis approach is a set of methods used to analyse data in which the time until the event of interest occurs. The response is often referred to as a failure time, survival time, event time and censoring ([Kleinbaum, et al., 2011](#); Schober and Vetter, 2018). Censoring is present when we have some information about a subject's event time but we don't know the exact event time. There are generally three reasons why censoring might occur: a subject does not experience the event before the study ends, a person is lost to follow-up during the study, and a person withdraws from the study (Schober and Vetter, 2018).

Failure occurs when the event of interest occurs, which must not necessarily be of negative impact. For the purpose of our study relating to exclusive breastfeeding failure will occur when mothers stop exclusive breastfeeding of their babies before six months while, censoring will occur when mothers do not experience the event of interest which is stop exclusive breastfeeding before the first six months of an infant's life. From past literature and to the best of my knowledge no studies has yet been conducted in Cameroon on exclusive breastfeeding using the survival analysis approach reasons why this study was developed to monitor the trend of exclusive breastfeeding using the survival analysis approach.

### **3.5 Sampling Procedure and Data Collection**

A retrospective survival analysis study was carried out with a simple random sampling technique employed to an estimated sampling population of 503 participants at the Chantal Biya Foundation in Yaoundé Cameroon. The first participant of the study was chosen by random and interviewed for about 10 to 20 minutes. The sampling method continued in that simple random order. Structured questionnaires were used to interview participating mothers by adopting a retrospective memory based on past event of interest which is when exclusive breastfeeding stops within the time frame of six months (Appendix 1).

Considering that this was a retrospective study, the study inclusion criteria were only babies from six to ten months to be recruited in the study of time to event of exclusive breastfeeding. Working retrospectively the event of interest to monitor was when exclusive breastfeeding stopped in the past for the recruited babies in the study who were six to ten months old. Six to ten months was the ideal age group for recruitment in to the study in order to avoid recall bias of breastfeeding mothers. Babies who recently turned six months

were the main target in the study as they had to immediately turn to the vaccination unit for vitamin A and the first dose of an influenza flu immunization. Six months being the main target was also due to the fact that mother's memories would still be fresh about past event of the babies first six months of life. The next target was babies whom recently turned nine months old since they had a routine free immunization vaccine of MMR (Measles, Mumps and Rubella) and a yellow fever vaccine to be received at the vaccination unit. Babies who were seven, eight and ten months old also got recruited in the study of time to event to meet up with the targeted sample size.

### **3.6 Exclusion Criterion**

Exclusion criterion included babies less than six months old and babies above 11 months old. Other exclusion criterion were nursing mothers who willingly objected to be part of the study were excluded from data collection as well as babies whose biological mothers were not present during vaccination. Confounders included babies with deceased mothers at birth, but their respective foster parents were interviewed on the baby's breastfeeding status. Babies who were set of twins were all handled separately and independently as they could record different cessation time to EBF. No disability case of a baby was encountered or visibly detected during data collection.

### **3.7 Quantitative Data Collection**

Mothers were interviewed with regards to their baby's age so as to know whom to recruit in the study of time to event for analysis. Data was collected between November 2019 and May 2020 through formal interviews guided by a data collection tool of structured questionnaires that addressed dependent variable such as "adherence to EBF" and

independent variables such as “maternal age”, “education level”, “origin”, “previous gestations”, “employment status”, “marital status”, “prenatal care”, “place of prenatal care” and “immunization calendar”. The interview was done individually and independently. The questionnaires comprised of both open and close ended questions drafted in both English and French for convenience and better understanding. Some basic information were present on the baby’s vaccination card which was directly extracted for use. This avoided time consumption and repetition of questions which equally gave room for participant to respond to other questions without complains.

### **3.8 Qualitative Data Collection**

Qualitative data was collected using a series of six item Likert scale questions (Appendix 1) through a formal interview. The Likert scale questions captured aspects like mother’s knowledge and perception towards exclusive breastfeeding practices. Other specific questions asked were to capture specific prognostic factors influencing exclusive breastfeeding like; mothers level of education, occupational and marital status.

### **3.9 Quantitative Data Analysis**

During survival analysis, the outcome was defined as the duration in months from birth to the occurrence of cessation of EBF before the recommended six months also termed as failure. Censoring was considered when the child under six months of age completed EBF at the required six months. Factors which influenced survival time such as marital status, educational level and employment status were considered as prognostic factors.

A database was generated from the data collected using the questionnaire and entered in Microsoft Excel spread sheets. This database was later on exported to the computer software SPSS version 21.0 (Statistical package for social science) and STATA Version 16 for statistical analysis. The data were statistically analysed based on the occurrence of an unwanted event of interest which was based on mothers stopping EBF before the recommended time of six months. Each prognostic factor was analysed to determine its significant effect on an unwanted event of interest using a parametric log-rank test for each prognostic factor such as, educational level, employment status and marital status. A Life table was constructed using the Kaplan Meier Approach (product limit approach) and also deduce a Kaplan Meier curve for difference in survival probability. Performed and interpret Semi parametric analysis using the Cox proportional hazard regression analysis model to explore the hazard ratio of associated risk factors considered simultaneously to survival time.

Relationship between the outcome variable and prognostic factors was analysed (using univariable analysis) and corresponding p-values recorded. Those which qualified ( $P < 0.05$ ) were considered as being significant to the outcome variable for the next step of multivariable analysis which were fitted together using backward elimination forward stepwise approach. Backward elimination forward stepwise approach involves taking out all non-significant variables after the first model analysis. The final model included all prognostic factors which appeared significant at ( $P < 0.05$ ) or had significant biological significance for retention in the final model.

### **3.10 Qualitative Data Analysis**

Analysis for breastfeeding mothers' knowledge and perceptions towards exclusive breastfeeding practices in Yaoundé was conducted using a six-item, five Likert scale with an equal number of positive and negative statements. The scores were, 1= strongly disagree, 2= disagree, 3= indifferent, 4= agree and 5= strongly agree (Appendix 1). The resulting output from the Likert scale was analysed descriptively using SPSS version 21.0 to determine mother's perception towards EBF.

### **3.11 Ethical Consideration**

A research approval letter was obtained from Sokoine University of Agriculture after proposal presentation. Research approval letter with clear protocols and methodology to be adopted when carrying out research on the field was deposited at the Center Regional Ethics Committee for Human Health Research at the ministry of public health Yaoundé Cameroon in order to obtain an ethical clearance support letter for research. Study proposal was approved and an ethical clearance consideration was signed in October 2019 for data collection for a duration of six months (Appendix 6). Ethical consideration such as confidentiality was ensured at all levels since mothers were interviewed independently in a confined vaccination room with only staff members of the vaccination unit present.

### **3.12 Expected Outcome**

We expect a positive outcome where, there would be a change in behaviour and practices towards the importance of exclusive breastfeeding. This positive outcome will only result from the significant input of our research when our efforts, inputs and activities shall be implemented. This improvement will lead to a possible increase in the prevalence of

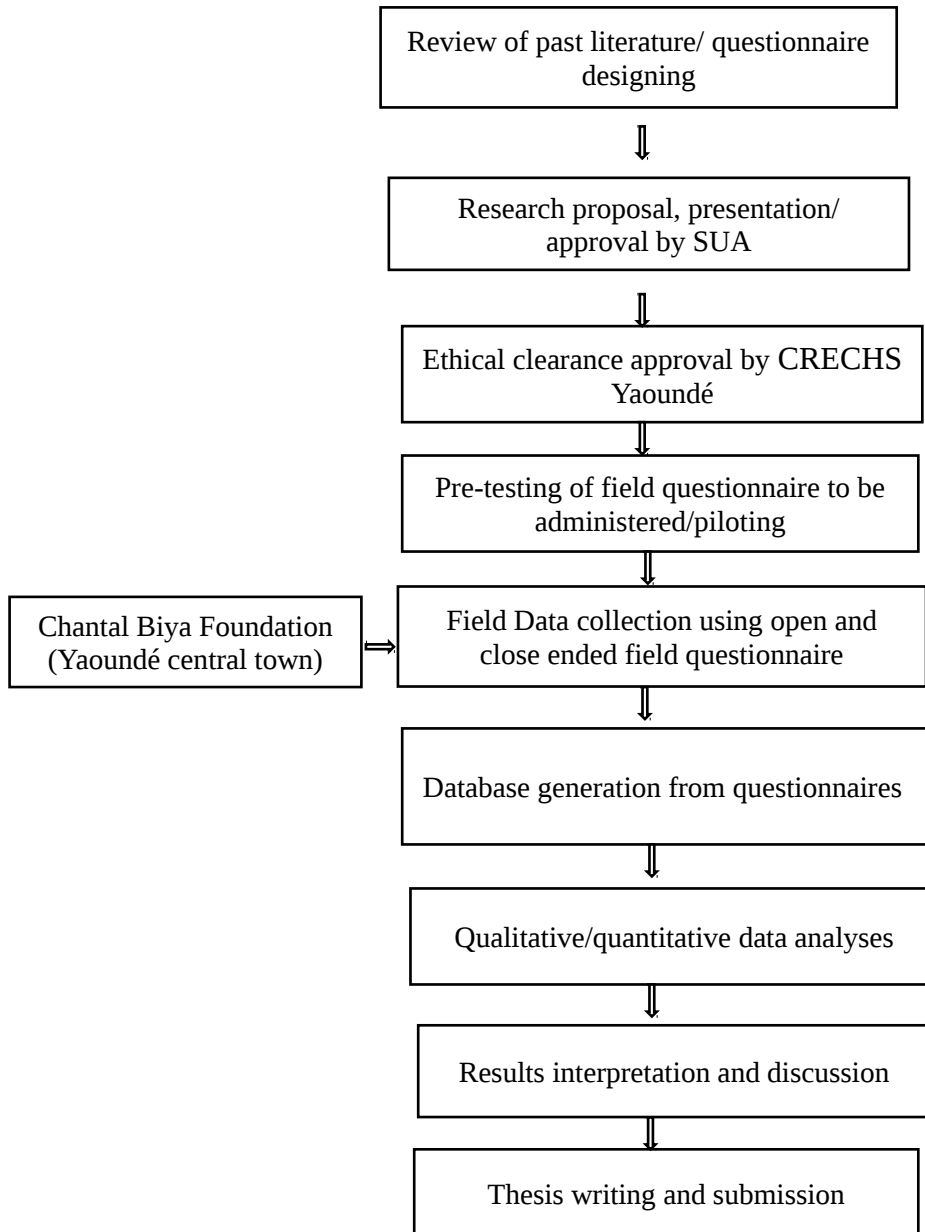
mothers practising exclusive breastfeeding and decrease in infection, malnutrition and mortality amongst infants.

