REGIONAL VARIATION OF THE LENGTH OF POSTPARTUM AMENORRHEA IN NIGERIA.

BY:

FADIPE, OLUWABUKOLA TITILOPE

MATRIC NO: 136976

A RESEARCH PROJECT SUBMITTED TO THE DEPARTMENT OF EPIDEMIOLOGY AND MEDICAL STATISTICS, FACULTY OF PUBLIC HEALTH, COLLEGE OF MEDICINE, UNIVERSITY OF IBADAN, OYO STATE

IN PARTIAL FULFILMENT OF THE REQUIREMENT FOR THE AWARD OF THE DEGREE OF MASTERS OF PUBLIC HEALTH IN MEDICAL DEMOGRAPHY.

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CERTIFICATION

I certify that this research work was carried out under my supervision by **FADIPE, OLUWABUKOLA TITILOPE** of the Department of Epidemiology and Medical Statistics. Faculty of Public Health, College of Medicine, University of Ibadan. Ibadan. Oyo State. Nigeria.

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DEDICATION

This research work is dedicated to the God Almighty, the father of life with whom there is no variableness or shadow of turning, who gave me light through the huddles of life in the course of this work. To Jesus Christ, the mediator of the new covenant through which I have access to the Father and to the Holy Spirit who lifted and comforted me when the storm of life came over me. All good and perfect gifts come from you alone.

To my late mum, despite all the troubles I took you through, you believed in me against all odds and trusted so much in my future that you gave your all to make my dreams come true. You were the best. I wish you were here now to witness the end of the very work you began. Rest on my darling mum in the bosom of our Lord and savior, Jesus Christ.

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I appreciate the financial contribution of John Hopkins School of Public Health and Bill and Belinda Gates Foundation through the Center for Population and Reproductive Health under the leadership of Prof. Ojengbede.

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My amiable friends, Folake Ojelade, Damilola Obinna, Toyosi Adetimehin, Ayodele Akinola, Nike Ejiranti, Biola Adeboye, Bukola Ajana, Nike Oshatimehin and others who saw me through my dark hours and kept reminding me of this work till they saw it completed. What if you were not there? You all shall find help when it is most needed in Jesus name.

To the great evidence of God's faithfulness and the manifestation of His promise (...never to leave me nor forsake me...), my understanding, caring and loving husband, Akinwale Akinniyi, thank you for reviving the vision and even when I had given up hope, you kept believing. I love you so much. We owe this and more to the love we share and our children- Akinola and Ololade Akinniyi. Thanks for being there and allowing God to use you. You mean so much to me.

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ABSTRACT

Background: Postpartum amenorrhea is the period between the end of childbirth and the return of menstruation. Use of method of family planning is poor in Nigeria due to lack of adequate information of various options available. Postpartum amenorrhea is a natural method of family planning with no side effect on mother and on the child. Regional variation of the length of postpartum amenorrhea will give insight into its adaptability as a method of family planning in different geo-political regions in Nigeria.

Methodology: The study was retrospective in design. Data were obtained from Nigeria Demographic and Health Survey 2013 which involved women in their reproductive age group (N=6,705). Out of the women included in the analysis, 4,753 women were uncensored and 1,952 were censored. The estimate of the median durations of postpartum amenorrhea of women in different regions of Nigeria was calculated with 50% percentile of the distribution taken as the summary index. The end-point of the study is the return of menses.

Results: The findings of this study showed that the national median duration of postpartum amenorrhea was six and half (6.5) months for Nigerian women. The estimate of postpartum amenorrhea in Nigeria varies by region. The estimate for the South West region at 6.5 months obtained in this study was close to that of the WHO multinational study (1998) for Sagamu, South West, Nigeria where the median duration of postpartum amenorrhea of women was reported to be seven (7) months. There was no particular pattern noticed in the estimate of the duration of postpartum amenorrhea among the regions. Nationally, major factors influencing the duration of postpartum amenorrhea Nigeria are: marriage, breastfeeding status, survival of the index child and nutritional status.

Conclusion: There were statistically significant differences in the duration of postpartum amenorrhea among the geo-political regions. Regional variations should be considered in advising women on the use of postpartum amenorrhea as a method of contraceptive depending on which part of the country the women are from.

Keywords: Postpartum amenorrhea, Nigerian geo-political regions, censored, family planning
Word Count: 323

CHAPTER ONE

INTRODUCTION

1.1. BACKGROUND TO THE STUDY

Postpartum amenorrhea is the period between the end of childbirth and the return of menstruation. It is associated with each conception regardless of its outcome. The outcome of a pregnancy could be spontaneous abortion, an induced abortion, a still birth or a live birth. After childbirth, it becomes important for the body to nourish the baby. So the pituitary gland concentrates on producing large amounts of the hormone Prolactin. Prolactin is the main hormone responsible for stimulating growth of the breasts during pregnancy and for initiating and maintaining the secretion of breast milk while breastfeeding the baby (Riordan and Wambach, 2010). The high level of prolactin suppresses the secretion of Follicle Stimulating Hormones (FSH) and Luteinizing Hormones (LH) from the pituitary gland resulting in loss of periods and amenorrhea (McNelly, 1994). The blood level of prolactin, which is already high during pregnancy, increases sharply after childbirth. If breastfeeding is started and continued, the level remains high, preventing ovulation and menstruation. During this period, if coitus takes place, the probability of conception is markedly reduced (Taylor, 2003). If however, breastfeeding is never started or stopped at any time, the level of prolactin decreases. The pituitary starts to secrete FSH and LH, and the menstrual cycle begins to occur again (McNelly., 1994).

Postpartum amenorrhea is a biological variable associated with each conception regardless of its outcome. It depends on a number of factors which may vary from woman to woman in a population depending on age, marital duration, number of pregnancies, nutritional status and the practice of breastfeeding (Tennekoon et al 2005). It is one of the natural contraceptive methods that is efficient at delaying pregnancy after birth. If effectively used through exclusive breastfeeding, it has the tendency to reduce total fertility rate particularly in a developing country like Nigeria where access to modern contraceptive method is limited and barriers to the adoption of modern contraceptive methods are numerous.

While the progress made in recent decades in fertility reduction has been impressive, up to 222 million women in the developing world still report an unmet need for contraception (Singh and Darroch 2013). Part of the challenge in addressing current levels of unmet need is the limited use of contraception by women during the first 6 to 12 months postpartum and the discontinuation rates, with about half of all users abandoning their methods six months after adoption (Francis et al., 2012). Both issues lead to limited success in effective birth spacing, which then impacts maternal and infant health. New methods are needed that offer greater ease of use, are women-controlled, and do not require significant health infrastructure or medical provider involvement for service delivery. Unmet need is present in all populations, but it is believed to be particularly high at the very early stages of the transition, when fertility ideals are changing but reproductive behaviour is not. Unmet need for contraceptives in Nigeria is 16% (NDHS, 2013) and this has led women to unintended pregnancies. The end result of such pregnancies is abortion or birth and has significant effect on psychological life of the victims.

Unintended pregnancy is currently one of the greatest challenges faced by women of reproductive age in most developing countries of the world (Singh et al.,2013). It has become a public health concern in some countries like Nigeria, because its effects are not limited to women, but also the families and the society. It has negative economic, educational and social consequences for both the family and the nation (Dixit, 2012).

In Nigeria, unintended pregnancy and unsafe abortion are critical public health problems (Onche, 2011). An estimated one in five pregnancies in Nigeria is unintended, because of low knowledge and practice of contraception, desire for smaller families, growing urbanization, increase participation of women in paid labour force and diminish ability of families to support many children (Akinrinola et al., 2006). For those women who may want to maintain the unintended pregnancy, they may face a lot of adverse social and economic impact on the family. The women's hope for better life for herself, education and prosperity for her family may be marred by unintended pregnancy (Etuk and Ekanem, 2003). Increased incidence of family disharmony is common, increased incidence of child abandonment (child neglect), battered baby syndrome, juvenile delinquency and increased number of street children are also associated with unintended pregnancies (Etuk and Ekanem, 2003).

Postpartum amenorrhea is a cost effective method for family planning in that it attracts no cost on the part of the woman, it only requires that the woman breastfeeds exclusively.

1.2. STATEMENT OF THE PROBLEM

Nigeria is the most populous country in Africa. With apopulation growth rate of 2.5%, the population is projected to reach 433 million by the year 2050, making it the third most populous country in the world, after India and China (Population Reference Bureau 2011). Nigeria, with a total fertility rate of 5.5 live births per woman is considered among the high fertility countries worldwide. The population growth rate is high despite its high population figure (NPC., 2006). Unfortunately, the contraceptive prevalence rate is low. According to the national survey report, the contraceptive prevalence rate is about 10% while 29% of Nigerian women are currently using a contraceptive method (Macro International and NPC, 2013). The unmet need for modern contraceptive is high in Nigeria with about 15% of married women of reproductive age wanting to use contraceptive method but is not (NDHS, 2013). The level of unmet need has implication on fertility and in the long run has influence on advancement of development indices of a nation.

Many women do not have adequate knowledge of utilization of postpartum amenorrhea as an important fertility control measures. Many women in Nigeria do not use contraceptive because of the fear of side effects and non-availability. At times, distance to health facility may be far particularly those residing in the rural areas. These in most cases, limit the use of modern contraceptive but postpartum amenorrhea does not incur any of these challenges.

Postpartum amenorrhea is also a natural method of family planning which has no side effect on the mother and on the child and women do not need to engage in routine activities like taking drugs or injections. It creates more warmth and attention from mother to child and keeps women in control.

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1.3. RATIONALE FOR THE STUDY

Postpartum amenorrhea is one of the factors of fertility regulation. As a developing country, there is need in Nigeria to curb the population growth rate and increase the level of development. Study on the duration of postpartum amenorrhea. estimation, as well as its effect on fertility is most important in a heterogeneous and traditional society like Nigeria.

Postpartum amenorrhea is important to scientists and family planning programme managers because it helps to reduce associated risks involved in pregnancy and childbearing thereby reducing maternal mortality and fertility. Therefore, acquiring knowledge about its length in different regions will help in its adaptability to family planning services available to Nigerian women.

There are two major approaches to the measurements of the duration of postpartum amenorrhea, that is the prospective and the retrospective approach. The prospective approach is effective because subjects would be followed up until resumption of menstruation. However, the method is very expensive and takes a longer time to conduct. A retrospective study looks backwards and examines exposures to suspected risk or protection factors in relation to an outcome that is established at the start of the study. The retrospective approach is common in Nigeria. For instance, the Nigeria Demographic Health Survey has used this approach (NDHS, 2013) but the analysis has not gone beyond univariate and bivariate levels. More importantly, regional analysis despite the heterogeneous nature of Nigerian population is yet to be analyzed. This study therefore, moves beyond the level of bivariate and based its analysis on each of the regions in Nigeria. It also provided analysis at national level.

1.4. OBJECTIVES

1.4.1. Main Objective

To determine regional variations in the length of postpartum amenorrhea in Nigeria.

1.4.2. Specific Objectives

The specific objectives are to:

1. Estimate the length of postpartum amenorrhea in women in different regions in Nigeria.
2. Identify factors influencing the length of postpartum amenorrhea in women in different regions in Nigeria.
3. Compare factors influencing the length of postpartum amenorrhea between regions

1.5 RESEARCH QUESTIONS

1. What is the duration of postpartum amenorrhea in Nigeria?
2. Is there difference in duration of postpartum amenorrhea in each geo-political zone in Nigeria?
3. What factors are associated with the duration of postpartum amenorrhea in each geo-political zone in Nigeria?

CHAPTER TWO

LITERATURE REVIEW

2.1 INTRODUCTION

Nigeria is the most populous country in Africa. With a population growth rate of 2.5%, the population is projected to reach 433 million by the year 2050, thus, making it the fourth most populous country in the world, after India, China and the United States (Population Reference Bureau, 2011). As at 2014, the population of Nigeria was 178.5 million. (World Population Review., 2015). Also, Nigeria has a high total fertility, maternal and infant mortality rates are very high (560/100,000 and 69/1,000 respectively), which are of major public health concern around the world (World Bank, 2014).

Studies have linked these high rates to early marriage, men's dominant roles as household decision makers, polygyny and lack of information about and access to family planning methods (Caldwell and Caldwell 1987). Although, awareness and information about family planning is on the increase and more women are getting to know about the need for family planning methods around the world, adequate knowledge of utilization is poor and use of contraceptives is still very low especially in Nigeria (Konje and Ladipo., 1999). This gap can be filled by introducing a more user-friendly contraceptive method such as postpartum amenorrhea to women especially those uneducated women in the rural areas. Postpartum amenorrhea is a biological variable associated with each conception regardless of its outcome which may be a spontaneous abortion, an induced abortion or a still birth and not necessarily a live birth. The fecundability of a woman is temporarily suspended following each conception when menstruation ceases for some time and before the resumption of ovulation.

Previous studies have shown that the problem of unsafe abortion is more in Sub-Saharan Africa due to limited uptake of family planning, a shift towards the use of traditional contraceptive methods instead of modern methods, decreased effective use of contraception (Fatima et al.,2005), highly restrictive abortion laws and Ekpenyong et al. poor access to safe abortion services. In Nigeria, unintended pregnancy and unsafe abortion are critical public health problems (Onche., 2011). An estimated one in five pregnancies in Nigeria is unintended, because of low knowledge and practice of contraception, desire for smaller families, growing urbanization, increase participation

of women in paid labour force and diminish ability of families to support many children (Akinrinola et al., 2006). For those women who may want to maintain the unintended pregnancy, they may face a lot of adverse social and economic impact on the family. The women's hope for better life for herself, education and prosperity for her family may be marred by unintended pregnancy (Etuk and Ekanem, 2003). Increased incidence of family disharmony, increased incidence of child abandonment (child neglect), battered baby syndrome, juvenile delinquency and increased number of street children are also associated with unintended pregnancies (Etuk and Ekanem, 2003).

2.2. Postpartum Amenorrhea: Worldwide Scenario

Postpartum amenorrhea involves exclusive breastfeeding among women. The duration of PPA among US women who breastfed for six months or more was significantly longer compared with that of a formula-feeding group (Heinig et al., 1994). In a study based on data of urban and rural areas of Varanasi in 1987, the median duration of postpartum amenorrhea was reported as 5.82 months (Singh., et al 1994). Despite the majority of researches show that exclusive breastfeeding delays the resumption of ovarian cyclicity, it is important to know that a high proportion of women have their postpartum menstrual cycle before the sixth postpartum month (Valdes., et al 1992). Studies showed that indeed women breastfeeding exclusively until six months postpartum had a lower risk of menstruation resumption between four and half and six months than did women who introduced semisolid, high-energy-density food to their infants at four (4) months (Dovey., et al 2001).

In a study of the effect of breastfeeding pattern on the duration of amenorrhea among 676 Chilean women, it was reported that the first bleeding was experienced before the end of six months of postpartum by 57% of cases (Diaz., et al 1988). The association of breastfeeding with duration of amenorrhea was weak; however, the risk of experiencing the first bleeding was reduced with a higher number of nursing episodes of suckling per day. In fact, the intensity of suckling causes the secretion of prolactin hormone which prevents ovulation and estrogen synthesis, thus prolonging the duration of amenorrhea (Valayati., 1985). However, in a prospective study of 444 women from Indonesia, it was reported that earlier supplementation corresponded with shorter duration of amenorrhea for the majority of women (Jones., 1990).

2.3. Postpartum Amenorrhea in Sub-Saharan Africa

The duration of postpartum amenorrhea is affected by several factors. In particular, exclusive breastfeeding can prolong its duration. The mean duration of postpartum amenorrhea of non exclusively breastfeeding mothers was significantly lower than that of exclusively breastfeeding mothers (Exceller et al., 1988). Also, a cross-sectional survey of women from Egypt showed that about half of them were still amenorrheic after four months postpartum and the number decreased to about 34% after six months postpartum period (El-Salm and Darwish., 1992).

2.4. Determinants of Postpartum Amenorrhea

Previous studies showed that some factors are associated with the duration of postpartum amenorrhea. Some of these factors are:

2.4.1. Age of Mothers

Studies have shown that the duration of postpartum amenorrhea is strongly associated with the age of mothers (Aryal., 2008; Yadava and Jain., 1998). Older respondents are under-reporting the postpartum amenorrhea events than younger ones. In the study, current age of mother and age of mother at the birth of the child were found significantly related with the distribution of postpartum amenorrhea. Also, the average duration of postpartum amenorrhea was found higher for older mothers and higher age at birth of the child whereas the lower duration was found for lower parity and younger mothers (Cleland, 1993). The average duration of postpartum amenorrhea was about eight months for mothers currently aged below 24 years and it gradually increased to reach about thirteen months for mothers aged 35-49 years. The average duration of postpartum amenorrhea was found about eight months for mothers currently aged below 24 years and it gradually increased to reach about thirteen months.

2.4.2. Women Education

It is a well-established fact that educational level among mothers is inversely associated to the duration of postpartum amenorrhea (Aryal, 2005; 2006; 2007). Longer duration of postpartum amenorrhea was observed among women who had some formal education over time. About 33, 80 and 98 per cent of mothers resumed their

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menstruation before 6, 18 and 30 months respectively among illiterate whereas about 57, 96 and 100 per cent mothers had their menses returned among intermediate and more educated mothers. Also, average duration of postpartum amenorrhea was about 11 months among uneducated women whereas it was about 8 months among intermediate and more educated mothers. By indication, the higher the educational level of the families, the lower the duration of postpartum amenorrhea.

The result of the WHO multinational study of breastfeeding showed that educated breastfeeding women in Sagamu, Nigeria remained amenorrheic for seven months which may herald the direction of future infant feeding practices and fertility in the country (WHO., 1998).

2.4.3. Religion

Contraception has been known to humankind from the earliest times. Ancient Jewish sources, early Islamic medical texts, and Hindu sacred scriptures all indicate that herbal contraceptives could induce temporary sterility. However, there exists no uniform position on contraception within each of the major religious traditions; rather, the issue is marked by a plurality of views from followers, religious leaders and scholars. Most traditions are founded on notions of fertility and procreation within the family and thus, while the views on contraception vary widely, no religion advocates the goal of a childless marriage or the use of contraception outside of the marriage contract. (Kathleen O'Grady, 1999)

Common concerns unite all major religious traditions on the issue of birth control. The critics of family planning in each tradition fear that contraceptive use will encourage immorality and illicit sex, while further, many non-Western faiths fear that liberal contraceptive policies encourage a Western model of living that would destroy the family and family values. Feminist commentators have viewed prohibitions on birth control as a means to control female sexuality and independence. Religion is known to be greatly influenced by the use of contraceptives. Catholic and Islamic opinions of birth control are the most comprehensively covered in the secondary literature. Catholic prohibition on artificial birth control methods is a logical extension of its traditional teachings on morality and the family (Janet, 1991).

2.4.4. Parity

Parity is defined as the number of births a woman had ever had as at the date of the survey, thereby reflecting the birth order of the index child. The categories are three: (i) women with one child, (ii) women with two or three children, and (iii) women with four or more children. A report of Progress in Reproductive Health Research (2000) reveals that women with more previous live births may experience longer postpartum amenorrhea.

Parity of the mother was found significantly related with the duration of postpartum amenorrhea. The average duration of postpartum amenorrhea was found higher for higher parity whereas the lower duration was found for lower parity and younger mothers. There was a positive effect of parity on postpartum amenorrhea up to parity three but thereafter the relation disappeared among women in Guatemala City (Kurz., et al 1993). The effect of parity on the duration of postpartum amenorrhea may be related to previous breastfeeding experience. This is possible because the experience and confidence gained from breastfeeding one child may increase the duration of breastfeeding in subsequent children.

2.4.5. Survival status of the Index Child

The survival status of the index child had a strong effect on the duration of postpartum amenorrhea (Yadava and Jain, 1998). In the study, the longer duration of postpartum amenorrhea was observed in mothers whose index child was alive (11.4 months) as compared to mothers whose index child was dead (6.4 months).

2.4.6. Women's Occupation

Occupational status exhibited strong association with the duration of postpartum amenorrhea. An increase in the socio-economic status of the family was related to a decrease in duration of postpartum amenorrhea (Mannan and Islam, 1995; Sivakami, 2003). The study also revealed that women who work in skilled occupations or as merchants experience somewhat higher risks but the magnitude of the differences are not statistically significant. Women who work in agricultural activities may have heavy workloads and expend considerable amounts of energy in daily activities while women who work in skilled jobs, trade activities, or as housewives tend to expend less energy

during the postpartum period. Generally, working mothers showed a slightly lower duration (10.1 months) than housewife (11.7 months).

2.4.7. Marital Status

Marriage here refers to unions that are recognized by civil and religious laws as well as by the community. In most societies, marriage sanctions childbearing and married women are exposed to a greater risk of becoming pregnant than unmarried women. Thus, women in populations in which age at marriage is low tend to start childbearing early and have a high fertility level. In urban areas, delayed marriage plays an even more important role in keeping fertility low, and contraceptive use approaches breastfeeding in terms of the magnitude of its inhibiting effects on fertility. Not every married woman is at risk of pregnancy, while some unmarried women are at risk of pregnancy because they are sexually active (Jones et al., 2012).

2.4.8. Breastfeeding status of women

Postpartum amenorrhea and breastfeeding were strongly associated to each other and thereby affect the fertility outcomes (Aryal, 2008). Breastfeeding delays the resumption of menstruation after childbirth, and lactational amenorrhea—and the associated suppression of ovulation—is still the primary factor responsible for birth spacing in sub-Saharan Africa, where the use of modern contraception is limited by lack of access and by ideologic concerns in traditionally pronatalistic societies. Breastfeeding is a major determinant of fertility in countries where effective contraceptive methods are not widely available (Peng et al, 1994). Short birth intervals should be prevented because it affects prolonged breastfeeding (Simondon KB, Costes R, et al 2001), which is associated with an increased mortality risk in children, at least up to the age of 2 years (Lancet 2000).

Studies have shown that the frequency of breastfeeding also has a significant effect on postpartum amenorrhea. Also, at each postpartum duration, women who breastfed their children on demand (12 times a day or more) experienced a significant delay in the resumption of menses when compared to women who breastfed between one and seven times a day (Tennekoon, Wasalathanthri and Jeevnthayaparan et al., 2005). The interval between suckling episodes also may influence the duration of amenorrhea (Gray, 1994). Long-term breastfeeding is consistently associated with long

periods of postpartum amenorrhea, ovarian inactivity, and reduced fertility (Kurz et al, 1993). The result of an investigation on frequency of breastfeeding, age, level of education and parity on postpartum amenorrhea in a retrospective study of selected married Nigerian women showed that the length of postpartum amenorrhea positively correlated with duration and frequency of breastfeeding but negatively related to parity and years of maternal education (Ojofeitimi., 1981).

2.4.9. Maternal Nutritional Status

Studies report a longer duration of breastfeeding among more malnourished women (Popkin et al., 1993), even in affluent societies (Heining., 1994). However, it was suggested that the empirical evidence only reveals direct effects of maternal nutritional status on postpartum amenorrhea that are small and unimportant except under quite extreme conditions (Jones and Palloni., 1990). Though, this empirical evidence also indicated that the indirect effects of malnutrition, through selected mediating factors, may be more consequential (Kurz et al., 1993).

Overall, it is expected that a higher socioeconomic status probably demonstrate a better health, better education and a better nutrition of mothers. However, studies revealed that a better health of mother provides a better quality and more quantity of breast-milk, and if the mother feeds her child for longer duration, her period of postpartum amenorrhea would be prolonged. Healthy mothers experienced a shorter duration of postpartum amenorrhea while more periods of illness led to longer duration of postpartum amenorrhea.

In as much as these literatures exist, most of them failed to look at the multivariate and regional analysis of these factors especially in a community as heterogeneous as Nigeria. This study will focus mainly on the shortcomings of the previous studies on postpartum amenorrhea.

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CHAPTER THREE

METHODOLOGY

3.1. STUDY AREA

The study site is Nigeria which has six geo-political regions, namely North Central, North East, North West, South West, South East and South South. Nigeria is situated at the western Sub-Saharan Africa with an estimated population of over 178 million people (NBS 2014). The country occupies a landmass of 923,768 km2 and is the fourth largest in Africa with heterogeneous population consisting of different ethnic groups and culture. For administrative purpose, Nigeria is divided into 36 states and the Federal Capital Territory (FCT) and the states are sub-divided into 774 local government areas (L.G.As) and each L.G.A. into wards.

3.2. STUDY POPULATION

The target groups were women aged 15-49 years in randomly selected households across Nigeria. The 2013 Nigeria Demographic Health Survey (NDHS) consists of a nationally representative sample of 38,948 women age 15-49 years that were individually interviewed. All women aged 15-49 who were either permanent residents of the households in the 2013 NDHS sample or visitors present in the households on the night before the survey were interviewed.

The study population consists of women who:

- Had information about duration of their last postpartum amenorrhea
- Were not pregnant
- Women who had at least one delivery within 12 months before the survey

3.3. SAMPLE DESIGN

The research design was retrospective, cross sectional.

The 2013 Nigeria Demographic and Health Survey (NDHS) is the fifth Demographic Health Survey in the series under the Worldwide Demographic and Health Surveys programme. It was conducted and implemented in Nigeria by the National Population Commission (NPC, 2013). A complete listing of households and a

mapping exercise were carried out for each cluster from December 2012 to January 2013, with the resulting lists of households serving as the sampling frame for the selection of households in the second stage. All regular households were listed. The NPC listing enumerators were trained to use Global Positioning System (GPS) receivers to take the coordinates of the 2013 NDHS sample clusters. In the second stage of the selection process, an average of 45 households was selected from each cluster by equal probability systematic sampling. A total of 38,522 households were interviewed out of which 38,948 and 17,359 women and men were interviewed respectively.

These data from National Population Commission information were intended to assist policymakers and programme managers in evaluating and designing programmes and strategies for improving health and family planning services in the country.

3.4. DEPENDENT VARIABLE

The dependent variable was duration of postpartum amenorrhea among women.

3.5. INDEPENDENT VARIABLES

The main independent variable was region and others were age of mothers, occupation, type of place of residence, religion, level of education, ethnicity, wealth index, survival status of index child, breastfeeding status, parity, nutritional status and current marital status of mothers.

3.6. DATA MANAGEMENT:

SAMPLE WEIGHTING

The dataset was first weighted before analysis for representativeness.

DATA FILE

The Individual dataset (NGIR6AFL.dta) – Stata file format was used in the study. Socio-demographic characteristics needed for the analysis were carefully identified.

CENSORING

Censored cases were women whose menses had not returned as at the time of the survey. For this category of women, duration of amenorrhea was calculated from the

date of birth of their index children to the date of the survey.

3.7. STATISTICAL ANALYSIS

The Stata 12.0 was used for the data analysis. The estimate of the median durations of postpartum amenorrhea in women in different regions of Nigeria was calculated with 50% percentile of the distribution taken as the summary index.

The end-point of the study is the return of menses.

The status is amenorrheic status.

3.7.1. Kaplan Meier

The duration of postpartum amenorrhea for each woman was determined from the date of birth of index child to the resumption of menstruation. Kaplan Meier median survival estimate of postpartum amenorrhea for each woman was calculated in each geo-political region. It estimates conditional probabilities of resuming menses at each time point after delivery till the resumption of menstruation for each individual woman depends on a set of x of n variables in each region.

The Kaplan Meier estimate of the survivor function S(t) can be written as

$$S(t) = \prod_{i=1}^{j} pi$$

Where xi = x1 + x2 + x3+.....+xn

Pi = (nj-dj)/nj is the estimated probability that a woman remain amenorrheic through the time interval which begins at t(j)

For j= 1, 2 3, ...r

Π stands for "the product of"

It was postulated that the survival function S(t) is the summation of probability of resuming menses after child birth.

3.7.2. Log Rank Test

The statistical test of significance for the differences between regions was done using

log rank test. All six (6) regions were compared in a group and then in pairs with the use of log rank test and the bonferroni criterion were used to control the error rate in the multiple comparisons.

When two regions are being compared,

Log-rank statistic $= \frac{(O_2 - E_2)^2}{Var(O_2 - E_2)}$ is adopted

$$Var(O_2 - E_2) = \sum_i \frac{n_{1i} n_{2i} (m_{1i} + m_{2i})(n_{1i} + n_{2i} - m_{1i} - m_{2i})}{(n_{1i} + n_{2i})^2 (n_{1i} + n_{2i} - 1)}$$

i=1, 2

Oi – Ej $= \sum_{j=i}^{n} (m_{ij} - e_{ij}) =$ Summed observed in group i minus expected score in group j

$$e_{1j} = \left(\frac{n_{1j}}{n_{1j} + n_{2j}}\right) x(m_{1j} + m_{2j}) \text{ and } e_{2j} = \left(\frac{n_{2j}}{n_{1j} + n_{2j}}\right) x(m_{1j} + m_{2j})$$

Where $\left(\frac{n_{1j}}{n_{1j} + n_{2j}}\right)$ the proportion of risk is set and $(m_{1j} + m_{2j})$ is the number of failures over both groups

3.7.3. Cox Regression model

Stata software was used to compute Cox's regression analysis (Cox. 1972) which was performed to determine the variables associated with the duration of postpartum amenorrhea in women of different regions in Nigeria.

For the analysis, each socio-demographic characteristic was analyzed initially by a bivariate analysis using a Cox's non parametric hazards regression model in each region:

$h_i(t) = h_o(t) \exp \{\beta_i x_i(t)\}$

$$\frac{h(t)}{h_o(t)} = \exp \{\beta 1 x 1i(t)\}$$

$$\log \frac{h(t)}{h_o(t)} = \{\beta 1 x_1\}$$

Variables whose bivariate test had a $P \leq 0.2$ and those that, in the light of existing research, were believed to be of biolog ic importance in each geo-political region were then included in a multivariate regression analysis.

$$h(t) = \exp \{\beta 1 x 1 i(t) + \beta 2 x 2 i(t) + \beta 3 x 3 i(t) + \ldots + \beta p x p i(t)\}$$
$$ho(t)$$

$$hi(t) = ho(t) \exp \{\beta 1 x 1 i(t) + \beta 2 x 2 i(t) + \beta 3 x 3 i(t) + \ldots + \beta p x p(t)\}$$

$$\log \frac{h(t)}{ho(t)} = \{\beta 1 x 1 + \beta 2 x 2 + \beta 3 x 3 + \ldots + \beta p x p\}$$

$h_i(t)$ is the Cox non parametric hazards regression model of the return of menses at time t postpartum for the ith on N women

$x_{ji}(t)$ is the value at time t of the jth explanatory variable

$ho(t)$ is the baseline hazard which is a function of time t but does not involves X's

βs are the regression coefficients

For the multivariate analysis, the Cox proportional hazards regression model assumes that the time to event and the covariates are related through the following equation in each region:

The hazard function is a measure of the potential for the event to occur at a particular time t, given that the event, which is menstruation, did not yet occur. The baseline hazard function measures this potential independently of the covariates. The

shape of the hazard function over time is defined by the baseline hazard, for all cases. The covariates simply help to determine the overall magnitude of the function. The value of the hazard is equal to the product of the baseline hazard and a covariate effect. While the baseline hazard is dependent upon time, the covariate effect is the same for all time points. Thus, the ratio of the hazards for any two cases at any time period is the ratio of their covariate effects. This is the proportional hazards assumption. The corresponding hazard ratios were obtained by exponentiating the regression coefficients.

3.7.4. Adjustment

In statistics, the Bonferroni correction is a method used to address the problem of multiple comparisons. It is based on the idea that if an experimenter is testing n dependent or independent hypotheses on a set of data, then one way of maintaining the family wise error rate is to test each individual hypothesis at a statistical significance level of 1/n times what it would be if only one hypothesis were tested. The Bonferroni correction is derived by observing Boole's inequality. If you perform n tests, each of them significant with probability β, (where β is unknown) then the probability that at least one of them comes out significant is (by Boole's inequality) $\leq n \cdot \beta$. Now we want this probability to equal α, the significance level for the entire series of tests. By solving for β, we get $\beta = \alpha / n$. So if you want the significance level for the whole family of tests to be (at most) α, then the Bonferroni correction would be to test each of the individual tests at a significance level of (α/n). Statistically significant simply means that a given result is unlikely to have occurred by chance assuming the null hypothesis is actually correct (i.e., no difference among groups, no effect of treatment, no relation among variables). This result does not require that the tests be independent (Abdi H. 2007).