### **3.13 Study Limitations**

This study had some limitations like not stating mother's number of ANC and post natal visits, child spacing and number of children. Other limitations include mode of delivery and cultural believes towards EBF.



### 3.14 Work Methodology



**Figure 1: Synoptic diagram of work methodology**

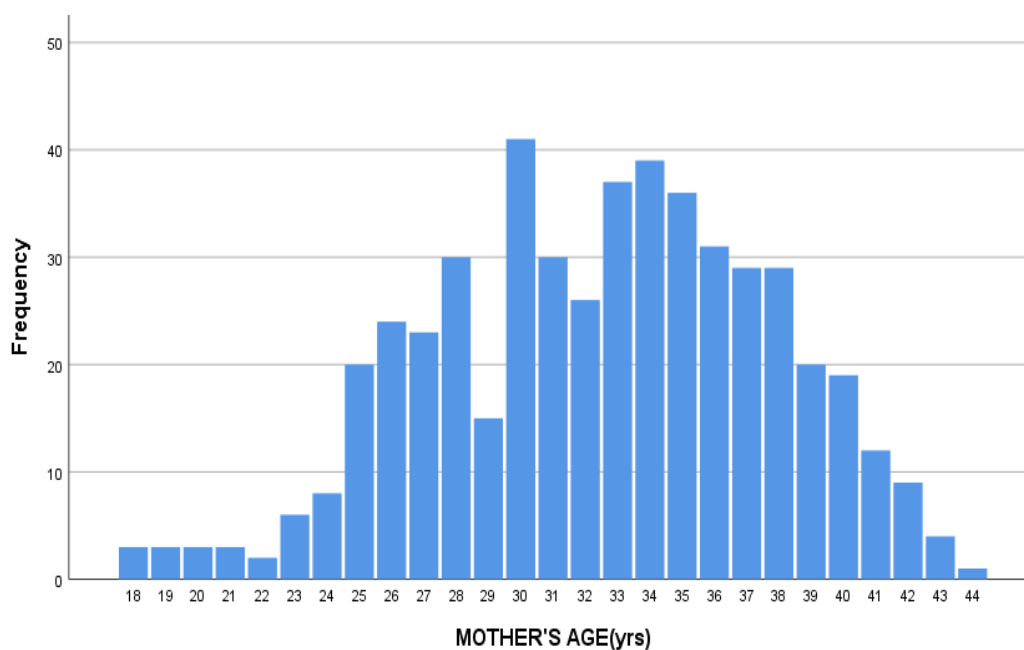
Figure 1 shows a synoptic diagram of work methodology before and during field data collection. This synoptic diagram illustrates the various steps involved in this works procedure.

**CHAPTER FOUR****4.0 RESULTS AND DISCUSSION****4.1 Demographic Characteristics and Statistical Distribution of Mothers Represented in the Study**

Table 1 represents the demographic characteristics and statistical distribution of all participants in the sample size. Approximately 70% of nursing mothers within the study were married and 69% attained higher level of education. Knowledge about breastfeeding recommendations was received by more than 90% of the nursing mothers who attended ANC. Notwithstanding, only about 38% of nursing mothers could answer yes to the recommended call of EBF.

**Table 1: Demographic characteristics and statistical distribution of mothers (N=503)**

<b>Variable</b>	<b>Level</b>	<b>Number</b>	<b>Percentage</b>
Employment	Employed	273	54.3
	Unemployed	230	45.7
Education level	Basic/No formal education	156	31.0
	Tertiary or Higher	347	69.0
Marital status	Married	356	70.8
	Not married	147	29.2
Practised EBF	Yes	191	38.0
	No	312	62.0
Practised Breast Milk Expression	Yes	200	39.8
	No	303	60.2
Attended ANC	Yes	501	99.6
	No	2	0.4

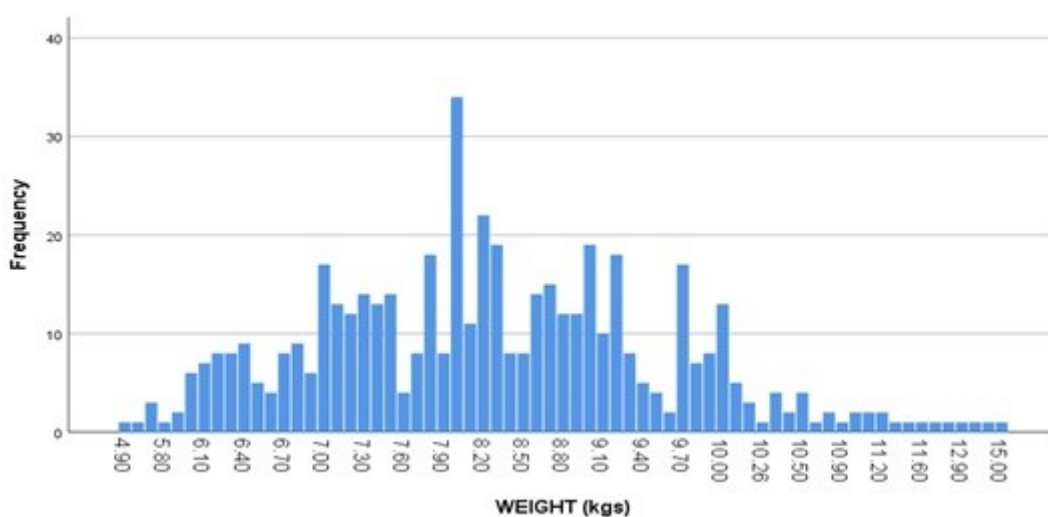


**Figure 2: A bar chart representing the frequencies of mother's ages**

#### 4.2 Demographic Characteristics and Statistical Distribution Of Babies

**Table 2: Demographic characteristics and statistical distribution of Babies (N=503)**

<b>Variable</b>	<b>Level</b>	<b>Number</b>	<b>Percentage</b>
Sex	Male	241	47.9
	Female	262	52.1
Colostrum intake	Yes	464	92.2
	No	39	7.8
Contracted Diarrhoea	Yes	133	26.4
	No	370	73.6
Developed respiratory problems during the study	Yes	31	6.2
	No	472	93.8
Babies ages	6 months	224	44.5
	7 months	54	10.7
	8 months	16	3.2
	9 months	197	39.2
	10 months	12	2.4



**Figure 3: A bar chart representing the weight of babies included in the study**

#### **4.3 Description of Factors Influencing EBF**

Prognostic factors such as mother's employment status, educational level and marital status were all influencing factors towards the duration of EBF as shown in Table 3. Out of this influencing factor as shown in Fig. 3, mother's employment status was not statistically significant towards the duration of EBF.

**Table 3: Distribution of factors that affect EBF**

<b>Variable</b>	<b>Level</b>	<b>Number</b>	<b>n (%) Practiced EBF</b>	<b>Statistical significance (p)</b>
Employment	Employed	273	100 (36.6%)	0.425
	Unemployed	230	91 (39.6%)	
Education level	Basic/No education	156	74 (47.4%)	0.005
	Tertiary or Higher level	347	117 (33.7%)	
Marital status	Married	356	147 (41.3%)	0.003
	Not married	147	44 (29.9%)	

#### 4.4 Survival Analysis

Factors that affected survival time of EBF are summarized in Table 4.

**Table 4: Summarized Univariate analysis of factors that affected survival time**

Term	Hazard Ratio	95% CI	Coefficient ( $\beta$ )	S.E	Z-statistic	p-value
Tertiary/Basic Education	1.43	1.11-1.84	0.3586	0.1844	2.78	0.005
Married/not married	0.70	0.55-0.89	-0.3525	0.8479	-2.92	0.003
Employed/unemployed	1.12	0.85-1.48	0.1143	0.1607	0.80	0.425

#### 4.5 Life Table and Survival Function

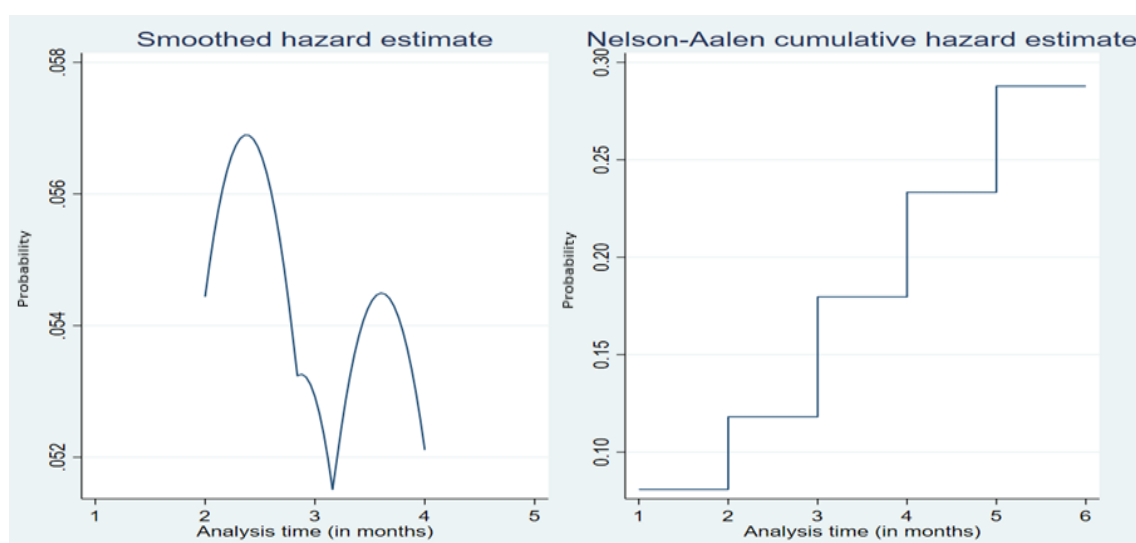
**Table 5: Life Table analysis**

Time (months)	N (503)	Failure	Survival function	Std. error	[95% CI]	
1	503	147	0.9191	0.0064	0.9056	0.9308
2	356	49	0.8849	0.0078	0.8686	0.8993
3	307	59	0.8305	0.0100	0.8097	0.8491
4	248	35	0.7859	0.0120	0.7612	0.8083
5	213	22	0.7431	0.0144	0.7136	0.7701
6	191	0	0.7431	0.0144	0.7136	0.7701

## 4.6 Non-Parametric Estimation

### 4.6.1 Graph of Hazard Ratio

The hazard ratio shows the probability of having the event (the mother stops exclusive breastfeeding). Regarding the trend in Fig. 4, it appears that when time goes up, babies are less likely to be exclusively breastfed after a specific time period after month two and three.



**Figure 4: Graph of hazard ratio**

### 4.6.2 Survival function (Kaplan-Meier survival curve)

At the beginning we had the full sample (proportion=1) as shown in Fig 5. As time goes on, the probability to survive decreases, the baby is less likely to be exclusively breastfed. The Kaplan-Meier survival function shows that survival probabilities go down to 74.3% (0.74) over a six months period. This means that the chances for a baby to remain exclusively breastfed after five months is 74.3% (0.74) as shown in Fig. 5 (see Table 5 for other months).



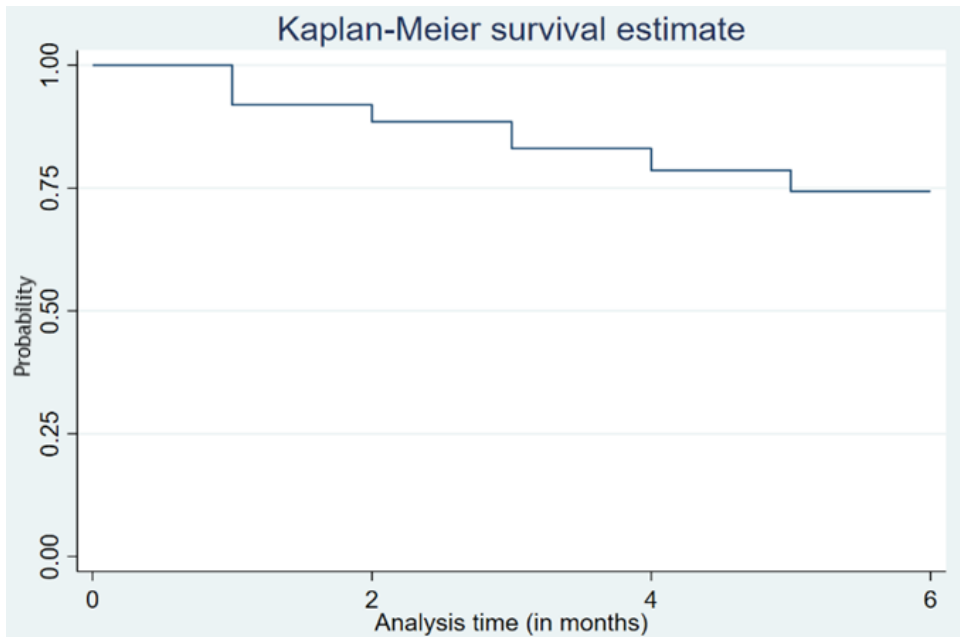


Figure 5: Survival function (Kaplan-Meier survival curve)

#### 4.6.3 Kaplan-Meier survival curves for two groups

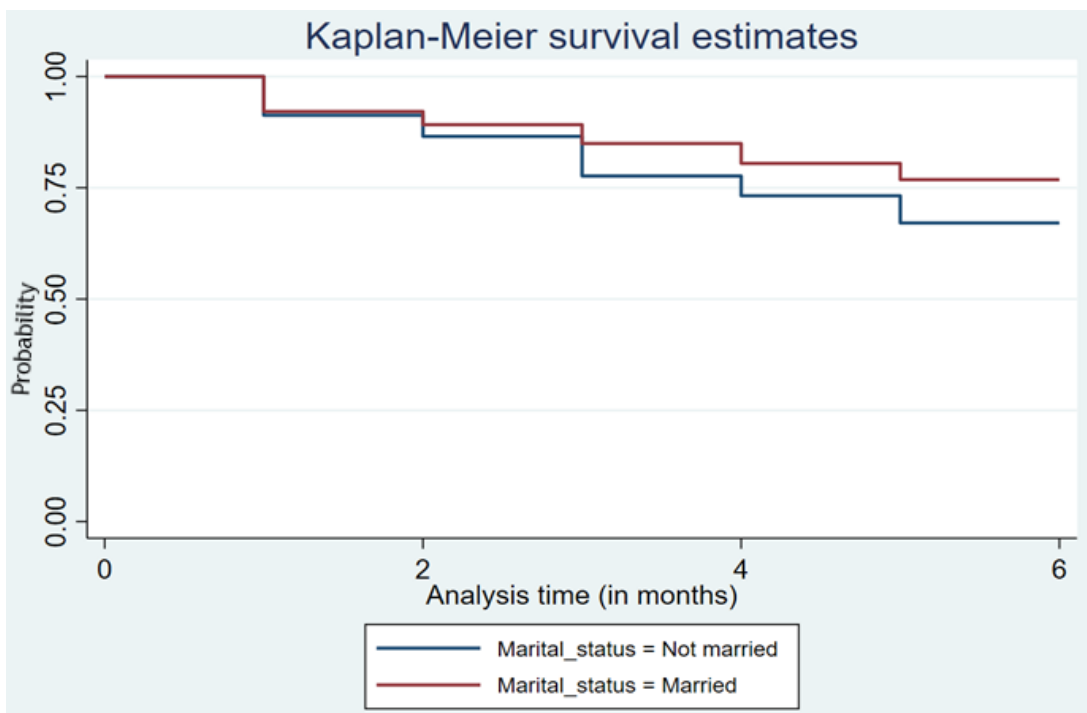


Figure 6: Kaplan-Meier survival curves for two groups regarding the marital status

Figure 6 gives the survival function (Kaplan-Meier survival estimates) for two groups regarding the marital status of the mothers. The survival graphs show the survival rate is almost the same in both groups for babies under two months of age. But after two months, the fact that the mother is married is associated with higher survival rate of EBF for their babies. This means that babies whose mothers are married are more likely to be exclusively breastfed than babies with single parents. This difference is supported by the log rank test (Table 6) computed for those two groups.

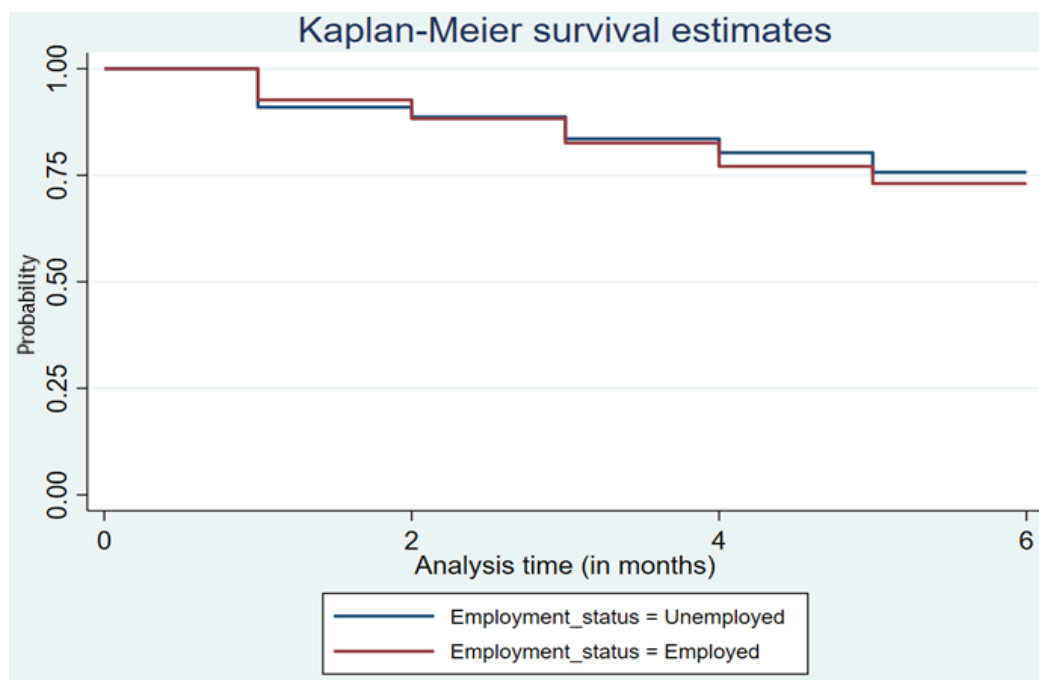
#### 4.6.4 Log-rank test for equality of survivor functions (marital status)

**Table 6: Log-rank test for equality of survivor functions (marital status)**

<b>Marital status</b>	<b>Events observed</b>	<b>Events expected</b>
Not married	103	81.58
Married	209	230.42
Total	312	312
chi2(1)	8.23	
Pr>chi2	0.0041	

The survival functions are significantly different (P value=0.0041<5%).