Bonferroni adjustment for multiple comparison for statistically significant differences between the regions was applied for analysis using P<0.01 [that is, 0.05/ 5 (number of comparison within region)]. This was done by including a factor at five levels of regions, with North Central as the reference. To examine differences between various pairs of regions, the analysis was repeated using each of the other regions as the reference and the Bonferroni criterion was used to control the maximum experiment-wise error rate for multiple comparisons. The limitation of this adjustment is that there

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is no allowance for control for effect of confounders as in multivariate analysis.

3.8 Limitations of the study

There is limitation in the manner in which the duration of amenorrhea is being calculated. The first problem is that of recall data. So many variables had to do with recall especially date of birth of last child which was used to compute duration of amenorrhea. Also, for censored cases, duration of amenorrhea could be shorter because of the way it was calculated. Some women might have longer duration than the date of the survey but limited to the date of survey so they can be included in the analysis. This could affect the median duration of amenorrhea calculated.

The number of censored cases is high and this could reduce the precision of the estimates of the duration of postpartum amenorrhea calculated for uncensored cases.

CHAPTER FOUR

RESULTS

This chapter presents the results of the analysis of 6,705 women that were eligible for the study. The results showed that out of this number, women with known duration of amenorrhea were 4,753 women (uncensored cases) and women who had incomplete information about duration of amenorrhea were 1,952 (censored cases) women. Therefore, analysis was carried out on 4,753 women who had information about duration of amenorrhea and on censored cases (1,952) where duration of postpartum amenorrhea was calculated from the date they had their last child to the date of the survey.

4.1 DEMOGRAPHIC CHARACTERISTICS OF RESPONDENTS

Table 4.1 below shows the demographic characteristics of women in the six geo-political regions of the country. Almost one-third (31.4%) of the women were from the North-Western Nigeria while about 68.6% were distributed within the other five geo-political zones. Analysis showed that South-West had the highest proportion of women in the Southern region, followed by 12% in South-South. Overall, the table also revealed that majority of the respondents was from the Northern part of the country with South West being the highest (31%).

About half (48.3%) of the women were aged between 25-34 years. This shows that majority of the women were middle aged that is, not too young and not too old in the reproductive age distribution. Less than one-tenth of the population was teenagers while only 2% were in the oldest age group of 45-49years. The mean age of the women was about 28years. There were about twice as many women in the rural area as compared to the urban area. North West region had about a fifth of the women living in urban area as compared to women in the rural area while North East had about a quarter of the women living in the urban area as compared to women in the rural area. Overall, larger proportions of the population or women in the urban areas were constituted or concentrated in the Northern part of the country. In the Southern region, South-West had the highest proportions of women in the urban areas (69%) while 36% reside in the rural areas in South East.

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About 37.6% of women had between one and two children while about three in every ten women had between three to four children. North Western region had the highest (45.2%) number of women with five children and above while South Western region had the lowest (17.7%) number of women. The mean parity is four. That is, each woman had an average of four children in Nigeria.

About 92 in every 100 women were married while about 8 in every 100 women were not currently married as at the time of the survey. Some of those considered as not currently married were cohabiting with their partners; some were widowed, divorced or separated while some had actually not been married before. The South Eastern region had the highest (15.1%) number of women that were not currently married while the North West had the least (2.0%).

TABLE 4.1 Demographic characteristics of women by regions in Nigeria

Variables	North Central	North East	North West	South East	South South	South West	Nigeria
Region							
Number of Woman	962	1,329	2,104	608	826	876	6,705
%age	14.4	19.8	31.4	9.1	12.3	13.1	100.0
Mean Age (SD)	27.7(0.21)	27.3(0.19)	27.5(0.16)	28.6(0.24)	28.2(0.23)	28.6(0.20)	27.8(0.08)
Mean Parity (SD)	3.4(0.07)	4.3(0.08)	5.5(0.06)	3.3(0.09)	3.6(0.08)	3.0(0.06)	3.9(0.03)
Mean BMI (SD)	2.27(0.02)	2.05(0.02)	2.02(0.01)	2.41(0.03)	2.42(0.03)	2.31(002)	2.18(0.01)
Age							
15-19	58 (6.0)	155 (11.7)	254 (12.1)	28 (4.6)	79 (9.2)	42 (4.8)	613 (9.1)
20-24	256 (26.6)	331 (24.9)	481 (22.9)	124 (20.4)	185 (2.4)	179 (20.4)	1,556 (23.2)
25-29	292 (30.4)	349(26.3)	552 (26.2)	204 (33.6)	214 (5.9)	281 (32.1)	1,892 (28.2)
30-34	190 (19.8)	235(17.7)	382 (18.2)	144 (23.7)	182 (2.0)	213 (24.3)	1,346 (20.1)
35-39	101 (10.5)	171(12.9)	260 (12.4)	77 (12.7)	121 (4.7)	123 (14.0)	853 (12.7)
40-44	51 (5.3)	68(5.1)	121 (5.8)	28 (4.6)	42 (5.1)	31 (3.5)	341 (5.1)
45-49	14 (1.5)	20(1.5)	54 (2.6)	3 (0.5)	6 (0.7)	7 (0.8)	104 (1.6)
Type of place of Residence							
Urban	308 (32.0)	279(21.0)	410 (19.5)	380 (62.5)	254 (30.8)	602 (68.7)	2,233(33.3)
Rural	654 (68.0)	1,050(79.0)	1,694 (80.5)	228 (37.5)	572 (69.3)	274 (31.3)	4,472(66.7)
Total Children ever born							
1-2	402 (41.8)	427 (32.1)	637 (30.3)	273 (44.9)	362 (43.8)	419 (47.8)	2.520(37.6)
3-4	286 (29.7)	349 (26.3)	517(24.6)	175 (28.8)	204 (24.7)	302 (34.5)	1,833(27.3)
5+	274 (28.5)	553(41.6)	950 (45.2)	160 (26.3)	260 (31.5)	155 (17.7)	2.352(35.1)
Marital Status							
Not Currently Married	42 (4.4)	58 (4.4)	42 (2.0)	92 (15.1)	228 (27.6)	81 (9.2)	543 (8.1)
Married	920 (95.6)	1.271(95.6)	2,062 (98.0)	516 (84.9)	598 (72.4)	795 (90.8)	6,162 (91.9)

The data as presented in Table 4.2 below shows that a large percentage (95.7%) of women had their index child alive as at the time of the survey. At least 95% of women in all the geo-political regions had their index child alive as at the time of the survey. Survival rate is higher in the first year of birth. It was discovered that almost half (44.6%) of the women were poor, about two in every ten women were average while about four in every ten women were rich. South Eastern region had the highest (33.6%) percentage of rich women while North East (26.3%) and North West (26.2%) regions had the least percentage of rich women. It was noticed that the women in the North are generally poor.

Over one-third (33.7%) of the women were not working, over one-third (34.1%) of the women were into sales while 32.2% of them were into other forms of occupation. North Eastern region had the highest (46.9%) number of women who were not working which is almost half of the women in the region while the South Western region had the least (19.2%) number of women who were not working. Approximately 91% of the women were breastfeeding their last (index) child as at the time of the survey. North Western region had the highest (92.1%) number of women who were currently breastfeeding as at the time of the survey while South South region had the lowest (87.4%). Breastfeeding practice was highest in the North Western region. It was revealed that about 7 of every 10 women had normal weight while others had a form of obesity, overweight or underweight. North West region had the highest percentage (75.3%) of women with normal weight while women from the South region (South East-61.2%, South South-61.5%, South West-61.4%) had low percentages of women with normal weights. The mean BMI is approximately 2 which indicate normal weight. Therefore, most of the women had normal weight.

Almost half of the women (44.1%) had no formal education, almost one-fifth (19.2%) had only completed primary education and over a quarter of them (30.2%) had secondary education while only 6.5% of them had higher education. The North West region had the highest (77.8%) number of women with no education while only 3.1% of the women in South East had no formal education. The South Western region had the highest (17.6%) number of women with higher education while the North Western region had only 1% of the women with higher education. This depicts a high level of illiteracy on the Northern part of the country. It was observed that the women practiced two (2) major religions-Islam and Christianity, but Islam was more prevalent. There were about two-third as many women practicing Islam than Christianity. This showed

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The data as presented in Table 4.2 below shows that a large percentage (95.7%) of women had their index child alive as at the time of the survey. At least 95% of women in all the geo-political regions had their index child alive as at the time of the survey. Survival rate is higher in the first year of birth. It was discovered that almost half (44.6%) of the women were poor, about two in every ten women were average while about four in every ten women were rich. South Eastern region had the highest (33.6%) percentage of rich women while North East (26.3%) and North West (26.2%) regions had the least percentage of rich women. It was noticed that the women in the North are generally poor.

Over one-third (33.7%) of the women were not working, over one-third (34.1%) of the women were into sales while 32.2% of them were into other forms of occupation. North Eastern region had the highest (46.9%) number of women who were not working which is almost half of the women in the region while the South Western region had the least (19.2%) number of women who were not working. Approximately 91% of the women were breastfeeding their last (index) child as at the time of the survey. North Western region had the highest (92.1%) number of women who were currently breastfeeding as at the time of the survey while South South region had the lowest (87.4%). Breastfeeding practice was highest in the North Western region. It was revealed that about 7 of every 10 women had normal weight while others had a form of obesity, overweight or underweight. North West region had the highest percentage (75.3%) of women with normal weight while women from the South region (South East-61.2%. South South-61.5%. South West-61.4%) had low percentages of women with normal weights. The mean BMI is approximately 2 which indicate normal weight. Therefore, most of the women had normal weight.

Almost half of the women (44.1%) had no formal education, almost one-fifth (19.2%) had only completed primary education and over a quarter of them (30.2%) had secondary education while only 6.5% of them had higher education. The North West region had the highest (77.8%) number of women with no education while only 3.1% of the women in South East had no formal education. The South Western region had the highest (17.6%) number of women with higher education while the North Western region had only 1% of the women with higher education. This depicts a high level of illiteracy on the Northern part of the country. It was observed that the women practiced two (2) major religions-Islam and Christianity, but Islam was more prevalent. There were about two-third as many women practicing Islam than Christianity. This showed

that Islam is a more prevalent religion among the respondents. About 40.3% of the women were from Hausa/Fulani tribe, over one-tenth were Igbos (10.9%) and Yorubas (11.4%) respectively while 37.5% of them were from other minority groups which form over one-third (37.5%) of the women included in the study.

Table 4.2 Socio-economic characteristics of women

Variables	NorthCentral	North East	North West	SouthEast	South South	South West	Nigeria
Survival status of index child							
No	39 (4.1)	59 (4.4)	89 (4.2)	28 (4.6)	36 (4.4)	38 (4.3)	289(4.3)
Yes	923 (96.0)	1,270(95.6)	2.015(95.8)	580 (95.4)	790 (95.6)	838 (95.7)	6,416(95.7)
Wealth Index							
Poor	58 (6.0)	155 (11.7)	254 (12.1)	28 (4.6)	76 (9.2)	42 (4.8)	2.990(44.6)
Average	256 (26.6)	331 (24.9)	481 (22.9)	124 (20.4)	185 (22.4)	179 (20.4)	1.351(20.2)
Rich	292 (30.4)	349 (26.3)	552 (26.2)	204 (33.6)	214 (25.9)	281 (32.1)	2,364(35.3)
Occupation							
Not Working	272 (28.3)	623 (46.9)	757 (36.0)	185 (30.4)	253 (30.6)	168 (19.2)	2,258(33.7)
Professional/Technical	49 (5.1)	18 (1.4)	15 (0.7)	47 (7.7)	254 (4.2)	75 (8.6)	239 (3.6)
Sales	300 (31.2)	275 (20.7)	907 (43.1)	183 (30.1)	254 (30.8)	364 (41.6)	2,283(34.1)
Agricultural-Employee	222 (23.1)	136 (10.2)	14 (0.7)	93 (15.3)	111 (3.4)	59 (6.7)	635 (9.5)
Services	44 (4.6)	25 (1.9)	39 (1.9)	60 (9.9)	85 (10.3)	84 (9.6)	337 (5.0)
Skilled Manual	58 (6.0)	216 (16.3)	358 (17.0)	37 (6.1)	47 (5.7)	103 (11.8)	819(12.2)
Other	17 (1.8)	36 (2.7)	14 (0.7)	(0.5)	41 (5.0)	23 (2.6)	134 (2.0)
Breastfeeding Status							
No	82 (8.5)	113 (8.5)	166 (7.9)	75 (12.3)	104 (12.6)	72 (8.2)	612 (9.1)
Yes	880 (91.5)	1.216(91.5)	1.938(92.1)	533 (87.7)	722 (87.4)	804 (91.8)	6.093(90.9)
Nutritional Status							
Underweight	39 (4.1)	189 (14.2)	262 (12.5)	21 (3.5)	31 (3.8)	68 (7.8)	610 (9.1)
Normal weight	679 (70.6)	931 (70.1)	1.585(75.3)	372 (61.2)	508 (61.5)	538 (61.4)	4,613 (68.8)
Over weight	191 (19.9)	164 (12.3)	214(10.2)	160 (26.3)	200(24.2)	198 (22.6)	1.127(16.8)
Obese	53 (5.5)	45 (3.4)	43 (2.0)	55 (9.1)	87 (10.5)	72 (8.2)	355 (5.3)
Highest Educational Level							
No Education	310 (32.2)	850 (64.0)	1.636(77.8)	19 (3.1)	58 (7.0)	86 (9.8)	2.959(44.1)
Primary	242 (25.2)	225 (16.9)	258 (12.3)	133(21.9)	246 (29.8)	182 (20.8)	1.286(19.2)
Secondary	326 (33.9)	222 (16.7)	189 (9.0)	382(62.8)	451(54.6)	454 (51.8)	2.024(30.2)
Higher	84 (8.7)	32 (2.4)	21 (1.0)	74 (12.2)	71 (8.6)	154 (17.6)	436 (6.5)
Religion							
Christian	483 (50.2)	256 (19.3)	61 (2.9)	607 (99.8)	805 (97.5)	586 (66.9)	2.798 (41.7)
Islam	479 (49.8)	1,073(80.7)	2,043(97.1)	1 (0.2)	21 (2.5)	290 (33.1)	3.907(58.3)
Ethnicity							
Hausa/Fulani	58 (6.0)	155 (11.7)	254 (12.1)	28 (4.6)	76 (9.2)	42 (4.8)	2.699(40.3)
Igbo	256 (26.6)	331 (24.9)	481 (22.9)	124 (20.4)	185 (22.4)	179 (20.4)	732(10.9)
Yoruba	292 (30.4)	349 (26.3)	552 (26.2)	204 (33.6)	214 (25.9)	281 (32.1)	761(11.4)
Others	190 (19.8)	235 (17.7)	382 (18.2)	144 (23.7)	182 (22.0)	213 (24.3)	2.513(37.5)

Figure 4.1. shows the estimate of the median duration of postpartum amenorrhea and 95% confidence interval (CI) with respect to region. According to the chart, the overall median duration to be six and half (6.5) months. It was noticed that four (4) of the regions had the same duration of six and half (6.5) months each which corresponds with the national estimate. Only North West and South East regions had a tie duration of seven and half (7.5) months which are higher durations than the national estimate.