#### 4.6.5 Kaplan-Meier Survival curves for two groups regarding the employment status



**Figure 7: Kaplan-Meier survival curves for two groups regarding the employment status**

According to Fig. 7, the difference between the survival functions graphs is less pronounced when the time goes on. The log rank test (Table 7) computed for the difference in the two groups regarding the employment status shows that the survival functions are not significantly different ( $P$  value=0.5418>5%). Thus, the survival rate of babies is not significantly different regarding the employment status of their mothers.

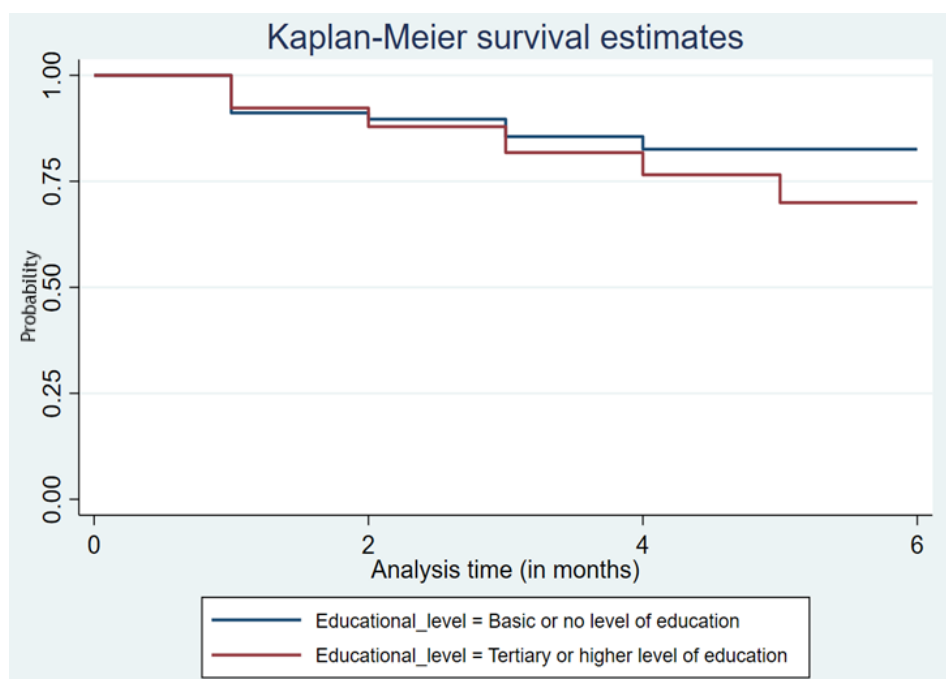
#### 4.6.6 Log-rank test for equality of survivor functions (employment status)

**Table 7: Log-rank test for equality of survivor functions (employment status)**

Marital status	Events observed	Events expected
Unemployed	139	143.74
Employed	173	168.26

Total	312	312.00
chi2(1)	0.37	
Pr>chi2	0.5418	

#### 4.6.7 Kaplan-Meier survival curves for two groups regarding educational level



**Figure 8: Kaplan-Meier survival curves for two groups regarding the educational level**

According to Fig. 8 the difference in survival rate is the same before the first month regardless of the educational level. Notwithstanding, at the interval of one to two months of age, the survival rate is greater for babies whose mother have tertiary or higher level of education even though the difference is less pronounced. After two months of age, higher level of survival rate is associated with basic or no level of education. This equally means babies whose mothers have tertiary or higher level of education are less likely to be exclusively breastfed after two months. The log rank test (Table 8) computed for the difference in the two groups regarding educational level, shows that the survival functions are significantly different ( $P$  value=0.0062<5%).

#### 4.6.8 Log-rank test for equality of survivor functions (educational level)

**Table 8: Log-rank test for equality of survivor functions (educational level)**

Marital status	Events observed	Events expected
Basic or no level of education	82	103.39
Tertiary or higher level of education	230	208.61
Total	312	312.00
chi2(1)	7.5	
Pr>chi2	0.0062	

### 4.7 Parametric Estimation Output

#### 4.7.1 Cox proportional hazard model coefficients and hazard rates

The dependent variable is duration (time in months to the event of interest). This is a combination of time and event. The event here is “stop exclusive breastfeeding before six months”. Unlike the non-parametric analysis where the hazard rate is the probability that the event will happen at time  $t$  given that the individual is at risk at time  $t$ , the hazard rate in the Cox proportional hazard model is defined as:

$$\gamma(t|X, \beta) = \gamma_0(t) \exp(X' \beta)$$

The first model used carried three independent variables: Marital status, Educational level and Employment status. The model is valid, but as expected the impact of employment status is not significant (P value=0.425>5%) (Table 9).

#### 4.7.2 Cox proportional hazard coefficients and hazard rates for the first model

**Table 9: Cox proportional hazard coefficients and hazard rates for the first model**

<b>_t</b>	<b>Hazard Ratio</b>	<b>Coefficient</b>	<b>Std. Err</b>	<b>z</b>	<b>P&gt; z </b>	<b>[95% CI]</b>	
Marital status (married/Single)	0.6777	-.38902	0.0924	-2.85	0.004	0.5188	0.8853
Education level(Tertiary or Higher/Basic or no formal Education)	1.3848	0.32554	0.1866	2.42	0.016	1.0634	1.8033
Employment status (Unemployed/Employed )	1.1211	0.11433	0.1607	0.80	0.425	0.8465	1.4847

The second model is considered by excluding non-significant variables. The two remaining independent variables are: Marital status and Educational level.

Tables 10 and 11 gives the estimation of the parametric models. The model is valid (P value<0.05, see the software output in Appendix 4).

#### 4.7.3 Cox proportional hazard model coefficients

**Table 10: Cox proportional hazard model coefficients**

<b>_t</b>	<b>Coef.</b>	<b>Std. Err</b>	<b>z</b>	<b>P&gt; z </b>	<b>[95% CI]</b>
-----------	--------------	-----------------	----------	-----------------	-----------------

Marital status	-0.3525639	0.120633	-2.92	0.003	-0.5889994	-0.1161283
Educational level	0.3586335	0.12887	2.78	0.005	0.1060589	0.6112082

#### 4.7.4 Cox proportional hazard rates

**Table 11: Cox proportional hazard rates**

<b>_t</b>	<b>Hazard Ratio</b>	<b>Std. Err</b>	<b>z</b>	<b>P&gt; z </b>	<b>[95% CI]</b>	
Marital status	0.7028837	0.084790	-2.92	0.003	0.5548822	0.890361
Educational level	1.431372	0.184456	2.78	0.005	1.111887	1.842656

From the estimation Tables, the effect of both marital status and education level is significant (P value=0.003<5% and P value=0.005<5% respectively). The coefficient for marital status is negative (Coef=-0.352), this means that a change in the mother status from “not married” to “married” (0 to 1) will affect negatively the chance of the mother to stop exclusive breastfeeding. That change is associated with a decrease of 100-70.3=29.7% chances for mother to stop exclusive breastfeeding. In other words, babies with married mothers have 29.7% less chances to not be exclusively breastfed.

The coefficient for educational level is positive (Coef. =+0.359), this means that a change in the mother status from “Basic or no level of education” to “Tertiary or higher level of education” (0 to 1) will affect positively the chance of the mother to stop exclusive breastfeeding, associated with an increase of 143.1-100=43.1% of the chance for the mother to stop exclusive breastfeeding. In other words, babies with more educated mothers have 43.1% more chance not to be exclusively breastfed.

#### 4.7.5 Parametric estimation for the robustness of the results

It is observed that changes can be identified only at the hazard rate and the survival function for these models. The following tables summarize the forms of hazard rate for each parametric model.

**Table 12: Some parametric models**

Parametric model	Hazard function	Survival function
Exponential	$\gamma$	$\text{Exp}(-\gamma t)$
Weibull	$\gamma \alpha t^{\alpha-1}$	$\text{Exp}(-\gamma t^\alpha)$
Gompertz	$\gamma \exp(\alpha t)$	$\text{Exp}\left(-\left(\frac{\gamma}{\alpha}\right) (e^{\alpha t} - 1)\right)$

The estimations of these models are valid P values < 5%, see the software estimation outputs (Appendix 4). The following tables give estimation results for parametric models.