FIGURE 4.1 Kaplan-Meier Median survival estimate of the duration of postpartum amenorrhea with respect to region

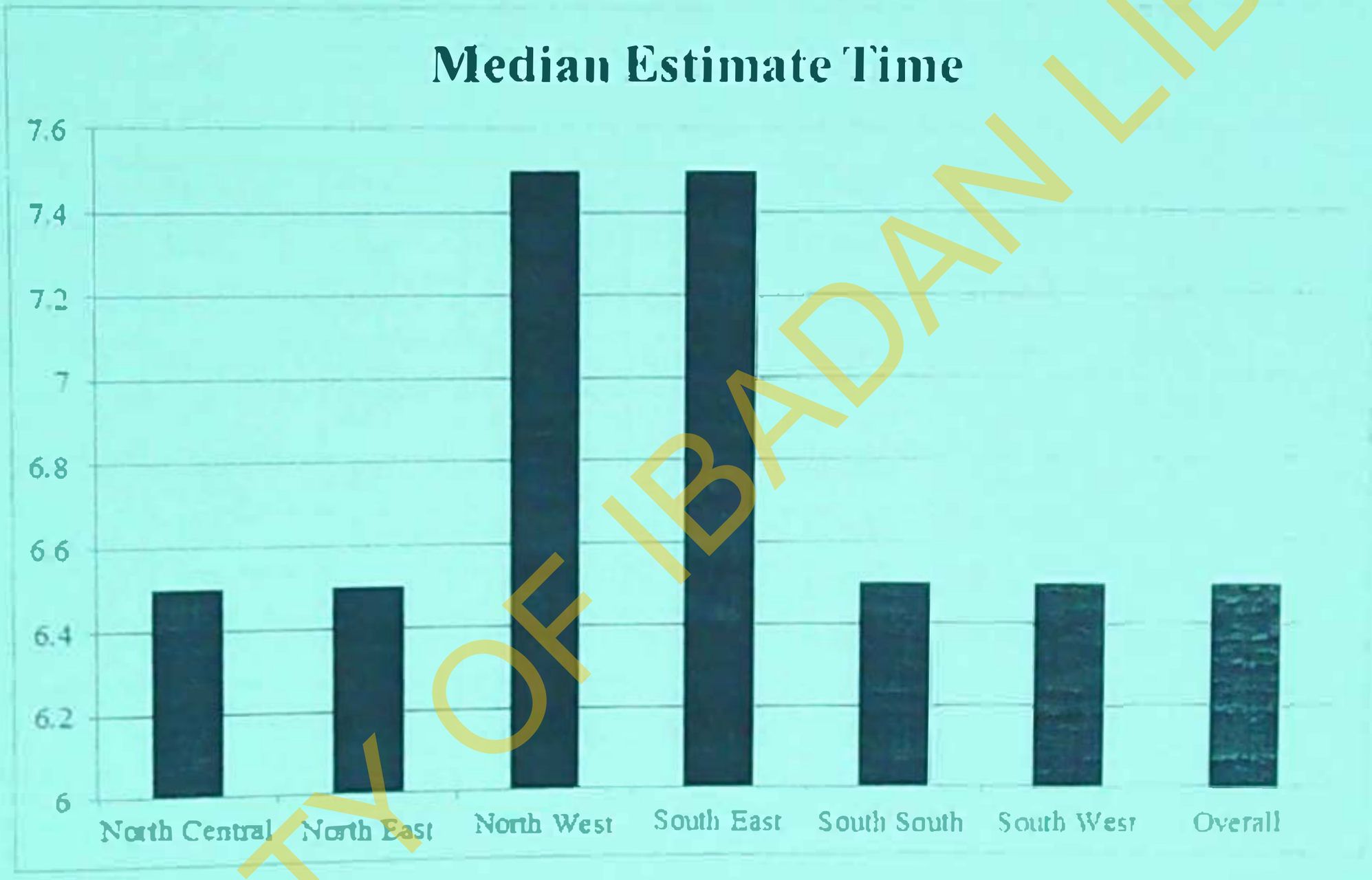


Table 4.3 shows the survival estimates in Nigeria over a period of one year at different time intervals. It was observed that out of a total of 6,705 women in Nigeria, only 309 women remained amenorrheic longer than the one year interval with a probability of 0.0018. While menstruation returned for 297 women, 12 women were yet to resume menstruation as at the time of the survey.

TABLE 4.3 Estimate of survival functions using Life Table in Nigeria

Interval		Beginning Total	Deaths	Censored	Survival Function	Standard Error	95% C.I.	
							Lower	Upper
0	1	6705	254	49	0.9620	0.0023	0.9571	0.9663
1	2	6402	525	298	0.8812	0.0040	0.8731	0.8888
2	3	5579	477	381	0.8032	0.0050	0.7932	0.8128
3	4	4721	443	368	0.7248	0.0057	0.7134	0.7358
4	5	3910	444	238	0.6399	0.0063	0.6274	0.6521
5	6	3228	382	136	0.5625	0.0067	0.5493	0.5755
6	7	2710	401	193	0.4762	0.0069	0.4626	0.4897
7	8	2116	360	82	0.3936	0.0069	0.3800	0.4072
8	9	1674	317	75	0.3174	0.0068	0.3041	0.3307
9	10	1282	330	54	0.2339	0.0064	0.2215	0.2465
10	11	898	302	48	0.1531	0.0056	0.1423	0.1643
11	12	548	221	18	0.0903	0.0046	0.0815	0.0997
12	13	309	297	12	0.0018	0.0007	0.0008	0.0038

Figure 4.2 shows the combined survival function S(t) for all regions which gives the probability that a woman survives (remains amenorrheic) longer than some specified time t. The median duration of amenorrhea which is also the 50% percentile was six and half (6.5) months for these women.

FIGURE 4.2 Survival function curve for Nigerian women

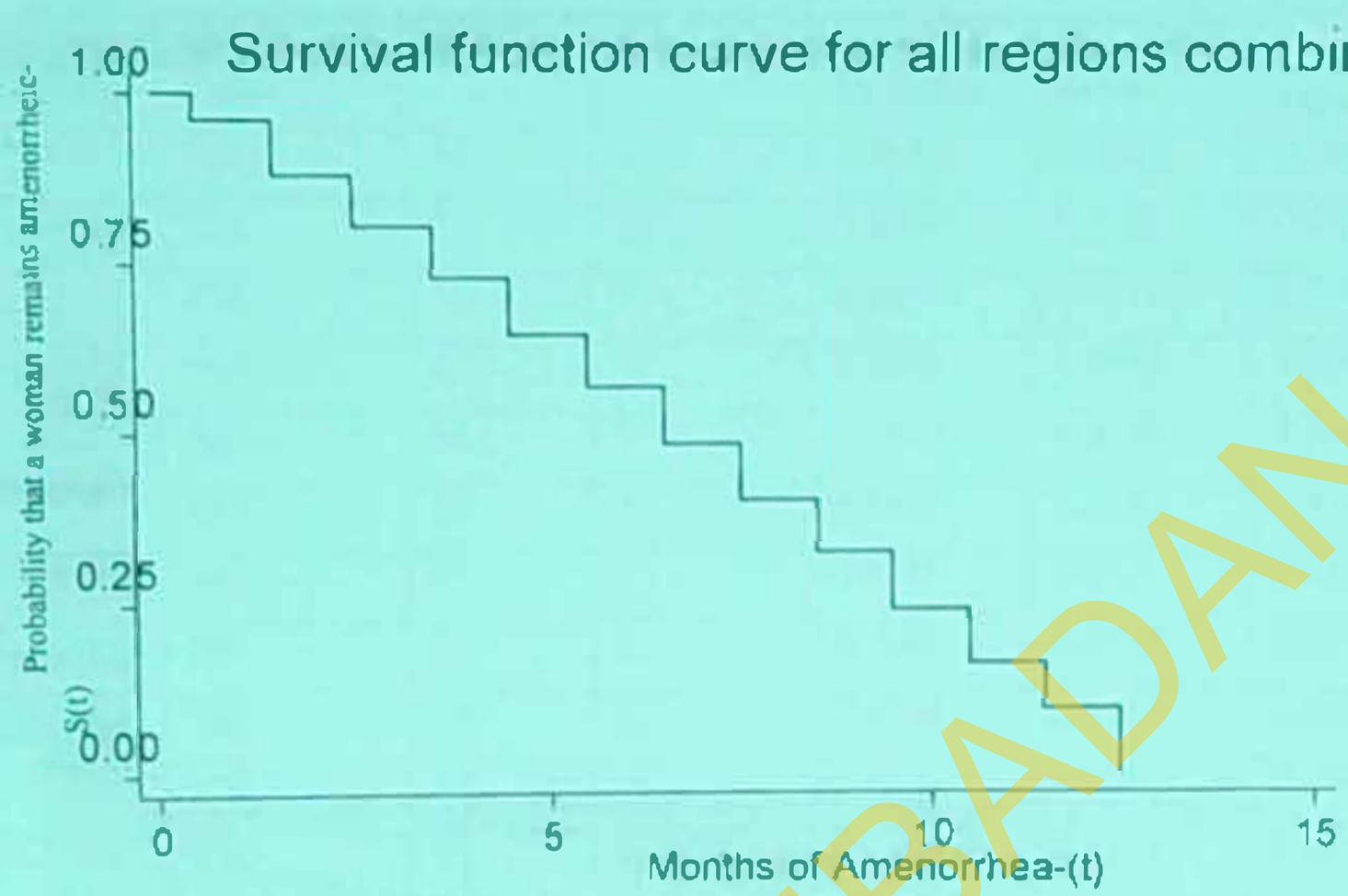


Table 4.4 shows the survival estimates in North Central over a period of one year at different time intervals. It was observed that out of a total of 962 women in the region only 41 women remained amenorrheic longer than the one year interval with a probability of 0.0013. While menstruation returned for 40 women, only 1 woman was censored, that is, yet to resume menstruation as at the time of the survey.

TABLE 4.4. Estimate of survival functions using Life Table in North Central

Interval		Beginning Total	Deaths	Censored	Survival Function	Standard Error	95% C.I.	
							Lower	Upper
0	1	962	35	9	0.9634	0.0061	0.9405	0.9736
1	2	918	67	56	0.8900	0.0102	0.8691	0.9084
2	3	795	70	47	0.8096	0.0131	0.7823	0.8338
3	4	668	62	70	0.7303	0.0152	0.6991	0.7588
4	5	536	62	30	0.6434	0.0169	0.6091	0.6755
5	6	444	59	20	0.5559	0.0181	0.5197	0.5905
6	7	365	47	31	0.4811	0.0186	0.4442	0.5171
7	8	287	51	8	0.3944	0.0188	0.3579	0.4311
8	9	228	39	15	0.3247	0.0185	0.2887	0.3611
9	10	174	44	10	0.2403	0.0175	0.2066	0.2752
10	11	120	39	9	0.1591	0.0157	0.1297	0.1911
11	12	72	34	7	0.1033	0.0137	0.0784	0.1321
12	13	41	40	1	0.0013	0.0018	0.0000	0.0123

FIGURE 4.3 Survival function curve for North Central

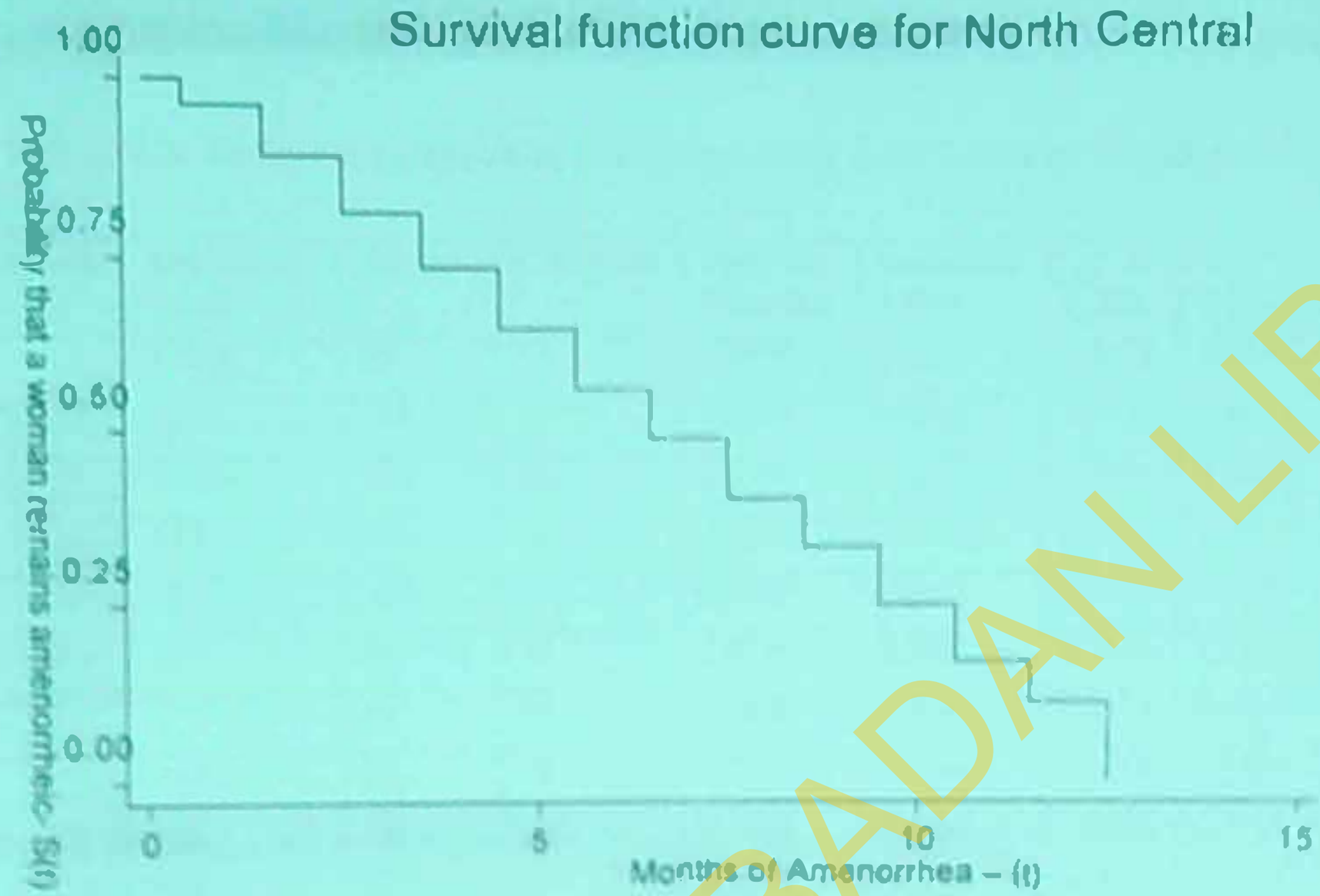


Table 4.5 shows the survival estimates in North East over a period of one year at different time intervals. It was observed that out of a total of 1,329 women in the region, only 54 women remained amenorrheic longer than the one year interval with a probability of 0.0012. While menstruation returned for 56 women, only 2 women were yet to resume menstruation as at the time of the survey and thus considered as censored.