#### 4.7.6 Exponential regression hazard rates

**Table 13: Exponential regression hazard rates**

_t	Hazard Ratio	Std. Err	z	P> z	[95% CI]	
Marital status	.6930993	.083574	-3.04	0.002	.5472144	.8778764
Educational level	1.452723	.1871455	2.90	0.004	1.128568	1.869985
_cons	0.058270	0.007792	-21.26	0.000	0.044835	0.075732



#### 4.7.7 Weibull regression coefficients and hazard rates

**Table 14: Weibull regression coefficients and hazard rates**

<b>_t</b>	<b>Hazard Ratio</b>	<b>Std. Err</b>	<b>z</b>	<b>P&gt; z </b>	<b>[95% CI]</b>	
Marital status	0.677588	0.081761	-3.23	0.001	0.534879	0.8584
Educational level	1.486155	.1915785	3.07	0.002	1.154348	1.9133
_cons	0.0371207	0.005883	-20.78	0.000	0.027209	0.0506
ln_p	0.3003711	0.047443	6.33	0.000	0.2073842	0.3934
p	1.35036	0.064065	0.00	0.00	1.230455	1.4819
1/p	0.740543	.0351337	0.00	0.00	0.6747872	0.8127

#### 4.7.8 Gompertz regression and hazard rates

**Table 15: Gompertz regression and hazard rates**

<b>_t</b>	<b>Hazard Ratio</b>	<b>Std. Err</b>	<b>z</b>	<b>P&gt; z </b>	<b>[95% Conf. Interval]</b>	
Marital status	0.6853244	0.082702	-3.13	0.002	0.540974	0.86819
Educational level	1.47039	0.189575	2.99	0.003	1.142058	1.89312
_cons	0.0476869	0.007442	-19.50	0.000	0.035121	0.06475
gamma	0.0974003	0.037136	2.62	0.009	0.024615	0.17019

We can observe that the results are similar with cox proportional estimations and can be interpreted the same way. This shows that our estimation results are robust. The only difference is about the change in the hazard rate. The following table summarizes the change in hazard rate for all the models.

#### 4.7.9 Comparison of the models

**Table 16: Comparison of the various models**

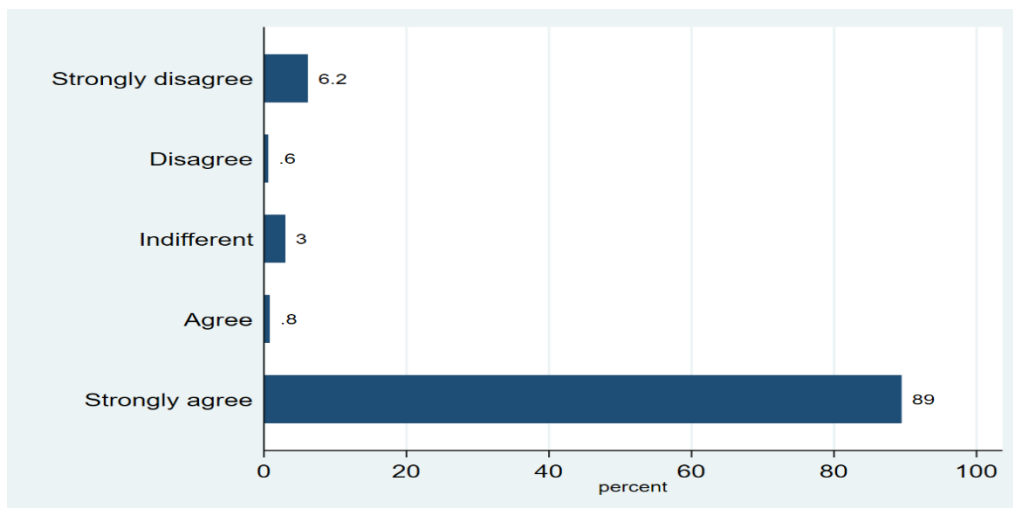
<b>Parametric model</b>	<b>Variable</b>	<b>Sense of change</b>	<b>Change in hazard rate</b>
Exponential	Marital status	Negative	31%
	Educational level	Positive	45%
Weibull	Marital status	Negative	32%
	Educational level	Positive	49%
Gompertz	Marital status	Negative	31%
	Educational level	Positive	47%
Cox proportional	Marital status	Negative	30%
	Educational level	Positive	43%

### 4.8 Qualitative Results

#### 4.8.1 Likert scale analysis on Knowledge and perception about EBF.

Below represents bar charts analysis of the Likert- item questions interviewed. The Likert scale was analysed descriptively.

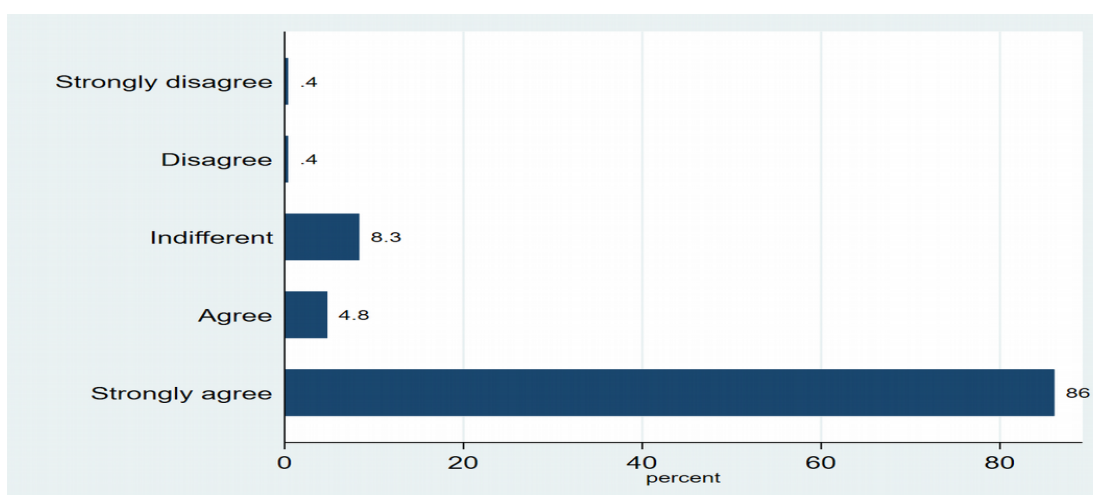
#### 4.8.2 Question 1: All babies have the right to exclusive breastfeeding for six months.



**Figure 9: Response to question 1**

Exclusive breastfeeding of infants stands as a fundamental right for infants where, the baby has the right to receive breast milk as his or her own means of survival. Fig. 9 represents the responses during the study concerning question 1. A total of 89% of mothers strongly agreed that all babies should receive only breast milk for at least six months.

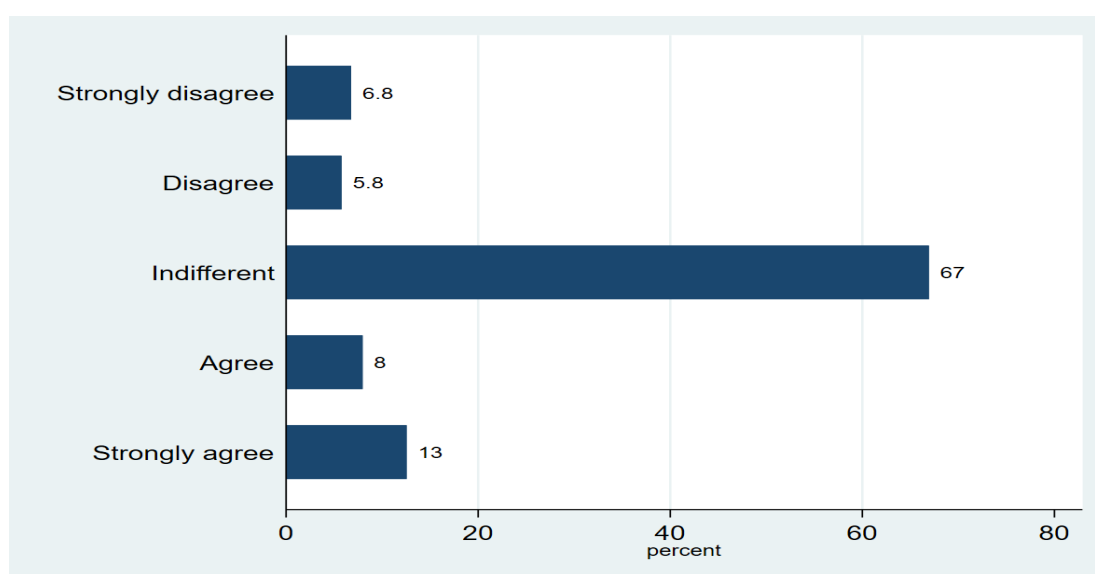
#### 4.8.3 Question 2: Exclusive breastfeeding is very beneficial to both mothers and babies.



**Figure 10: Response to question 2**

Exclusive lactation practices are an advantageous benefit for both mother and baby. Most of these benefits are usually underrated by some mothers. Nevertheless, some mothers still acknowledge its benefits as 86% of mothers strongly agreed to these facts.