TABLE 4.5. Estimate of survival functions using Life Table in North East

Interval		Beginning Total	Deaths	Censored	Survival Function	Standard Error	95% C.I.	
							Lower	Upper
0	1	1,329	53	15	0.9599	0.0054	0.9478	0.9692
1	2	1,261	124	42	0.8639	0.0095	0.8440	0.8814
2	3	1,095	104	70	0.7791	0.0117	0.7553	0.8010
3	4	921	102	38	0.6910	0.0132	0.6643	0.7161
4	5	781	103	28	0.5982	0.0143	0.5697	0.6255
5	6	650	74	19	0.5291	0.0147	0.4999	0.5575
6	7	557	89	23	0.4428	0.0149	0.4134	0.4717
7	8	445	88	14	0.3538	0.0146	0.3253	0.3825
8	9	343	66	12	0.2845	0.0140	0.2574	0.3122
9	10	265	84	6	0.1933	0.0126	0.1693	0.2185
10	11	175	63	9	0.1219	0.0107	0.1019	0.1437
11	12	103	45	2	0.0681	0.0085	0.0528	0.0859
12	13	56	54	2	0.0012	0.0012	0.0001	0.0068

FIGURE 4.4 Survival Function curve for North East

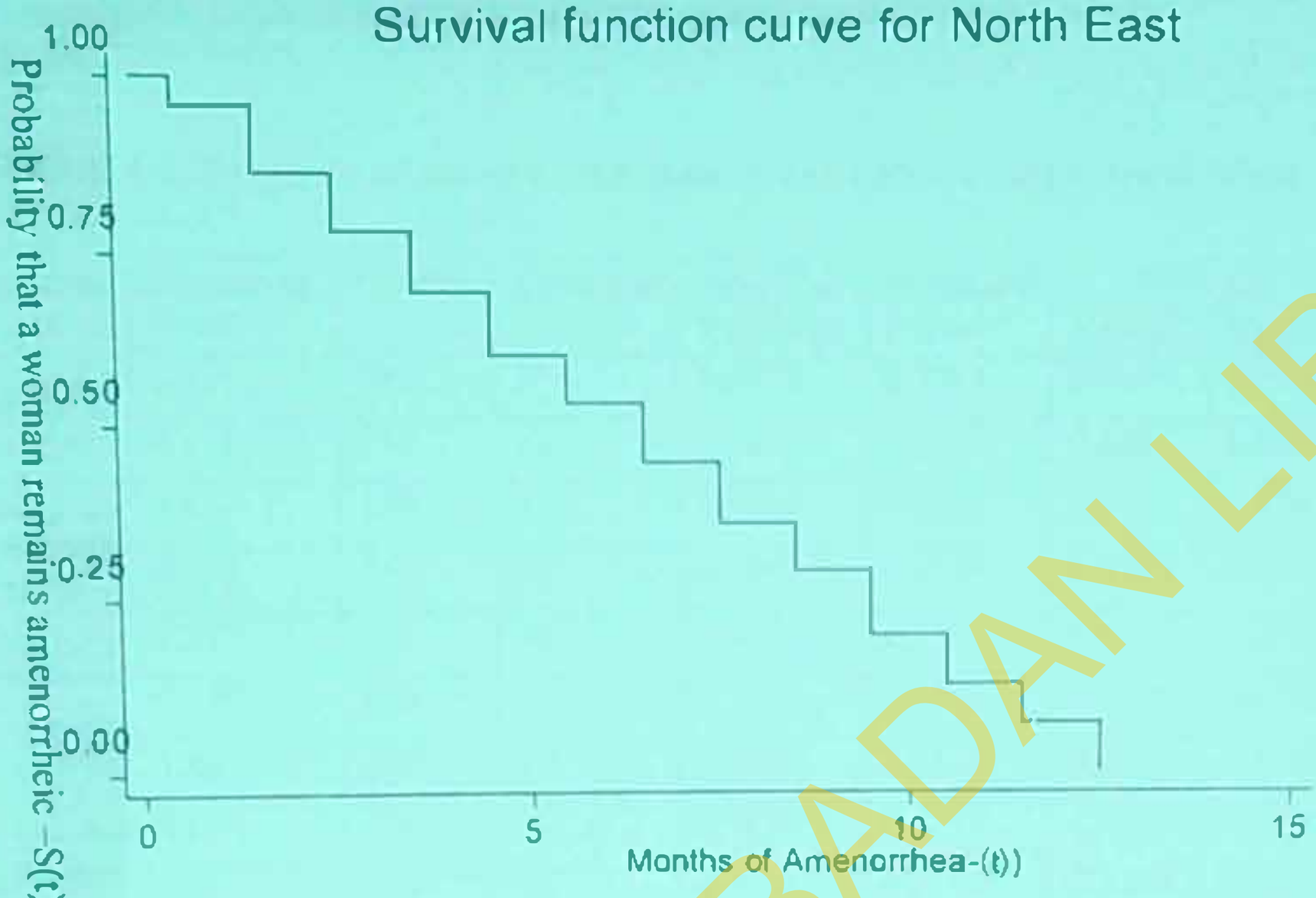


Table 4.6 shows the survival estimates in North West region over a period of one year at different time intervals. It was observed that out of a total of 2,104 women in the region. 148 women remained amenorrheic longer than the one year interval with a probability of 0.0015. While menstruation returned for 144 women, only 4 women were yet to resume menstruation as at the time of the survey which means they were censored.

TABLE 4.6. Estimate of survival functions using Life Table in North West

Interval		Beginning Total	Deaths	Censored	Survival Function	Standard Error	95% C.I.	
							Lower	Upper
0	1	2,104	90	3	0.9572	0.0044	0.9476	0.9650
1	2	2,011	154	34	0.8833	0.0070	0.8687	0.8963
2	3	1,823	138	107	0.8144	0.0086	0.7969	0.8305
3	4	1,578	152	69	0.7342	0.0099	0.7142	0.7530
4	5	1,357	145	46	0.6544	0.0108	0.6327	0.6751
5	6	1,166	128	31	0.5816	0.0114	0.5589	0.6035
6	7	1,007	146	40	0.4955	0.0117	0.4724	0.5183
7	8	821	129	22	0.4166	0.0117	0.3936	0.4395
8	9	670	137	20	0.3301	0.0114	0.3079	0.3525
9	10	513	123	18	0.2496	0.0107	0.2289	0.2707
10	11	372	123	16	0.1652	0.0094	0.1473	0.1841
11	12	233	80	5	0.1079	0.0080	0.0928	0.1242
12	13	148	144	4	0.0015	0.0010	0.0003	0.0051

FIGURE 4.5 Survival function curve for North West

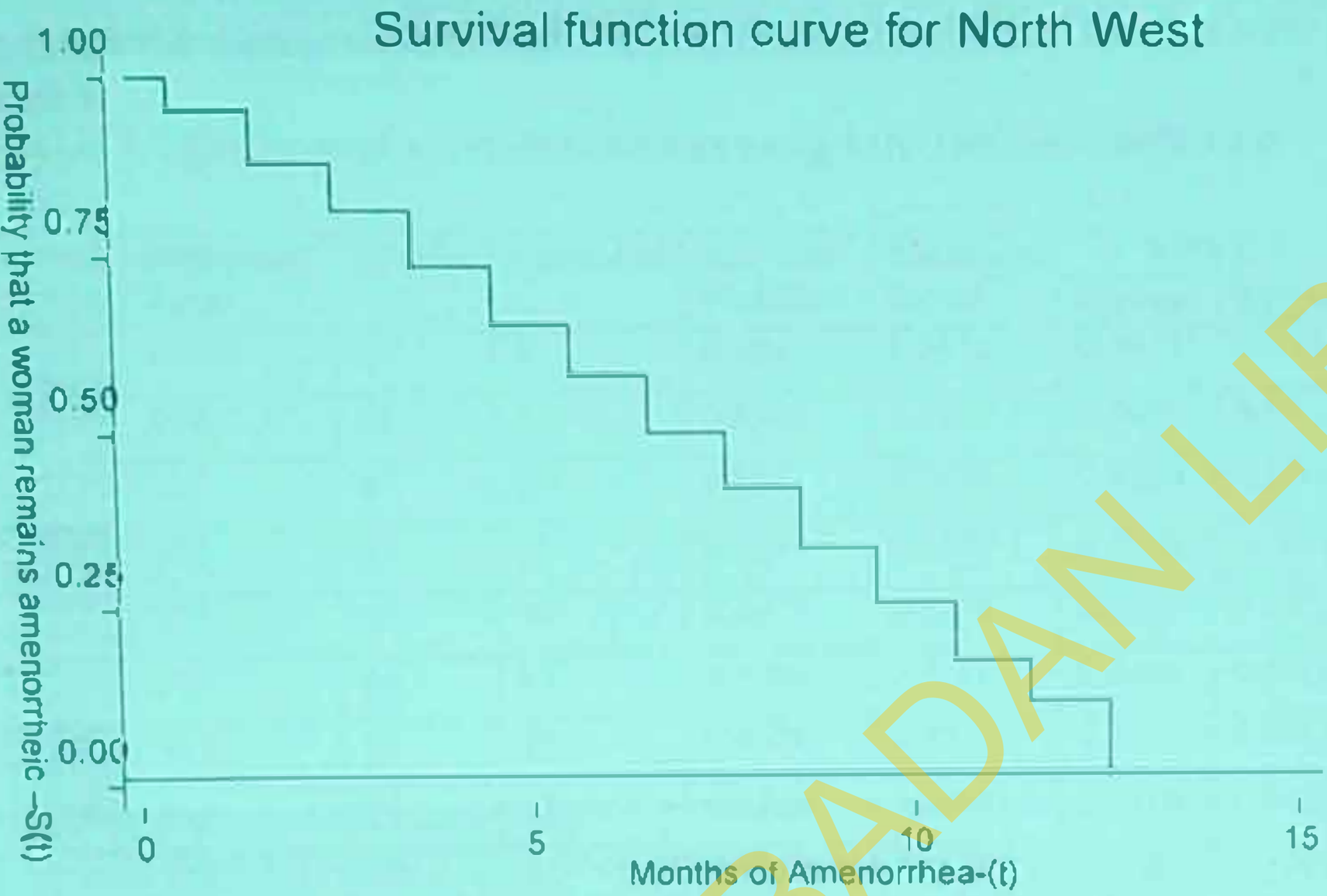


Table 4.7 shows the survival estimates in South East over a period of one year at different time intervals. It was observed that out of a total of 608 women in the region, only 12 women remained amenorrheic longer than the one year interval with a probability of 0.0000 and all of them had experienced the return of menstruation as at the end of the survey.

TABLE 4.7 Estimate of survival functions using Life Table in South East

Interval		Beginning Total	Deaths	Censored	Survival Function	Standard Error	95% C.I.	
							Lower	Upper
0	1	876	27	9	0.9690	0.0059	0.9551	0.9786
1	2	840	64	61	0.8924	0.0107	0.8695	0.9115
2	3	715	67	60	0.8051	0.0140	0.7760	0.8309
3	4	588	46	65	0.7384	0.0159	0.7058	0.7681
4	5	477	47	49	0.6617	0.0178	0.6257	0.6952
5	6	381	46	18	0.5799	0.0192	0.5413	0.6166
6	7	317	59	25	0.4676	0.0203	0.4273	0.5068
7	8	233	46	12	0.3728	0.0204	0.3328	0.4128
8	9	175	35	5	0.2972	0.0199	0.2587	0.3365
9	10	135	28	8	0.2336	0.0189	0.1976	0.2716
10	11	99	34	3	0.1522	0.0167	0.1212	0.1865
11	12	62	25	3	0.0893	0.0137	0.0648	0.1186
12	13	34	31	3	0.0041	0.0033	0.0007	0.0164

FIGURE 4.6 Survival function curve for South East

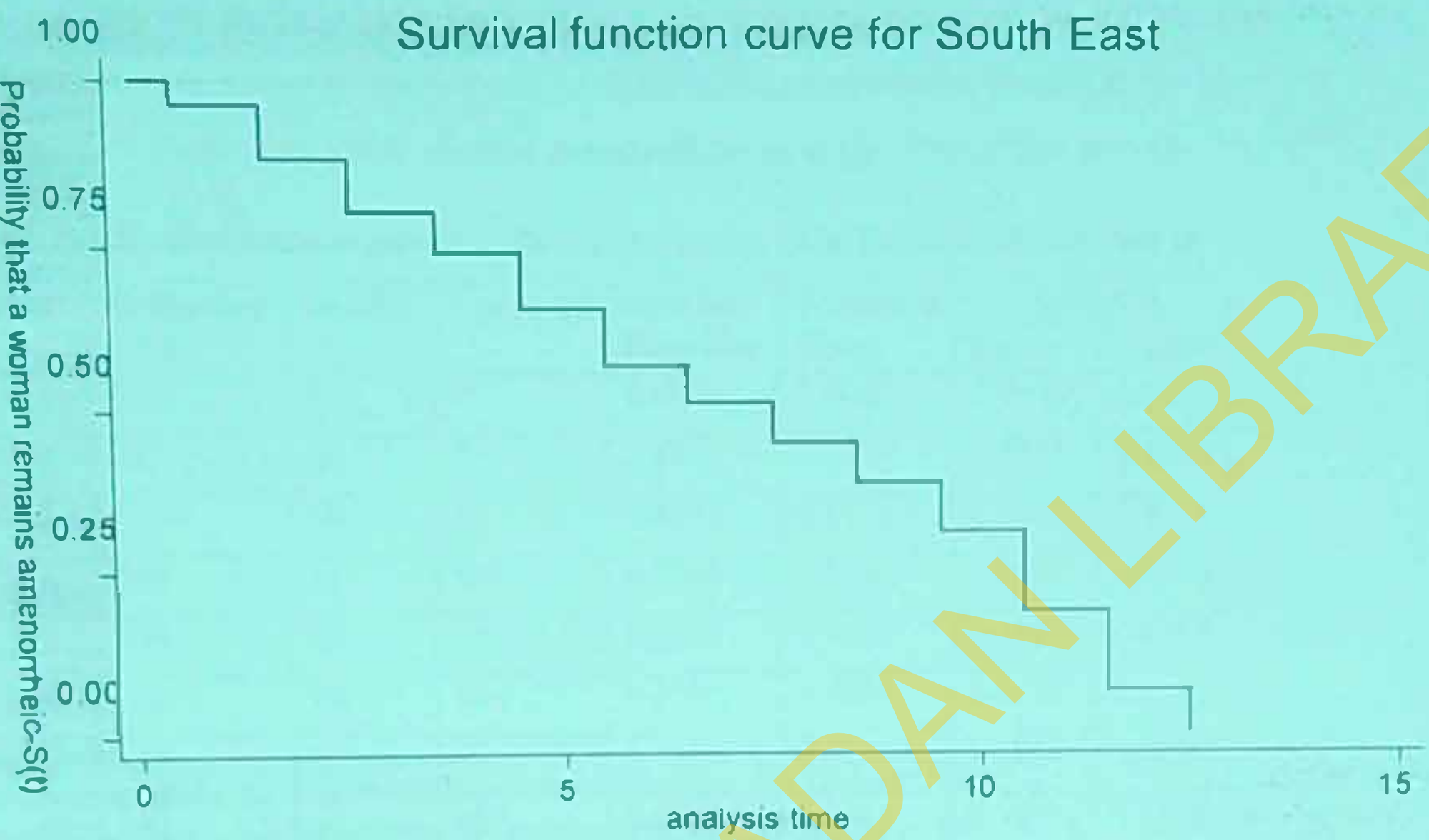


Table 4.8 shows the survival estimates in South South region over a period of one year at different time intervals. It was observed that out of a total of 826 women that began the time interval in the region, only 18 of them remained amenorrheic longer than the one year interval with a probability of 0.0040. While menstruation returned for 16 of the women, 2 of them were yet to resume menstruation as at the time of the survey.

TABLE 4.8 Estimate of survival functions using Life Table in South South

Interval		Beginning Total	Deaths	Censored	Survival Function	Standard Error	95% C.I.	
							Lower	Upper
0	1	826	27	4	0.9672	0.0062	0.9526	0.9774
1	2	795	68	55	0.8815	0.0114	0.8571	0.9020
2	3	672	56	52	0.8051	0.0143	0.7753	0.8314
3	4	564	51	85	0.7264	0.016	0.6923	0.7574
4	5	428	50	50	0.6363	0.0188	0.5981	0.6718
5	6	328	41	22	0.5540	0.0203	0.5132	0.5927
6	7	265	40	40	0.4635	0.0214	0.4210	0.5049
7	8	185	28	15	0.3904	0.0221	0.3471	0.4334
8	9	142	24	15	0.3207	0.0222	0.2776	0.3646
9	10	103	33	8	0.2138	0.0212	0.1738	0.2567
10	11	62	15	3	0.1608	0.0199	0.1241	0.2018
11	12	44	25	1	0.0684	0.0147	0.0433	0.1011
12	13	18	16	2	0.0040	0.0040	0.0004	0.0208

Table 4.8 shows the survival estimates in South South region over a period of one year at different time intervals. It was observed that out of a total of 826 women that began the time interval in the region, only 18 of them remained amenorrheic longer than the one year interval with a probability of 0.0040. While menstruation returned for 16 of the women, 2 of them were yet to resume menstruation as at the time of the survey.

TABLE 4.8 Estimate of survival functions using Life Table in South South

Interval	Beginning Total	Deaths	Censored	Survival Function	Standard Error	95% C.I.	
						Lower	Upper
0 1	826	27	4	0.9672	0.0062	0.9526	0.9774
1 2	795	68	55	0.8815	0.0114	0.8571	0.9020
2 3	672	56	52	0.8051	0.0143	0.7753	0.8314
3 4	564	51	85	0.7264	0.016	0.6923	0.7571
4 5	428	50	50	0.6363	0.0188	0.5981	0.6718
5 6	328	41	22	0.5540	0.0203	0.5132	0.5927
6 7	265	40	40	0.4635	0.0214	0.4210	0.5049
7 8	185	28	15	0.3904	0.0221	0.3471	0.4334
8 9	142	24	15	0.3207	0.0222	0.2776	0.3646
9 10	103	33	8	0.2138	0.0212	0.1738	0.2567
10 11	62	15	3	0.1608	0.0199	0.1241	0.2018
11 12	44	25	1	0.0684	0.0147	0.0433	0.1011
12 13	18	16	2	0.0040	0.0040	0.0004	0.0208

FIGURE 4.7 Survival function curve for South South

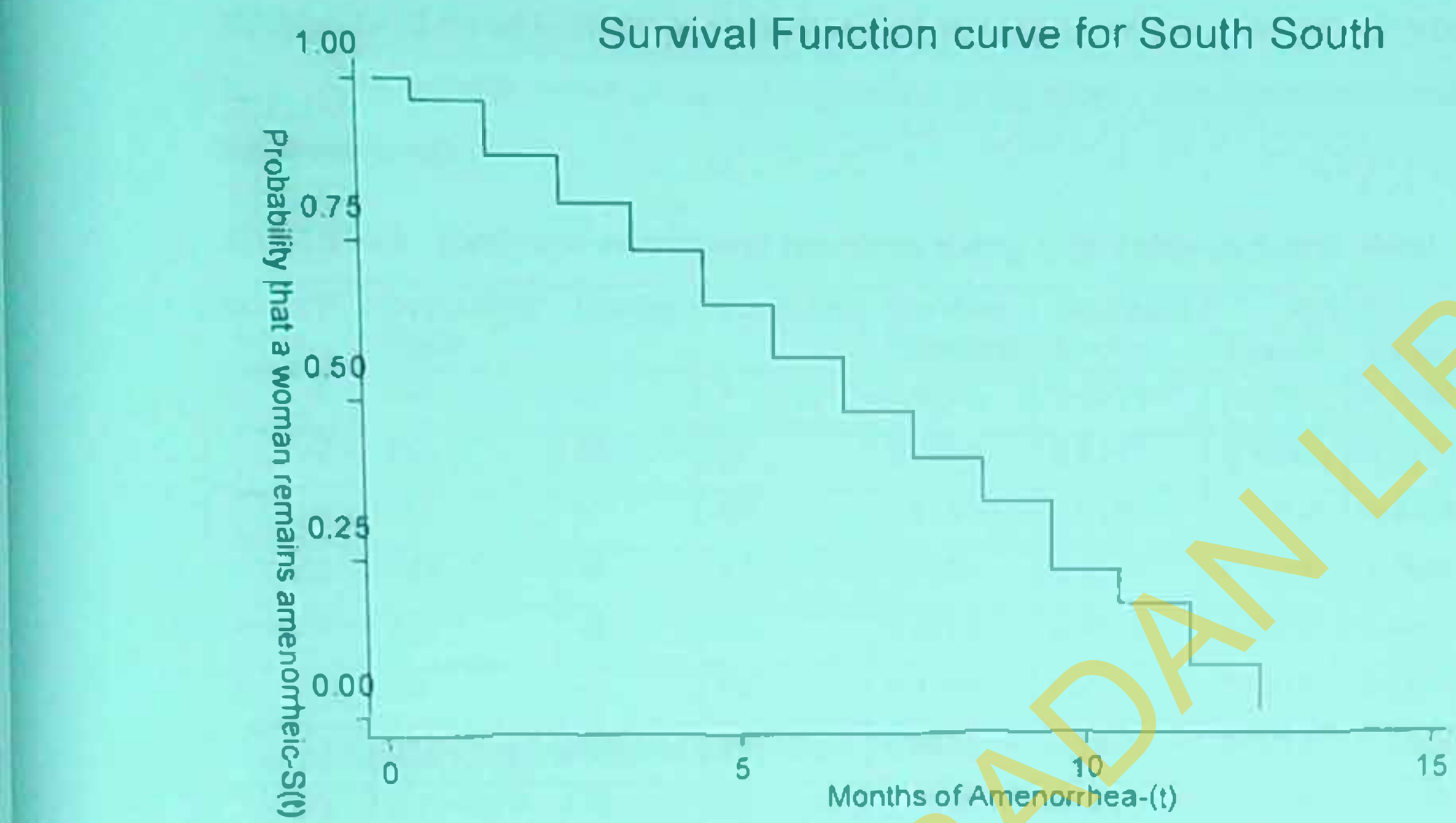


Table 4.9 shows the survival estimates in South West region over a period of one year at different time intervals. It was observed that out of a total of 876 women in the region, only 34 women remained amenorrheic longer than the one year interval with a probability of 0.0041. While menstruation returned for 31of those women, 3 women were yet to resume menstruation as at the time of the survey and thus considered as being censored.

TABLE 4.9 Estimate of survival functions using Life Table in South West

Interval		Beginning Total	Deaths	Censored	Survival Function	Standard Error	95% C.I.	
							Lower	Upper
0	1	876	27	9	0.9690	0.0059	0.9551	0.9786
1	2	840	64	61	0.8924	0.0107	0.8695	0.9115
2	3	715	67	60	0.8051	0.0140	0.7760	0.8309
3	4	588	46	65	0.7384	0.0159	0.7058	0.7681
4	5	477	47	49	0.6617	0.0178	0.6257	0.6952
5	6	381	46	18	0.5799	0.0192	0.5413	0.6166
6	7	317	59	25	0.4676	0.0203	0.4273	0.5068
7	8	233	46	12	0.3728	0.0204	0.3328	0.4128
8	9	175	35	5	0.2972	0.0199	0.2587	0.3365
9	10	135	28	8	0.2336	0.0189	0.1976	0.2716
10	11	99	34	3	0.1522	0.0167	0.1212	0.1865
11	12	62	25	3	0.0893	0.0137	0.0648	0.1186
12	13	34	31	3	0.0041	0.0033	0.0007	0.0164

FIGURE 4.8. Survival function curve for South West

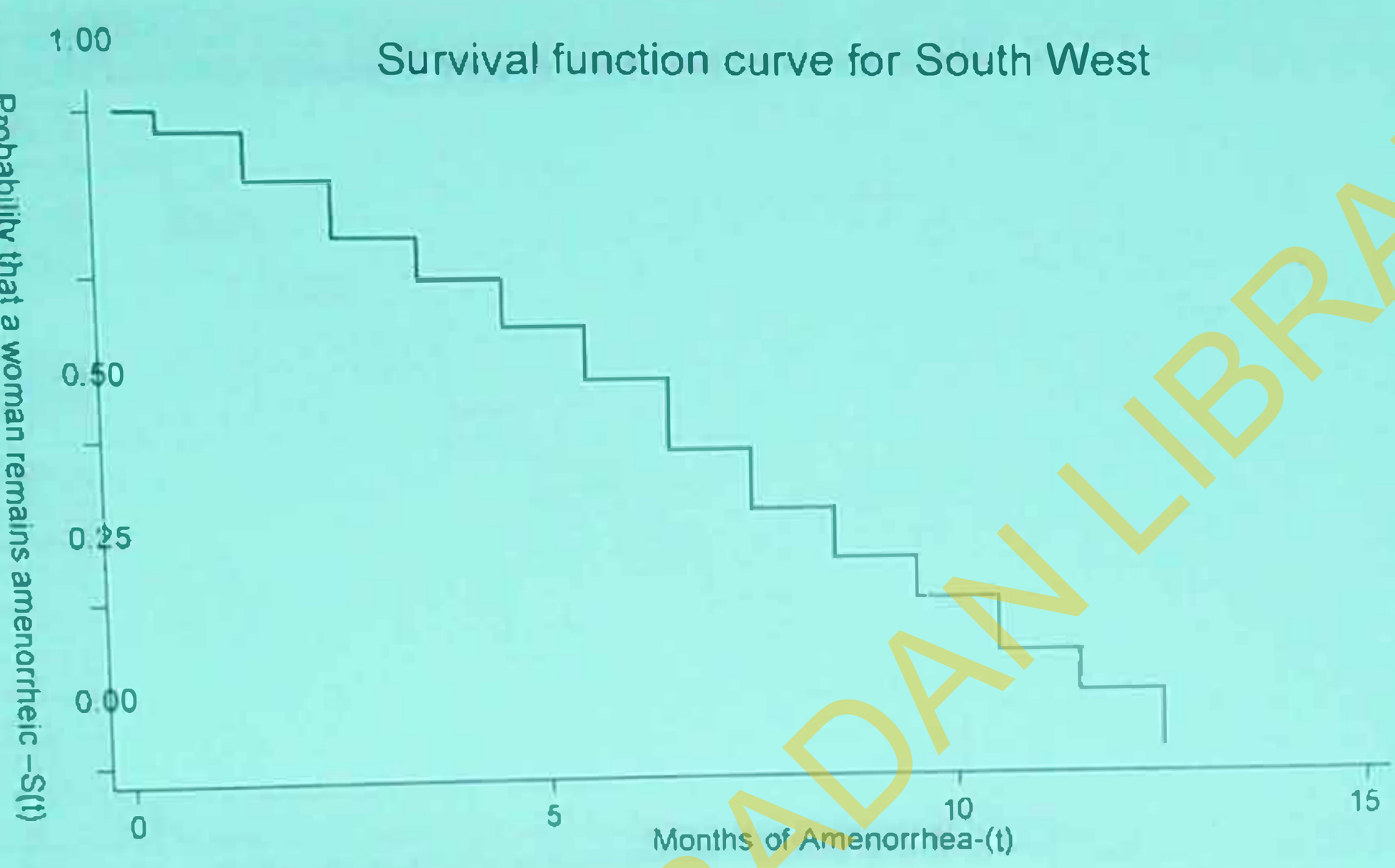
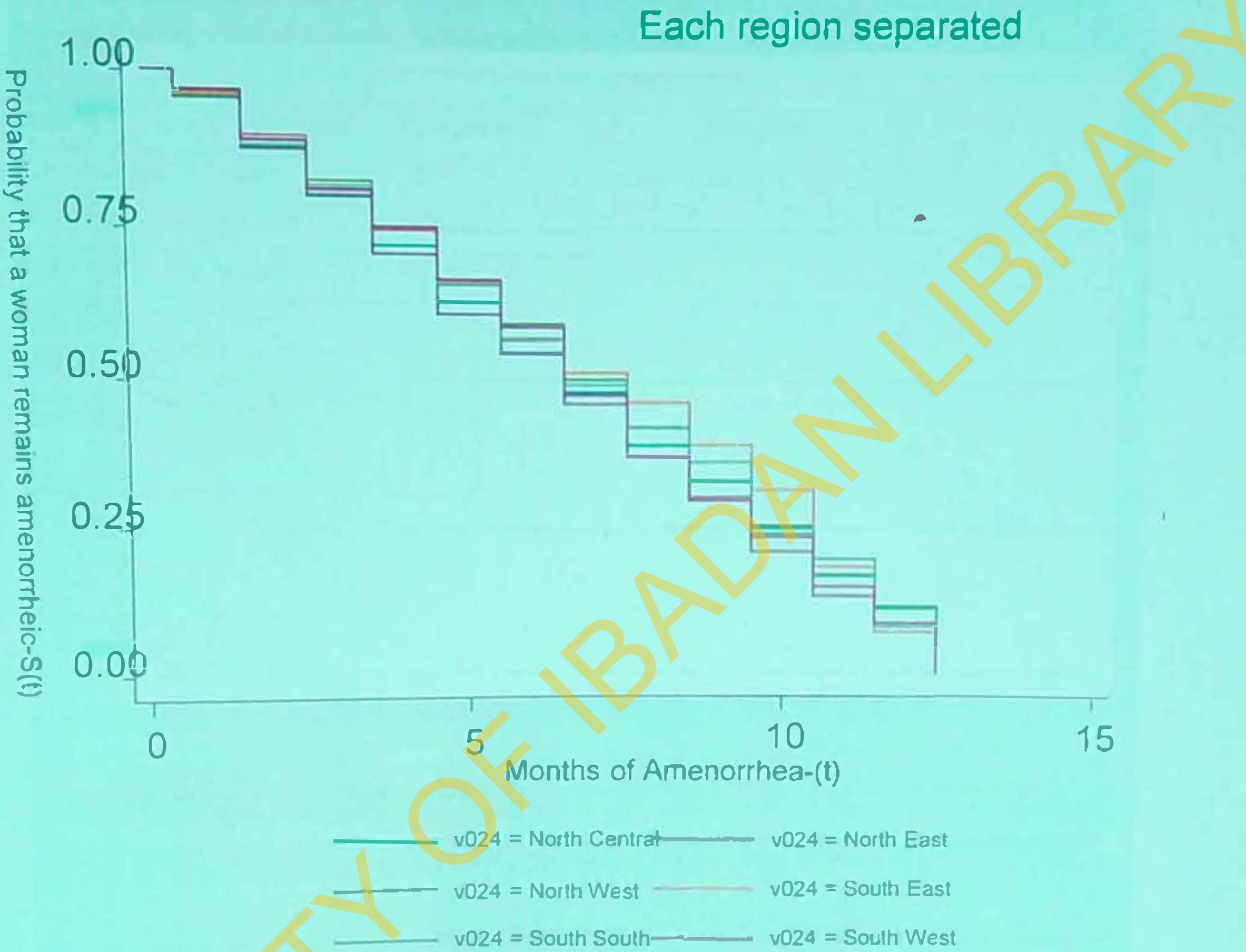


FIGURE 4.9. Survival function curve for each region separated



In Table 4.9, the data show that there was significant difference between duration of postpartum amenorrhea in the six geo-political regions with P<0.05.

Table 4.10 – Log rank test of the survival functions for six geo-political zones in Nigeria

Region	Observed	Expected	χ^2	P-Value
North Central	639	655.39	18.86	0.00
North East	1,049	944.92		
North West	1,689	1,749.57		
South East	347	365.81		
South South	474	474.27		
South West	555	563.04		

Table 4.11 below shows the relationship between each independent variable and duration of postpartum amenorrhea in Nigeria.

The analysis showed that marital status, breastfeeding status, survival status of index child and nutritional status were significantly associated with duration of postpartum amenorrhea. In Nigeria, women who were married and had their index child(ren) alive were 1.14 and 1.29 times more likely to return menstruation later than women who were not married and whose index child(ren) had died as at the time of the survey respectively.

Also, women were breastfeeding and had normal weights or underweight were 1.29 and 1.09 times more likely to return menstruation later than women who were not breastfeeding and those who were obese or overweight respectively. Survival status of index child(ren) and breastfeeding status were strongly associated with longer duration of postpartum amenorrhea.

Table 4.11 – Cox regression model examining the relationship between each independent variable singly and the duration of postpartum amenorrhea in Nigeria

Variables	Coefficient (β)	Significance (P-Value)	Exp(B) (Hazard Ratio)	95% CI for Exp(β)	
				Lower	Upper
Age					
15-24 (Ref.)		0.91			
25-34	0.28	0.78	1.01	0.94	1.08
35+	-0.15	0.89	0.99	0.92	1.08
Type of place of Residence					
Urban (Ref.)		1.00			
Rural	0.00	1.00	1.00	0.94	1.07
Highest Educational Level					
No Education/Primary (Ref.)		0.18			
Above Primary	-1.34	0.18	0.96	0.90	1.02
Current Marital Status					
Not Currently Married (Ref.)		0.03			
Married	2.15	0.03	1.14	1.01	1.28
Wealth Index					
Poor (Ref.)		0.67			
Average	-0.10	0.92	1.00	0.92	1.08
Rich	-0.88	0.38	0.97	0.91	1.04
Religion					
Christian (Ref.)		0.27			
Islam	1.11	0.27	1.04	0.97	1.10
Total Children ever born					
<2 (Ref.)		0.27			
<=2	1.10	0.27	1.04	0.97	1.12
Occupation					
Not working (Ref.)		0.02			
Working	-2.28	0.18	0.93	0.87	0.99
Ethnicity					
Hausa/Fulani (Ref.)		0.46			
Igbo	-1.39	0.16	0.93	0.83	1.03
Yoruba	0.06	0.95	1.00	0.90	1.11
Others	0.42	0.67	1.01	0.95	1.08
Breastfeeding status					
No (Ref.)		0.00			
Yes	3.93	0.00	1.29	1.14	1.46
Survival status of index child					
No (Ref.)		0.02			
Yes	2.26	0.02	1.29	1.03	1.60
Nutritional Status					
<24 (Ref.)		0.01			
>=24	2.25	0.01	1.09	1.02	1.16
Time to 1st Breastfeeding					
Immediately (Ref)		0.65			
Not Immediately	0.46	0.65	1.01	0.95	1.08
Region					
North Central (Ref.)		0.07			
North East	1.43	0.15	1.08	0.97	1.20
North West	-0.82	0.41	0.96	0.87	1.06
South East	-0.86	0.39	0.94	0.82	1.08
South South	-0.45	0.65	0.97	0.85	1.11
South West	0.12	0.91	1.01	0.89	1.14

Table 4.12 below shows the relationship between each independent variable and duration of postpartum amenorrhea in North Central.