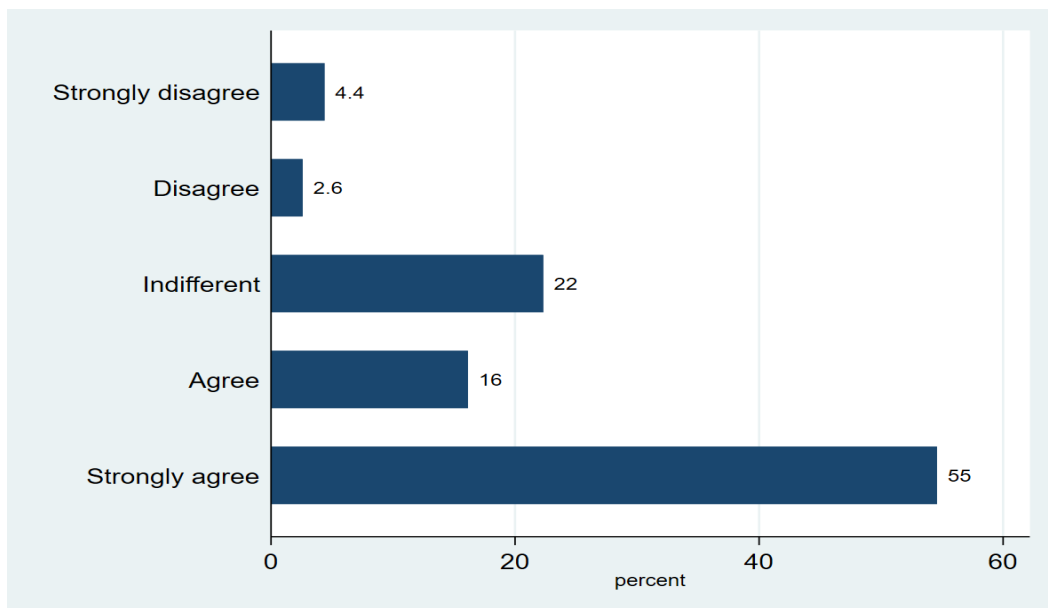
#### 4.8.4 Question 3: Exclusive breastfeeding is not supported by all babies



**Figure 11: Response to question 3**

Initiation to lactation is a natural reflex action to babies which they naturally adapt without circumstance. The question to whether all babies naturally support or do not support breastfeeding for six months remains an open question as most mothers had different experiences and views with babies. A total of 67% of mothers remain neutral or indifferent about their opinions to the validity of these question.

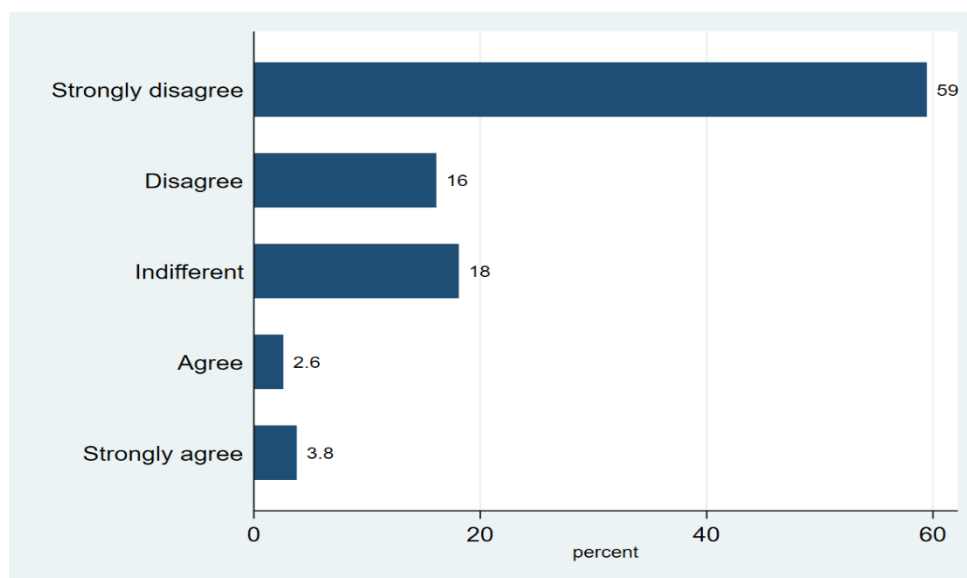
**4.8.5 Question 4: Babies whom are not exclusively breastfed stand a higher chance to morbidity and mortality later in life.**



**Figure 12: Response to question 4**

According to UNICEF and WHO (2003) babies who are not exclusively breastfed stand a higher chance to morbidity and mortality later in life. These are documented facts where 55% of mothers still acknowledge this evidence based theory. Meanwhile, 22% of mothers remain indifferent about this evidence. These facts were well acknowledged within the study as most babies who contracted diarrhoea and upper respiratory track complications were not exclusively breastfed for six months.

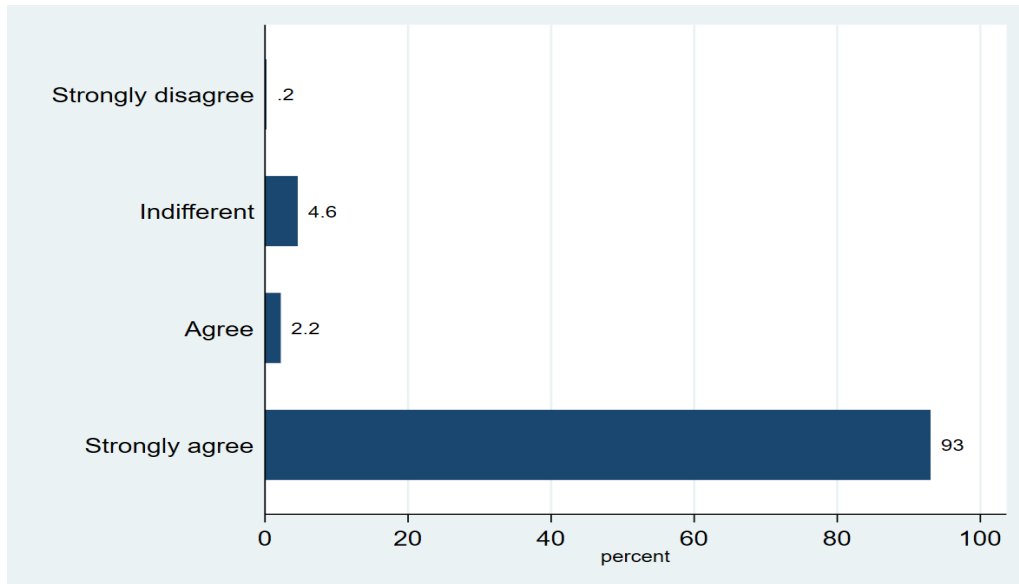
**4.8.6 Question 5: There is no basic difference between exclusively breastfed infants and non-exclusively breastfed infants.**



**Figure 13: Response to question 5**

Existing studies conducted by WHO (2008) and Sankar *et al.* (2015) have documented clear evidence between exclusively breastfed infants and non-exclusively breastfed infants. These studies are still valid as 59% of mothers could still experience the eminent differences between these two practices. It was noted that most mothers who countered this fact did not practice EBF. Meanwhile, 18% of mothers remained indifferent and 3.8% strongly agreed to the fact that there exists no basic difference between exclusively breastfed infants and non-exclusively breastfed infants.

**4.8.7 Question 6: Breastfeeding mothers should have a special consideration in order to promote and encourage exclusive breastfeeding.**



**Figure 14: Response to question 6**

The question to whether breastfeeding mothers should have a special consideration in order to promote and encourage exclusive breastfeeding was strongly perceived as a great motivational factor by most mothers to help them meet up to this task without environmental and external factors hindering this motherhood process. Moreover, 93% of mothers strongly agreed for the special status initiation to encourage EBF practices.

#### 4.9 Discussion

The mean survival time in months for mothers to practice exclusive breastfeeding was  $3.61 \pm 0.095$  months (Appendix 3). The censored rate was recorded at 38% which indicates that only 38% of the total sample size survived or practiced exclusive breastfeeding for a duration of six months. This in other words means, only 191 babies out of 503 babies actually received only breast milk without any other breast milk substitute for a duration of six months as recommended by the WHO. Meanwhile, the total failure rate was recorded at 62%. This equally implies 312 babies did not receive only breast milk for six months. This brings to a conclusion that 191 babies experienced EBF and 312 babies experienced Non-exclusive breastfeeding leading to a 38% censored rate and 62% failure rate respectively as shown in Table 1. Past studies conducted in Yaoundé Cameroon by Ngoum-sap *et al.* (2014) revealed EBF rate of only 15% with other studies conducted by Tambe *et al.* (2016) reported 42.5 % of babies were exclusively breastfed for six months. With reference to past studies conducted and present study, much room for improvement is needed to reach global breastfeeding target of 50%.

In addition, a life table of exclusive breastfeeding was developed using the Kaplan Meier approach of survival analysis as indicated in Table 5. This table indicates the number of breastfeeding mothers withdrawing at each given time interval from practicing EBF during the retrospective follow up. The required time interval was six months according to WHO recommendations with a starting time interval of one month with an end time of six months. The highest number of withdrawal cases during the study was recorded at one month where, 147 babies stopped or didn't receive breast milk only when they were about a month old. Due to the high level of participants drop out at various time interval this



brought forth the highest number of babies exposed to various risk factors link to non-exclusive breastfeeding such as diarrhoea and upper respiratory tract infections.

Diarrhoea is one of the main risk factors accompanied by early complementation of breast milk. Studies revealed that when mothers try to early substitute breast milk the baby's gastro-internal track becomes exposed to complications such as diarrhoea based on reports from WHO (2010). During the study, 26.4% of babies contracted diarrhoea as shown in table 2. More so, upper respiratory tract infections also account as one of the major risk factors linked to non-exclusive breastfeeding especially among babies from zero to five years across Africa and the world. Some studies revealed that, complications linked to non-exclusive breastfeeding comes as a long-term side effects (WHO, 2010; Pereira *et al.*, 2010; UNICEF, 2011; Chiabi *et al.*, 2014). During the study, 6.2% of babies developed upper respiratory tract infections as shown in Table 2.

Futhermore, Nursing mothers who were unemployed, 39.6% practiced EBF for six months while for mothers who were employed, 36.6% were able to practice EBF for six months. This provides evidence that prognostic factors like employment status does not greatly influence the duration of EBF due to no significance difference between the two groups of mothers with P-value greater than 5%. Therefore, the survival rate of babies is not significantly dependable on the employment status of their mothers. The reverse could seemingly look true with justifications that mothers who were employed spent less time with their babies. Whereas, mothers who were unemployed were at upper hand of practicing EBF since they spent more time or close contact with their babies. Notwithstanding, past studies have proven that, EBF rates are higher among unemployed

mothers where, mothers who are unemployed also practice EBF as the best way of cost effective practice (Muhammed and Seid, 2019). The motivation to exclusively breastfed can be more of a self-motivational factor to follow basic rules without cofounders in order to exclusively breastfeed.