The analysis showed that wealth status and ethnicity are significant with duration of postpartum amenorrhea in the North Central region. This showed that rich Yorubas and other minority ethnic groups were 0.76, 0.55 and 0.65 times more likely to return menstruation later than poor Hausa/Fulanis and Ibos. This implied that wealth is significant with shorter duration of postpartum amenorrhea. Rich women could afford to buy formula for their children and might not really observe exclusive breastfeeding which has fertility inhibiting factors.

Also, a high percentage of Yoruba women were educated and live in the urban cities with occupations that may not allow them to exclusively breastfeed their children.

TABLE 4.12 Cox regression model examining the relationship between each independent variable singly and the duration of postpartum amenorrhea in North Central

Variables	Coefficient (β)	Significance (P-Value)	Exp(B) (Hazard Ratio)	95% CI for Exp(β)	
				Lower	Upper
Age					
15-24 (Ref.)		0.89			
25-34	-0.07	0.95	0.99	0.82	1.21
35+	0.37	0.71	1.04	0.84	1.29
Type of place of Residence					
Urban (Ref.)		0.05			
Rural	1.93	0.05	1.19	1.00	1.41
Highest Educational Level					
No Education/Primary (Ref.)		0.52			
Above Primary	-0.65	0.52	0.95	0.80	1.12
Current Marital Status					
Not Currently Married (Ref.)		0.17			
Married	1.36	0.17	1.25	0.91	1.71
Wealth Index					
Poor (Ref.)		0.02			
Average	-1.86	0.06	0.83	0.68	1.01
Rich	-2.76	0.01	0.76	0.62	0.92
Religion					
Christian (Ref.)		0.29			
Islam	1.07	0.29	1.09	0.93	1.29
Total Children ever born					
<2 (Ref.)		0.50			
<=2	0.68	0.50	1.07	0.88	1.31
Occupation					
Not working (Ref.)		0.12			
Working	-1.55	0.12	0.86	0.72	1.04
Ethnicity					
Hausa/Fulani (Ref.)		0.01			
Igbo	-0.58	0.56	0.84	0.47	1.51
Yoruba	-3.33	0.00	0.55	0.39	0.78
Others	-2.82	0.01	0.65	0.48	0.88
Breastfeeding status					
No (Ref.)		0.06			
Yes	1.86	0.06	1.46	0.98	2.18
Survival status of index child					
No (Ref.)		0.07			
Yes	1.79	0.07	2.02	0.94	4.37
Nutritional Status					
<24 (Ref.)		0.32			
>=24	1.00	0.32	1.09	0.92	1.30
Time to 1st Breastfeeding					
Immediately (Ref)		0.75			
Not Immediately	0.32	0.75	1.03	0.87	1.21

Table 4.13 below shows the relationship between each independent variable and regional duration of postpartum amenorrhea in North East.

The analysis showed that ethnicity and time to first breastfeeding of child (index) were significant with duration of postpartum amenorrhea. Igbo and Yoruba women who did not put their index children to breast immediately were more likely to have their menstruation return later than Hausa/Fulani women who put their index children to breast immediately. There were more educated and wealthy women among the Igbos and Yorubas who could afford the luxury of formula feeding and who may not take breastfeeding seriously. This is unlike the poor Hausa/Fulani women whose major source of feeding for their newborns were breast milk.

Also, there had been a case of insurgency going on in the North East for some years which had led to the displacement of a lot of women causing a lot of unrest, poverty and health issues affecting majorly women and children.

TABLE 4.13 Cox regression model examining the relationship between each independent variable singly and the duration of postpartum amenorrhea in North East

Variables	Coefficient (β)	Significance (P-Value)	Exp(B) (Hazard Ratio)	95% CI for Exp(β)	
				Lower	Upper
Age					
15-24 (Ref.)		0.47			
25-34	-0.74	0.46	0.95	0.82	1.09
35+	-1.20	0.23	0.90	0.76	1.07
Type of place of Residence					
Urban (Ref.)		0.18			
Rural	1.33	0.19	1.12	0.95	1.32
Highest Educational Level					
No Education/Primary (Ref.)		0.57			
Above Primary	-0.56	0.57	0.57	0.80	1.13
Current Marital Status					
Not Currently Married (Ref.)		0.79			
Married	-0.26	0.79	0.96	0.72	1.28
Wealth Index					
Poor (Ref.)		0.53			
Average	-0.01	0.99	1.00	0.81	1.24
Rich	-1.12	0.26	0.90	0.75	1.08
Religion					
Christian (Ref.)		0.52			
Islam	-0.64	0.52	0.95	0.81	1.11
Total Children ever born					
<2 (Ref.)		0.37			
<=2	-0.09	037	0.92	0.78	1.10
Occupation					
Not working (Ref.)		0.68			
Working	-0.41	0.68	0.97	0.86	1.10
Ethnicity					
Hausa/Fulani (Ref.)		0.00			
Igbo	-45.75	0.00	0.01	0.00	1.00
Yoruba	-32.83	0.00	0.01	0.00	1.00
Others	0.82	0.41	1.05	0.93	1.19
Breastfeeding status					
No (Ref.		0.76			
Yes	0.30	0.76	1.04	0.79	1.37
Survival status of index child					
No (Ref.)		0.73			
Yes	0.34	0.73	1.09	0.67	1.78
Nutritional Status					
<24 (Ref.)		0.41			
>=24	0.83	0.41	1.07	0.91	1.25
Time to 1st Breastfeeding					
Immediately (Ref)		0.04			
Not Immediately	2.03	0.04	1.15	1.00	1.31

Table 4.14 below shows the relationship between each independent variable and regional duration of postpartum amenorrhea in North West.

The analysis showed that wealth status and ethnicity were significant with duration of postpartum amenorrhea. Rich minority ethnic groups in the North West were more likely to have their menstruation return later than women who were poor from the Hausa/Fulani ethnic group.

TABLE 4.14 Cox regression model examining the relationship between each independent variable singly and the duration of postpartum amenorrhea in North West

Variables	Coefficient (β)	Significance (P-Value)	Exp(B) (Hazard Ratio)	95% CI for Exp(β)	
				Lower	Upper
Age					
15-24 (Ref.)		0.43			
25-34	1.30	0.19	1.07	0.97	1.19
35+	0.52	0.60	1.03	0.91	1.17
Type of place of Residence					
Urban (Ref.)		0.17			
Rural	-1.39	0.17	0.92	0.82	1.03
Highest Educational Level					
No Education/Primary (Ref.)		0.49			
Above Primary	0.69	0.49	1.05	0.91	1.22
Current Marital Status					
Not Currently Married (Ref.)		0.43			
Married	0.80	0.43	1.16	0.81	1.67
Wealth Index					
Poor (Ref.)		0.21			
Average	0.61	0.54	1.04	0.92	1.17
Rich	1.74	0.08	1.12	0.99	1.28
Religion					
Christian (Ref.)		0.19			
Islam	1.30	0.19	1.20	0.91	1.59
Total Children ever born					
<2 (Ref.)		0.84			
<=2	-0.21	0.84	0.99	0.87	1.12
Occupation					
Not working (Ref.)		0.11			
Working	-1.61	0.11	0.92	0.84	1.02
Ethnicity					
Hausa/Fulani (Ref.)		0.18			
Igbo	-0.81	0.42	0.78	0.43	1.42
Yoruba	-0.26	0.79	0.86	0.27	2.69
Others	-2.06	0.04	0.80	0.65	0.99
Breastfeeding status					
No (Ref.)		0.07			
Yes	1.79	0.07	1.19	0.98	1.44
Survival status of index child					
No (Ref.)		0.44			
Yes	0.77	0.44	1.13	0.83	1.53
Nutritional Status					
<24 (Ref.)		0.15			
>=24	1.44	0.15	1.09	0.97	1.22
Time to 1st Breastfeeding					
Immediately (Ref)		0.50			
Not Immediately	-0.68	0.50	0.96	0.87	1.07

Table 4.15 below shows the relationship between each independent variable and regional duration of postpartum amenorrhea in South East.

The analysis showed that education and wealth status were significant with duration of postpartum amenorrhea. Wealthy educated women were more likely to have their menstruation later than women were poor and illiterate.

TABLE 4.15 Cox regression model examining the relationship between each independent variable singly and the duration of postpartum amenorrhea in South East

Variables	Coefficient (β)	Significance (P-Value)	Exp(B) (Hazard Ratio)	95% CI for Exp(β)	
				Lower	Upper
Age					
15-24 (Ref.)		0.68			
25-34	0.34	0.73	1.05	0.79	1.40
35+	0.84	0.40	1.16	0.82	1.63
Type of place of Residence					
Urban (Ref.)		0.51			
Rural	-0.06	0.51	0.93	0.74	1.16
Highest Educational Level					
No Education/Primary (Ref.)		0.00			
Above Primary	-3.15	0.00	0.69	0.55	0.87
Current Marital Status					
Not Currently Married (Ref.)		0.00			
Married	3.39	0.00	1.66	1.21	2.23
Wealth Index					
Poor (Ref.)		0.08			
Average	0.05	0.05	0.75	0.57	1.00
Rich	0.04	0.04	0.75	0.57	0.98
Religion					
Christian (Ref.)		0.00			
Islam	10.68	0.00	2.52	2.12	2.98
Total Children ever born					
<2 (Ref.)		0.18			
<=2	1.36	0.18	1.22	0.92	1.62
Occupation					
Not working (Ref.)		0.29			
Working	1.05	0.29	1.16	0.88	1.53
Ethnicity					
Hausa/Fulani (Ref.)		0.00			
Igbo	-1.15	0.25	0.57	0.22	1.49
Yoruba	0.78	0.44	1.50	0.54	4.15
Others	-0.46	0.65	0.67	0.12	3.72
Breastfeeding status					
No (Ref.)		0.07			
Yes	1.84	0.07	1.57	0.97	2.54
Survival status of index child					
No (Ref.)		0.55			
Yes	0.60	0.55	1.33	0.52	3.42
Nutritional Status					
<24 (Ref.)		0.34			
>=24	0.96	0.34	1.12	0.89	1.40
Time to 1st Breastfeeding		0.64			
Immediately (Ref)		0.64	1.06	0.84	1.32
Not Immediately	0.47				

Table 4.16 below shows the relationship between each independent variable and regional duration of postpartum amenorrhea in South South.

The analysis showed that breastfeeding status and survival status of index child were significant with duration of postpartum amenorrhea. Women whose index children were alive and were breastfeeding were more likely to have their menstruation return later than women who were not breastfeeding and had lost index children to death.

TABLE 4.16 Cox regression model examining the relationship between each independent variable singly and the duration of postpartum amenorrhea in South South

Variables	Coefficient (β)	Significance (P-Value)	Exp(B) (Hazard Ratio)	95% CI for Exp(B)	
				Lower	Upper
Age					
15-24 (Ref.)		0.51			
25-34	-1.00	0.32	0.89	0.70	1.13
35+	-0.03	0.97	1.00	0.76	1.30
Type of place of Residence					
Urban (Ref.)		0.96			
Rural	-0.05	0.96	0.99	0.80	1.21
Highest Educational Level					
No Education/Primary (Ref.)		0.82			
Above Primary	-0.23	0.82	0.98	0.80	1.19
Current Marital Status					
Not Currently Married (Ref.)		0.72			
Married	-0.36	0.72	0.96	0.76	1.20
Wealth Index					
Poor (Ref.)		0.19			
Average	1.50	0.13	1.25	0.93	1.66
Rich	0.32	0.75	1.05	0.80	1.37
Religion					
Christian (Ref.)		0.85			
Islam	-0.19	0.85	0.96	0.63	1.44
Total Children ever born					
<2 (Ref.)		0.19			
<=2	1.32	0.19	1.17	0.92	1.49
Occupation					
Not working (Ref.)		0.13			
Working	-1.53	0.13	0.83	0.66	1.05
Ethnicity					
Hausa/Fulani (Ref.)		0.01			
Igbo	-0.78	0.44	0.42	0.05	3.79
Yoruba	0.03	0.98	1.02	0.11	9.67
Others	-0.26	0.80	0.75	0.08	6.65
Breastfeeding status					
No (Ref.)		0.00			
Yes	3.88	0.00	2.06	1.43	2.97
Survival status of index child					
No (Ref.)		0.03			
Yes	2.20	0.03	3.05	1.13	8.21
Nutritional Status					
<24 (Ref.)		0.78			
>=24	-0.28	0.78	0.97	0.79	1.19
Time to 1st Breastfeeding					
Immediately (Ref)		0.14			
Not Immediately	-1.49	0.14	0.85	0.69	1.05

Table 4.17 below shows the relationship between each independent variable and regional duration of postpartum amenorrhea in South West.

The analysis showed that survival status of index children and nutritional status were significant with duration of postpartum amenorrhea. That is, underweight women whose index children were alive had a risk of returning menstruation earlier than those who were not underweight and whose index children were dead.

TABLE 4.17 Cox regression model examining the relationship between each independent variable singly and the duration of postpartum amenorrhea in South West

Variables	Coefficient (β)	Significance (P-Value)	Exp(B) (Hazard Ratio)	95% CI for Exp(β)	
				Lower	Upper
Age					
15-24 (Ref.)		0.41			
25-34	-0.19	0.85	0.98	0.79	1.22
35+	-1.11	0.27	0.87	0.67	1.12
Type of place of Residence					
Urban (Ref.)		0.64			
Rural	-0.47	0.64	0.96	0.80	1.15
Highest Educational Level					
No Education/Primary (Ref.)		0.68			
Above Primary	-0.41	0.68	0.96	0.80	1.15
Current Marital Status					
Not Currently Married (Ref.)		0.60			
Married	0.53	0.60	1.09	0.79	1.52
Wealth Index					
Poor (Ref.)		0.78			
Average	0.45	0.65	1.07	0.80	1.44
Rich	0.70	0.48	1.08	0.87	1.35
Religion					
Christian (Ref.)		0.65			
Islam	0.46	0.65	1.04	0.87	1.25
Total Children ever born					
<2 (Ref.)		0.18			
<=2	1.35	0.18	1.15	0.94	1.40
Occupation					
Not working (Ref.)		0.81			
Working	-0.24	0.81	0.97	0.78	1.21
Ethnicity					
Hausa/Fulani (Ref.)		0.52			
Igbo	1.43	0.15	1.39	0.88	2.19
Yoruba	0.69	0.49	1.13	0.80	1.61
Others	0.61	0.54	1.13	0.77	1.65
Breastfeeding status					
No (Ref.)		0.63			
Yes	0.48	0.63	1.10	0.74	1.64
Survival status of index child					
No (Ref.)		0.77			
Yes	0.30	0.77	1.29	1.03	1.60
Nutritional Status					
<24 (Ref.)		0.03			
>=24	2.22	0.03	1.22	1.02	1.46
Time to 1st Breastfeeding					
Immediately (Ref)		0.28			
Not Immediately	1.07	0.28	1.12	0.91	1.37

TABLE 4.17 Cox regression model examining the relationship between each independent variable singly and the duration of postpartum amenorrhea in South West

Variables	Coefficient (β)	Significance (P-Value)	Exp(B) (Hazard Ratio)	95% CI for Exp(β)	
				Lower	Upper
Age					
15-24 (Ref.)		0.44			
25-34	-0.19	0.85	0.98	0.79	1.22
35+	-1.11	0.27	0.87	0.67	1.12
Type of place of Residence					
Urban (Ref.)		0.64			
Rural	-0.47	0.64	0.96	0.80	1.15
Highest Educational Level					
No Education/Primary (Ref.)		0.68			
Above Primary	-0.41	0.68	0.96	0.80	1.15
Current Maritnl Status					
Not Currently Married (Ref.)		0.60			
Married	0.53	0.60	1.09	0.79	1.52
Wealth Index					
Poor (Ref.)		0.78			
Average	0.45	0.65	1.07	0.80	1.42
Rich	0.70	0.48	1.08	0.87	1.35
Religion					
Christian (Ref.)		0.65			
Islam	0.46	0.65	1.04	0.87	1.25
Total Children ever born					
<2 (Ref.)		0.18			
<=2	1.35	0.18	1.15	0.94	1.40
Occupation					
Not working (Ref.)		0.81			
Working	-0.24	0.81	0.97	0.78	1.21
Ethnicity					
Hausa/Fulani (Ref.)		0.52			
Igbo	1.43	0.15	1.39	0.88	2.19
Yoruba	0.69	0.49	1.13	0.80	1.61
Others	0.61	0.54	1.13	0.77	1.65
Breastfeeding status					
No (Ref.)		0.63			
Yes	0.48	0.63	1.10	0.74	1.64
Survival status of index child					
No (Ref.)		0.77			
Yes	0.30	0.77	1.29	1.03	1.60
Nutritional Status					
<24 (Ref.)		0.03			
>=24	2.22	0.03	1.22	1.02	1.46
Time to 1st Breastfeeding					
Immediately (Ref)		0.28			
Not Immediately	1.07	0.28	1.12	0.91	1.37

MULTIVARIATE

Tables 4.18 – 4.24 below show the results of the multiple models showing the association of several Cox regression of the relation between independent variables with the duration of postpartum amenorrhea in different geo-political regions in Nigeria.