One of the ways to mitigating the risk of not practicing EBF for busy career mothers was to endorse breast milk expression for storage and adequate usage when need be, but nevertheless some of them could not adhere to this principle. Findings from this study also revealed that some nursing mothers expressed the will to practice breast milk expression but some constraints hindered this act such as inadequate breast milk flow.

More so, the African mind-set is gradually shifting towards the western culture of gender equality and rights to female education. This has brought forth many changes as many women across Cameroon and Africa pursue education nowadays as compared to the past. Mothers with low level of education practice EBF at a rate of 47.4% while mothers with higher education practice EBF at a rate of 33.7%. Prognostic factors such as educational level proved that, there is a significant relationship between this variable and mother's ability to practice EBF since this variable was statistically significant with  $P=0.005$ . This study revealed that mothers with higher educational level played a negative role in promoting EBF as compared to mothers with basic or no level of education. A lower level of maternal schooling might be a predictive factor for successful practice of EBF.

From Table 3, among women who were married, 41.3% of mothers practiced exclusive breastfeeding for six months. While, women who were not married, only 29.9% of

mothers practiced EBF for six months. This can be assumed that, marital status influences mothers to exclusively breastfed their babies since studies have shown a statistically significant association between marital status and EBF with  $P=0.003$ . This assumption includes confounders such as established unmarried couple's cohabitating. Past evidence-based studies conducted in the United States of America according to Hellen *et al.* (2018) with 25,197 telephone interviews, it was found that children living with both parents were more likely to have been exclusively breastfed (80.4%) than children of other types of families. Mothers with their partners showed a positive influence on EBF practice. With reference to past studies conducted and present study, much room for improvement is needed to reach global breastfeeding target of 50%.

## CHAPTER FIVE

### 5.0 CONCLUSION AND RECOMMENDATIONS

This research carried out on time to event of EBF in Yaoundé Cameroon found that, since the implementation of the National Breastfeeding Sensitization Program by the Ministry of Public Health Cameroon (2016) in partnership with WHO in Cameroon, EBF rates in Cameroon are however, still below satisfactory levels (EDS-MICS, 2018). The time duration recommended by the WHO for EBF is still a challenge for mother and child health care services in Yaoundé. This study revealed that mean months for mother to practise EBF was  $3.61 \pm 0.095$  months with a range from one to six months. Further finding revealed that more than 90% of mothers were knowledgeable about EBF benefits and equally attended antenatal clinic notwithstanding, only 38% of them could survive EBF (Censored) with 62% whom couldn't adhere to EBF practices (Failure).

One of the objectives of ANC's is to educate and sensitize expectant mothers on the procedures of child care after child birth and essential benefits of practicing EBF both for the mother and baby. Despite the impressive percentage of mothers whom attended ANC's and received counselling and sensitization on the importance of EBF, the percentage of mothers whom answered yes to the recommended call of EBF was still low as unexpected.

Nursing mothers however, underrate the importance and essential benefits of practicing EBF for six months. Past studies conducted in Cameroon in the year 2015 by the World Bank started that 82.8% of mothers received antenatal care. This signifies a positive trend as the turnout of expectant mothers receiving antenatal care increased from 82.8% nationally (EDS-MICS, 2018) to 99.6% regionally in Yaoundé during the study. This signifies that, if much effort is vested upon nursing mothers on the richly benefits of practicing EBF, the gap of EBF will tremendously be narrowed and the prevalence rate of EBF shall increase in the subsequent years.

Therefore, stringent measures and recommendations have to be put in place for over 45% of children in Cameroon die from malnutrition related causes most of which could be prevented (Ngongalah *et al.*, 2018). Findings from the study conducted in Yaounde revealed that water was the main factor altering EBF for six months as most nursing mothers supplemented baby's formula with water to quench their thirst out of the grip of fear. These mothers believe that babies needed to drink water from their tender age for a healthy growth. Other supplements that interrupted EBF were Cereals, Corn porridge, fruit juice and bananas. During data collection it was observed that, the reason why some babies couldn't receive only breast milk from the first day of birth was because some expecting mothers gave birth through Caesarean section and premature delivery which didn't stimulate enough milk production after child birth. This therefore, triggered some mothers to involuntarily practiced mixed feeding. However, other reasons included present health status of some mothers living with HIV with low level of immunity whom out of will or advice from third parties practise artificial feeding. It was highly noted that prognostic factors which were highly significant to determinants of EBF durations were mother's level of education and marital status.

Based on the findings, the study recommends the following in order to promote EBF and narrow this existing gap. These recommendations are summarized in four main points:

- i. Reinforce prenatal sensitization on the richly benefits of EBF practices for both mother and Child during ANC
- ii. Review some National working policies for nursing mothers in some highly demanding sectors of employment such as offshore Mining and outstation diplomatic services. This policy review by policy makers will lead to flexibility and time to breastfed.
- iii. Encourage breastfeeding mothers to bond with their partners for parental support
- iv. Develop strategies to encourage men to attend prenatal clinics with their partners.

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		<input type="checkbox"/> <i>Occasionally</i>
10	Alcohol Status	<input type="checkbox"/> <i>Drink alcohol</i> <input type="checkbox"/> <i>No alcohol</i> <input type="checkbox"/> <i>Occasionally</i>
11	Religious status	<input type="checkbox"/> <i>Christians</i> <input type="checkbox"/> <i>Muslim</i> <input type="checkbox"/> <i>Others please specify</i>
<b>SECTION B: KNOWLEDGE AND AWARENESS ON EXCLUSIVE BREASTFEEDING</b>		
1	Did your baby receive the first breast milk which is thick and yellowish in color (COLOSTRUM) immediately after birth?	<input type="checkbox"/> <i>Yes</i> <input type="checkbox"/> <i>No</i> <input type="checkbox"/> <i>No idea</i>
2	Do you have an idea on the importance of your baby receiving the first breast milk (COLOSTRUM) immediately after birth?	<input type="checkbox"/> <i>Yes</i> <input type="checkbox"/> <i>No</i>
3	What was your baby's initial weight at birth?	
4	Have you heard about exclusive breastfeeding before?	<input type="checkbox"/> <i>Yes</i> <input type="checkbox"/> <i>No</i>
	If YES where?	<input type="checkbox"/> <i>Antenatal clinic</i> <input type="checkbox"/> <i>Social media</i> <input type="checkbox"/> <i>Others</i>
5	In your own opinion what do you think about exclusive breastfeeding?	<input type="checkbox"/> <i>Beneficial to the baby</i> <input type="checkbox"/> <i>Indifferent from artificial feeding</i> <input type="checkbox"/> <i>Others</i>
6	What advice have you been given on how long your baby should be exclusively breastfed or baby received only breast milk?	<input type="checkbox"/> <i>No advice given</i> <input type="checkbox"/> <i>Six months</i> <input type="checkbox"/> <i>Less than six months</i> <input type="checkbox"/> <i>Other (please specify)</i>
7	What advice have you been given about how and when you can introduce other breastmilk substitute or other food to the baby's diet?	<input type="checkbox"/> <i>No advice given</i> <input type="checkbox"/> <i>For as long as my baby can eat other apart from breast milk</i> <input type="checkbox"/> <i>Above six months</i> <input type="checkbox"/> <i>Other</i>
8	When did you start introducing your baby into other breastmilk substitute or other foods?	<input type="checkbox"/> <i>0 months</i> <input type="checkbox"/> <i>1 month</i> <input type="checkbox"/> <i>2 months</i> <input type="checkbox"/> <i>3 months</i> <input type="checkbox"/> <i>4 months</i> <input type="checkbox"/> <i>5 months</i>

		<input type="checkbox"/> 6 months months	<input type="checkbox"/> 7 months	<input type="checkbox"/> >8
9	When did you stop exclusive breastfeeding?	<input type="checkbox"/> 1 month months	<input type="checkbox"/> 2 months	<input type="checkbox"/> 3
		<input type="checkbox"/> 4 months months	<input type="checkbox"/> 5 months	<input type="checkbox"/> 6
		<input type="checkbox"/> 7 months		
10	Were there any factors that hinder you from practicing exclusive breastfeeding such as health and occupation if others specify?	<input type="checkbox"/> If yes specify	<input type="checkbox"/> No	
11	Did your baby receive only breastmilk for the first six months?	<input type="checkbox"/> Yes	<input type="checkbox"/> No	
12	At what age or month did your baby start receiving other artificial foods?	<input type="checkbox"/> 1 month months	<input type="checkbox"/> 2 months	<input type="checkbox"/> 3
		<input type="checkbox"/> 4 months months	<input type="checkbox"/> 5 months	<input type="checkbox"/> 6
		<input type="checkbox"/> 7 months		
13	Did your baby record any health complications such as diarrhea?	<input type="checkbox"/> Yes	<input type="checkbox"/> No	
14	Did your baby record any health complications such as any respiratory problems?	<input type="checkbox"/> Yes	<input type="checkbox"/> No	
15	Do you know how to express breastmilk?	<input type="checkbox"/> Yes	<input type="checkbox"/> No	
16	Have you expressed breastmilk before?	<input type="checkbox"/> Yes	<input type="checkbox"/> No	
17	If yes why? Or give reasons for expressing breast milk?	<input type="checkbox"/> For the baby's consumption	<input type="checkbox"/> Other	
18	Was the early initiation of mixed feeding intentional or other factors accounted for it? If yes indicate?	<input type="checkbox"/> Yes	<input type="checkbox"/> No	
19	Do you know the importance of exclusive breastfeeding for both mother and baby?	<input type="checkbox"/> Yes	<input type="checkbox"/> No	
20	Did you attend antenatal clinics during your pregnancy period?	<input type="checkbox"/> Yes	<input type="checkbox"/> No	
21	What is your baby's weight?			
22	Did your baby properly receive other food during mixed breastfeeding?	<input type="checkbox"/> Yes	<input type="checkbox"/> No	

23	Breastfeeding your baby exclusively was it your personal decision or you received advice from health care providers?	<input type="checkbox"/> Yes <input type="checkbox"/> No
24	Did you receive all necessary vaccines as required during pregnancy till date?	<input type="checkbox"/> Yes <input type="checkbox"/> No
25	Has your baby receive all necessary vaccines as required till date?	<input type="checkbox"/> Yes <input type="checkbox"/> No
<b>SECTION C: PERCEPTION OF PARTICIPANTS TOWARDS EXCLUSIVE BREASTFEEDING</b>		
1	All babies have the right to be exclusively breastfed for six months?	<input type="checkbox"/> <i>Strongly agree</i> <input type="checkbox"/> <i>Agree</i> <input type="checkbox"/> <i>Indifferent</i> <input type="checkbox"/> <i>Disagree</i> <input type="checkbox"/> <i>Strongly Disagree</i>
2	Exclusive breastfeeding is very beneficial to both mothers and baby?	<input type="checkbox"/> <i>Strongly agree</i> <input type="checkbox"/> <i>Agree</i> <input type="checkbox"/> <i>Indifferent</i> <input type="checkbox"/> <i>Disagree</i> <input type="checkbox"/> <i>Strongly Disagree</i>
3	Exclusive breastfeeding is not supported by all babies?	<input type="checkbox"/> <i>Strongly agree</i> <input type="checkbox"/> <i>Agree</i> <input type="checkbox"/> <i>Indifferent</i> <input type="checkbox"/> <i>Disagree</i> <input type="checkbox"/> <i>Strongly Disagree</i>
4	Babies who are not exclusively breastfed stand a higher chance to Morbidity and mortality later in life?	<input type="checkbox"/> <i>Strongly agree</i> <input type="checkbox"/> <i>Agree</i> <input type="checkbox"/> <i>Indifferent</i> <input type="checkbox"/> <i>Disagree</i> <input type="checkbox"/> <i>Strongly Disagree</i>
5	There is no basic difference between exclusively breastfed infants and non-exclusively breastfed infants?	<input type="checkbox"/> <i>Strongly agree</i> <input type="checkbox"/> <i>Agree</i> <input type="checkbox"/> <i>Indifferent</i> <input type="checkbox"/> <i>Disagree</i> <input type="checkbox"/> <i>Strongly Disagree</i>
6	Breastfeeding mothers should have a special status in other to promote and encourage exclusive breastfeeding?	<input type="checkbox"/> <i>Strongly agree</i> <input type="checkbox"/> <i>Agree</i> <input type="checkbox"/> <i>Indifferent</i> <input type="checkbox"/> <i>Disagree</i> <input type="checkbox"/> <i>Strongly Disagree</i>

**Appendix 2: Confidential undertaking which researcher had with participants before administering questionnaires.**

**CONFIDENTIALITY UNDERTAKING**

I undersign, NDUM OKWEN AKAH Gloria a public health researcher on ‘exclusive breastfeeding’.

I solely count on your honest collaboration for an effective study and all information’s, data and documents disclosed shall be treated as strictly confidential.

Under no circumstance will i make use of any confidential information supplied to me except for the purpose of the study as mentioned above.

Researcher’s signature

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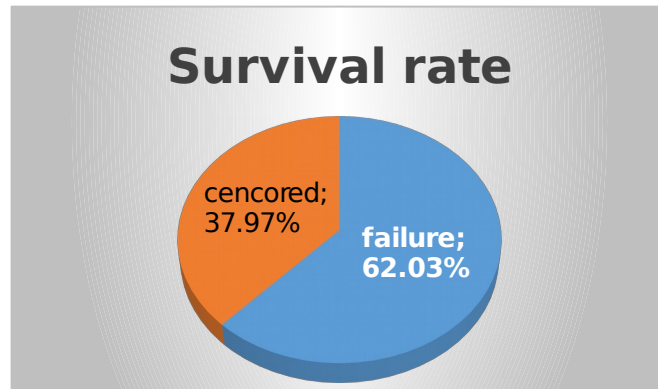
Participant signature

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**Appendix 3: Descriptive analysis of the total sample size.**

<b>Parameters</b>	<b>Mother's age in years</b>	<b>Baby's age in months</b>	<b>Survival time in months</b>	<b>Baby's weight</b>
Mean	32.49	7.44	3.61	8.266
Std. Error of Mean	0.233	0.064	0.095	0.0600
Median	33.00	7.00	3.00	8.200
Mode	30	6	6	8.0
Std. Deviation	5.219	1.438	2.135	1.3459
Variance	27.235	2.068	4.560	1.812
Range	26	4	5	10.1
Minimum	18	6	1	4.9
Maximum	44	10	6	15.0
Sum	16344	3743	1818	4157.6
Percentiles				
25	29.00	6.00	1.00	7.300
50	33.00	7.00	3.00	8.200
75	36.00	9.00	6.00	9.100

**Appendix 4: Survival rate estimate**

Appendix 4 is a pie chart representation of the survival analysis rate recorded during the study.

### Appendix 5: Detail Stata software outputs

This represents the true validity of the software results presented in the document for referencing

#### Log-rank test for equality of survivor functions

Educationa~1	Events observed	Events expected
Basic or no level of education	82	104.05
Tertiary or higher level of ed	230	207.95
Total	312	312.00

chi2(1) = 7.50  
Pr>chi2 = 0.0062

#### Log-rank test for equality of survivor functions

Employment~s	Events observed	Events expected
Unemployed	139	144.20
Employed	173	167.80
Total	312	312.00

chi2(1) = 0.37  
Pr>chi2 = 0.5418

#### Log-rank test for equality of survivor functions

Marital_st~s	Events observed	Events expected
Not married	103	81.48
Married	209	230.52
Total	312	312.00

chi2(1) = 8.23  
Pr>chi2 = 0.0041







## Weibull PH regression

No. of subjects =	1,818	Number of obs =	1,818
No. of failures =	312		
Time at risk =	5339		
Log likelihood =	-989.37886	LR chi2(2) =	18.78
		Prob > chi2 =	0.0001

_t	Haz. Ratio	Std. Err.	z	P> z	[95% Conf. Interval]	
Marital_status	.6775876	.0817608	-3.23	0.001	.534879	.8583716
Educational_level	1.486155	.1915785	3.07	0.002	1.154348	1.913337
_cons	.0371207	.0058831	-20.78	0.000	.027209	.0506429
/ln_p	.3003711	.0474431	6.33	0.000	.2073842	.3933579
p	1.35036	.0640653			1.230455	1.481949
1/p	.7405434	.0351337			.6747872	.8127073

## Appendix 6: Scan Copy of Ethical Clearance

REPUBLIQUE DU CAMEROUN  
*Paix – Travail – Patrie*  
 -----  
 MINISTRE DE LA SANTE PUBLIQUE  
 -----  
 SECRETARIAT GENERAL  
 -----  
 COMITE REGIONAL D'ETHIQUE DE LA  
 RECHERCHE POUR LA SANTE HUMAINE DU CENTRE  
 -----  
 Tél : 222 21 20 87/ 677 94 48 89/ 677 75 73 30  
 Mail : crersh\_centre@yahoo.com



REPUBLIC OF CAMEROON  
*Peace – Work – Fatherland*  
 -----  
 MINISTRY OF PUBLIC HEALTH  
 -----  
 SECRETARIAT GENERAL  
 -----  
 CENTRE REGIONAL ETHICS COMMITTEE  
 FOR HUMAN HEALTH RESEARCH  
 -----

CE N° /CRERSHC/2019

Yaoundé, le... 20 OCT 2019

### CLAIRANCE ETHIQUE

Le Comité Régional d'Ethique de la Recherche pour la Santé Humaine du Centre (CRERSH/C) a reçu la demande de clairance éthique pour le projet de recherche intitulé : « **Investigating on exclusive breast feeding, determinants and impact in Yaounde, Cameroon** » soumis par Mademoiselle **NDUM OKWEN AKAH Gloria**.

Après son évaluation, il ressort que le sujet est digne d'intérêt, les objectifs sont bien définis et la procédure de recherche ne comporte pas de méthodes invasives préjudiciables aux participants. Par ailleurs, le formulaire de consentement éclairé destiné aux participants est acceptable.

Pour ces raisons, le Comité Régional d'éthique approuve pour une période de six (06) mois, la mise en œuvre de la présente version du protocole.

L'intéressée est responsable du respect scrupuleux du protocole et ne devra y apporter aucun amendement aussi mineur soit-il sans l'avis favorable du Comité Régional d'Ethique. En outre, elle est tenue de:

- collaborer pour toute descente du Comité Régional d'éthique pour le suivi de la mise en œuvre du protocole approuvé ;
- et soumettre le rapport final de l'étude au Comité Régional d'éthique et aux autorités compétentes concernées par l'étude.

La présente clairance peut être retirée en cas de non-respect de la réglementation en vigueur et des directives sus mentionnées.

En foi de quoi la présente Clairance Ethique est délivrée pour servir et valoir ce que de droit.

Ampliation:  
 - CNERSH

LE PRESIDENT  
  
*Dr. Doko Doko*  
 Pharmacien