Table 4.18 shows the multiple models showing the association of several Cox regression of the relation between independent variables with the duration of postpartum amenorrhea in Nigeria. The analysis showed that women who were married, not underweight and breastfeeding were more likely to return menstruation later than women who were not married, underweight and not breastfeeding in Nigeria.

TABLE 4.18 Multiple model showing the nssociation of severnl Cox regression of the relationship between independent variables with the duration of postpartum amenorrhea in Nigeria

Variables	Coefficient (β)	Significance (P-Value)	Exp(B) (Hazard Ratio)	95% CI for Exp(β)	
				Lower	Upper
Current Marital Status					
Not Currently Married (Ref.)					
Married	1.88	0.06	1.12	1.00	1.26
Breastfeeding status					
No (Ref.)					
Yes	3.17	0.00	1.28	1.10	1.49
Survival status of index child					
No (Ref.)					
Yes	0.03	0.98	1.00	0.77	1.31
Nutritional Status					
<24 (Ref.)					
>=24	2.52	0.01	1.09	1.02	1.16
Test		**0.00**			

Table 4.19 shows the multiple models showing the association of several Cox regression of the relation between independent variables with the duration of postpartum amenorrhea in North Central. The analysis showed rich non Hausa/Fulani women were more likely to return menstruation later than poor Hausa/Fulani women in the North Central region.

TABLE 4.19 Multiple models showing the association of several Cox regression of the relationship between independent variables with the duration of postpartum amenorrhea in North Central

Variables	Coefficient (β)	Significance (P-Value)	Exp(B) (Hazard Ratio)	95% CI for Exp(β)	
				Lower	Upper
Wealth Index					
Poor (Ref.)					
Average	-1.54	0.12	0.85	0.69	1.05
Rich	-2.30	0.02	0.78	0.63	0.96
Ethnicity					
Hausa/Fulani (Ref.)					
Igbo	-0.07	0.95	0.98	0.53	1.79
Yoruba	-2.43	0.02	0.64	0.45	0.92
Others	-2.30	0.01	0.68	0.51	0.91
Test		**0.00**			

Table 4.20 shows the multiple models showing the association of several Cox regression of the relation between independent variables with the duration of postpartum amenorrhea in North East. The analysis shows that Igbo and Yoruba women were more likely to return menstruation later than Hausa/Fulani women in the North West respectively with P=0.00 for each category in the North East region.

TABLE 4.20 Multiple model showing the association of several Cox regression of the relationship between independent variables with the duration of postpartum amenorrhea in North East

Variables	Coefficient (β)	Significance (P-Value)	Exp(B) (Hazard Ratio)	95 % CI for Exp(β)	
				Lower	Upper
Ethnicity					
Hausa/Fulani (Ref.)					
Igbo	0.00	0.00	0.00	0.00	0.00
Yoruba	0.00	0.00	0.00	0.00	0.00
Others	0.95	0.34	1.06	0.94	1.21
Time to 1st Breastfeeding					
Immediately(Ref.)					
Not Immediately	2.06	0.04	1.15	1.01	1.31
Test		**0.08**			

Table 4.21 shows the multiple models showing the association of several Cox regression of the relation between independent variables with the duration of postpartum amenorrhea in North West. The analysis showed that rich women belonging to the minority ethnic group were more likely to return menstruation later than poor women from the three major ethnic groups (that is, Hausa/Fulani, Igbo and Yoruba in the North West region.

TABLE 4.21 Multiple models showing the association of several Cox regression of the relationship between independent variables with the duration of postpartum amenorrhea in North West

Variables	Coefficient (β)	Significance (P-Value)	Exp(B) (Hazard Ratio)	95% CI for Exp(β)	
				Lower	Upper
Wealth Status					
Poor (Ref.)					
Average	0.94	0.35	1.06	0.94	1.20
Rich	2.10	0.04	1.15	1.01	1.32
Ethnicity					
Hausa/Fulani (Ref.)					
Igbo	-1.31	0.26	0.70	0.38	1.30
Yoruba	-0.46	0.65	0.76	0.24	2.42
Others	-2.28	0.02	0.78	0.63	0.97
Test		0.07			

Table 4.22 shows the multiple models showing the association of several Cox regression of the relation between independent variables with the duration of postpartum amenorrhea in South East. The analysis showed that married Christian women who had above primary education were more likely to return menstruation later than unmarried Muslim women who had only up to primary education in the South East region.

TABLE 4.22 Multiple models showing the association of several Cox regression of the relationship between independent variables with the duration of postpartum amenorrhea in South East

Variables	Coefficient (β)	Significance (P-Value)	Exp(B) (Hazard Ratio)	95% CI for Exp(β)	
				Lower	Upper
Highest Educational Level					
No Education/Primary (Ref.)					
Above Primary	-2.25	0.02	0.75	0.59	0.96
Current Marital Status					
Not Currently Married (Ref.)					
Married	3.92	0.00	1.79	1.34	2.40
Wealth Index					
Poor (Ref.)					
Average	-1.26	0.21	0.83	0.62	1.11
Rich	-1.61	0.11	0.77	0.57	1.06
Religion					
Christian (Ref.)					
Islam	8.99	0.00	2.75	1.54	3.42
Test		0.00			

Table 4.23 shows the multiple models showing the association of several Cox regression of the relationship between independent variables with the duration of postpartum amenorrhea in South South. The analysis showed that women who breastfed were more likely to return menstruation later than women who did not breastfeed in the South South region.

TABLE 4.23 Multiple models showing the association of several Cox regression of the relationship between independent variables with the duration of postpartum amenorrhea in South South

Variables	Coefficient (β)	Significance (P-Value)	Exp(B) (Hazard Ratio)	95% CI for Exp(β)	
				Lower	Upper
Breastfeeding status					
No (Ref.)					
Yes	3.23	0.00	1.91	1.29	2.82
Survival status of index child					
No (Ref.)					
Yes	0.96	0.34	1.68	0.58	4.83
Test		**0.00**			

Table 4.24 shows the multiple models showing the association of several Cox regression of the relation between independent variables with the duration of postpartum amenorrhea in South West. The analysis showed that women who were underweight were less likely to return menstruation later than women who had normal weight, overweight and obese in the South West region.

TABLE 4.24 Multiple model showing the association of several Cox regression of the relationship between independent variables with the duration of postpartum amenorrhea in South West

Variables	Coefficient (β)	Significance (P-Value)	Exp(B) (Hazard Ratio)	95% CI for Exp(β)	
				Lower	Upper
Survival status of index child					
No (Ref.)					
Yes	0.46	0.65	1.16	0.62	2.15
Nutritional Status					
<24 (Ref.)					
>=24	2.25	0.02	1.23	1.03	1.47
Test		0.03			

Table 4.24 shows the multiple models showing the association of several Cox regression of the relation between independent variables with the duration of postpartum amenorrhea in South West. The analysis showed that women who were underweight were less likely to return menstruation later than women who had normal weight, overweight and obese in the South West region.

TABLE 4.24 Multiple model showing the association of several Cox regression of the relationship between independent variables with the duration of postpartum amenorrhea in South West

Variables	Coefficient (β)	Significance (P-Value)	Exp(B) (Hazard Ratio)	95% CI for Exp(β)	
				Lower	Upper
Survival status of index child					
No (Ref.)					
Yes	0.46	0.65	1.16	0.62	2.15
Nutritional Status					
<24 (Ref.)					
>=24	2.25	0.02	1.23	1.03	1.47
Test		0.03			

CHAPTER FIVE

DISCUSSION, CONCLUSION AND RECOMMENDATION

5.1 Discussion

Duration of Postpartum Amenorrhea in Nigeria

These analyses support previous findings suggesting that length of postpartum amenorrhea vary across regions. The findings of this study showed that the median duration of postpartum amenorrhea was six and half (6.5) months for Nigerian women. There were statistically significant differences in the duration among the regions. The estimate for the South West region at 6.5 months obtained in this study was close to that of the WHO multinational study (WHO, 1998) for Sagamu, South West Nigeria where the median duration of postpartum amenorrhea of women was reported to be seven (7) months. Although the figure of 8.9 months was reported for the south west in 2013 by the Nigeria Demographic and Health Survey which is higher than that reported in this study, it is worthy of note to say that the analysis techniques vary quite substantially and given the fact that many women were censored.

This implies that naturally, women in Nigeria will remain amenorrheic for an average period of six and half (6.5) months before returning to normal menstrual period. This is a grim situation for Nigeria when we put into consideration the very low uptake of contraceptive measures as reported by the major Surveys in Nigeria in recent times; the Multiple Indicator Cluster Survey of 2011, the National HIV & AIDS and Reproductive Health Survey of 2012 and the Nigeria Demographic and Health Survey of 2013 all reported values of 82.5%, 86.8% and 84% for women not using any form of contraception in Nigeria. The exposure of women to pregnancy is very much high when the window before a potential return to fertility is only 6.5 months short.

Factors affecting the length of Postpartum Amenorrhea in the regions of Nigeria

There were a number of factors influencing the length of postpartum amenorrhea in Nigeria. Marital status, breastfeeding status and nutritional status were significantly associated with duration of postpartum amenorrhea. Married women who were not underweight were more likely to return menstruation later than unmarried women who were underweight.

Of all demographic characteristics of women. only marriage was associated with longer duration of postpartum amenorrhea. While higher age. rural living and higher parity were associated with a lower likelihood of remaining amcnorrhcic. Also. two of the socio-economic characteristics (that is, breastfeeding status and nutritional status) were associated with longer duration of postpartum amenorrhea in Nigeria (Popkin et al., 1993). However, education, religion, ethnicity, occupation and wealth index were associated with shorter duration of postpartum amenorrhea.

Generally, in the Northern region. wealth index is significant with duration of postpartum amenorrhea. Poor women were more likely to remain amenorrheic longer than rich women. It is possible that these women because of their low socioeconomic status have less access to formula food for their children. Thus, they may breast-feed their child more frequently or spend more time per day doing it. and as a result have a higher likelihood of remaining amenorrheic. Another explanation for the longer duration of postpartum amenorrhea in the Northern region could be education. given what was reported in the Nigeria Demographic and Health Survey of 2013 that reported that only 1 in 10 women in the South West zone had no formal education compared to about 8 out of 10 in the North West zone; this finding is in line with the report of the study by Aryal in 2005 that established an inverse relationship between education and postpartum amenorrhea which concluded that the higher the educational level. the lower the duration of postpartum amenorrhea.

In the North West zone, we discovered a duration of 7.5 months in the duration of postpartum amenorrhea which is higher than the reported estimate in Nigeria Demographic and Health Survey 2013 of 6.4 months which is very much lower than the figure for Nigeria which stood at 10.6; the possible explanation for this finding may be the proportion of women breastfeeding in the North West zone which was the highest in the country and since the effect of breastfeeding on postpartum amenorrhea is well-known and documented it is not very surprising to then discover that this region has a relatively lengthy duration (Aryal., 2005). Also in the South East, education and religion also play significant roles in affecting the duration of postpartum amenorrhea in this region. The proportion of uneducated women was lowest in the South East.

As expected, we could not fully break down the effect of socioeconomic status on all intermediate and proximal determinants explaining postpartum amenorrhea. The

fact that socioeconomic status remained significantly associated with postpartum amenorrhea after controlling for the more proximate determinants of amenorrhea suggests that there are additional unmeasured factors that affect postpartum amenorrhea. Also, wealth status was significant in two of the geopolitical zones in the Northern region (that is, North Central and North West zones). This shows that poverty is positively associated with longer duration of postpartum amenorrhea.

Differential in the Length of Postpartum Amenorrhea between the Regions

There was no particular pattern noticed in the estimate of the duration of postpartum amenorrhea among the regions. Women in the North-West and South-East zones had the highest duration of postpartum amenorrhea (7.5 months each) and while the other four (4) geo-political regions had the same duration of six and half (6.5) months.

Nationally, marriage, breastfeeding status and nutritional status are factors significantly associated with variations in the length of postpartum amenorrhea. That is, women who were married, not underweight and breastfeeding had longer duration than women who were not married, underweight and not breastfeeding. By implication, marriage is a factor responsible for longer duration of postpartum amenorrhea in Nigeria while breastfeeding status and nutritional status are responsible for shorter duration of postpartum amenorrhea in Nigeria. Occupation is also one of the significant factors in North West zone which shows that occupation is a factor responsible for longer duration of postpartum amenorrhea in North West zone. In the South South region, breastfeeding status is a significant factor responsible for longer duration of postpartum amenorrhea in South South zone (Heining., 1994).

Also, nutritional status is responsible for longer duration of postpartum amenorrhea especially in the South West zone. Poorly nourished women are more likely to remain amenorrheic (Kurz et al. 1993). Another possibility is that undernourished women produce less milk per nursing episode (Delgado et al. 1982. Lunn et al. 1984), and their children need to suck longer or more intensely than children of better-nourished mothers to obtain the amount of milk that they require.

Prolonged lactation has an effect on maternal energy reserves and causes maternal weight loss. It is possible that prolonged lactation in women decreases the

amount of body fat that is needed to resume menstruation, and the reduction of body fat accumulates over time. Therefore, the probability of undernourished women remaining amenorrheic is likely to be greater and increase over time compared with better-nourished women. Maternal nutritional status according to Popkin et al. 1993 may influence postpartum amenorrhea even in advanced countries because nutritional status has a direct bearing with socio-economic status and it has been discovered that better health of mothers provide a better quality and more quantity of milk breast milk, and that if the mother feeds her child for longer duration, her period of postpartum amenorrhea would be prolonged.

5.2 Conclusion

In Nigeria, a woman remains amenorrheic for about six and half months. This estimate varies by region in the country. While the duration of amenorrhea was highest in the North-West and South-East zones and the least was experienced in remaining four zones of the country. Major factors influencing the duration of postpartum amenorrhea Nigeria are: marriage, breastfeeding status, survival of the index child and nutritional status.

5.3 Recommendation

It is thus recommended that:

- Regional variations should be considered in advising women on the use of postpartum amenorrhea as a method of contraceptive depending on which part of the country the women are from.
- Some other factors peculiar to different regions which may inhibit the duration of postpartum amenorrhea should be carefully looked into.
- Estimates of regional postpartum amenorrhea from a prospective study would be an important area for further research.

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