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Sociodemographic and Pregnancy Risk Factors Associated with Place of Delivery Among Northern Nigerian Women

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This is to certify that the doctoral dissertation by

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Walden University
2020

Abstract

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MBBS, University of Maiduguri, Borno State, Nigeria, 1997

MPH, Usman Danfodio University, Sokoto State, Nigeria, 2007

Dissertation Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Philosophy

Public Health

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Abstract

One out of every 13 women in Nigeria die during childbirth. In Nigeria, over 60% of deliveries that take place at home were attended to by an unskilled person. This study involved using Thaddeus and Maine's three delays model to determine the influence of sociodemographic factors (woman's age, woman's residence [rural/urban], woman's and husband's education level, husband's occupation, household wealth), pregnancy risk factors (antenatal care usage, wanted pregnancy, and birth order) on the choice of place of delivery amongst women of reproductive age (15-49 years) in Northern Nigeria. This quantitative cross-sectional study used the National Demographic Health Survey of 2018. Data from 15,243 women were analyzed using descriptive statistics and binomial logistic regression analysis. Women's sociodemographic risk factors of age (p=.005), residence (rural/urban) (p=.001), education level (p= .001), and husband's education level (p=.001), household wealth (p= .001), antenatal care usage (p=.001) and birth order (p=.001) were associated with the place of delivery. Husband's occupation p= .977 (p> .05) and wanted pregnancy p=.101 (p> .05) were not associated with place of delivery. The findings from this study will assist the Ministry of Health in Nigeria to develop policies and design and implement interventions that may improve health outcome of mothers and their newborns delivered at health facilities. This study has the potential of positive social change that could increase the proportion of women who deliver in health facilities, which may lead to reduction in morbidity and mortality among mothers and newborns in Nigeria. Further research is needed to determine more determinants of place of deliveries and the reasons for nonuse of obstetric services among pregnant women in Nigeria.

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Dedication

I want to first thank God Almighty for providing me with the resources, the strength to achieve this great milestone in my doctoral journey.

I want to also appreciate my wife Mrs. Joan Ojochide Daniel, my daughters Miss Favour Ojonoma Daniel, Miss Glory Chubyojo Daniel and Prisca Enyo-Ojo Daniel and my adopted daughter Mercy Okedi for standing by and encouraging me through six years of my doctoral journey.

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May God Almighty reward you all, in Jesus name. Amen.

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Chapter 1: Introduction to the Study

Introduction

This is a quantitative cross-sectional study to determine the influence of sociodemographic factors (women's age, residence, and education level; husband's education level and occupation; household wealth), pregnancy risk factors (perceived cost of delivery and transportation, antenatal care usage, perception of quality of care at delivery, status of wanted pregnancy, and birth order) on the choice of place of delivery amongst women of reproductive age (15-49 years) in Northern Nigeria. Proper antenatal care coupled with the choice of place of delivery enhances the quality of child delivery (Gebregziabher, 2019). Place of delivery is one of the determinants of neonatal mortality (Abubakar et al., 2017; Adedokun et al., 2019).

In this study, I provide information regarding determinants of place of delivery amongst women of reproductive age in northern Nigeria. These additional determinants of place of delivery have not been previously studied using Thaddeus and Maine's three delays model on maternal health care use in Nigeria. These determinants of place of delivery include husband's education level, household wealth, antenatal care usage, perception of quality of care at delivery, status of wanted pregnancy, and birth order. Findings may be used as advocacy tool for policymakers and health managers to develop policies and strategies that could lead to increases in the proportion of women who deliver in health facilities. These findings may provide women and their newborns an opportunity for quality of care from antenatal care through delivery, which may

ultimately lead to reductions in morbidity and mortality amongst women and newborns. These findings have the potential of positive social change in the lives of mothers and children in Nigeria.

In this chapter, I provide an overview of sociodemographic and pregnancy risk factors and place of delivery in Northern Nigeria. The following sections include the background, problem statement, purpose of the study, research questions, conceptual framework, nature of the study, definitions, assumptions, scope and delimitations, limitations, significance, and a summary.

Background

There have been several studies in Nigeria that examined factors such as age, residence location, ethnicity, socioeconomics, educational levels, religion, quality index, antenatal care attendance, and other personal reasons for use of health facilities for delivery. Egharevba et al. (2017) found that 75% of women who registered for ANC delivered at health facilities while 15% delivered at home or were assisted using traditional birth attendance (TBA). Some predictors of place of delivery are number of children, decision to deliver at a hospital, labor occurring at night and transportation. Ogbo et al. (2020) investigated trends and factors that drive the use of unskilled birth attendants during democratic governance in Nigeria from 1999 to 2018. Higher parental education, maternal employment, coming from a rich household, higher maternal age, frequent ANC visits, nearness of health facilities, and female autonomy in households contributed to a lower odds of unskilled birth attendants. Rural residence, geopolitical

region, lower maternal age (15–24 years), and higher birth intervals of 2 years were associated with higher odds of unskilled birth attendants assisting deliveries.

This quantitative cross-sectional study involved using national household data from the Nigeria Demographic and Health Survey (NDHS) in 2018 to determine the influence of sociodemographic factors and pregnancy risk factors on the choice of place of delivery amongst women of reproductive age in Northern Nigeria. This study provides information regarding additional determinants of place of delivery amongst women of reproductive age in northern Nigeria. This study will provide a comprehensive understanding of reasons to guide appropriate interventions to address problems associated with maternal morbidity and mortality, which will ultimately improve maternal health outcomes in Nigeria. Findings may be used as advocacy tool for the development of policies and strategies that could lead to increases in the proportion of women who deliver in health facilities.

Problem Statement

In 2017, it was estimated that about 295,000 women died during pregnancy and childbirth worldwide (World Health Organization [WHO], 2019). Ninety-four percent of these deaths are preventable and occur in low-resource settings. During the same year, approximately 810 women died each day from pregnancy and childbirth. Countries in Sub-Saharan Africa and Southern Asia accounted for 196,000 and 58,000 maternal deaths, respectively (WHO, 2019). The maternal mortality ratio (MMR) in low-income countries during 2017 was 462 per 100,000 live births when compared with 11 per

100,000 live births in high-income countries (WHO, 2019). One out of every 13 women in Nigeria die during childbirth (Egharevba et al., 2017). Most of these deaths are due to hemorrhage, infections, unsafe abortions, eclampsia, and obstructed labor, which are preventable (Egharevba et al., 2017).

Abubakar et al. (2017) said over 80% of deliveries that takes place at home were attended to by an unskilled person, increasing the chances of perinatal mortality. To prevent maternal and child morbidity and mortality during pregnancies and childbirth, health facilities provide ANC services to women who avail themselves. Seventy-five percent of women who registered for ANC delivered at health facilities, while 15% delivered at home or assisted by TBA (Egharevba et al., 2017). According to Yaya et al. (2018), 45.4% of rural women feel that facility deliveries are not necessary because health facilities may be too far away with no transport. Costs of delivery at health facilities were too high, and therefore, efforts that address regional disparities in terms of accessing maternal healthcare services through health promotion programs may improve delivery at health facilities.

Approximately 62% of women did not deliver at health facilities and 92% of those who did not attend ANC did not use health facilities for delivery. Chances of nonuse of health facilities for delivery increases with individuals living in poor households, those aged 25–34 years, are unmarried, or are women who live in socioeconomically disadvantaged communities (Adedokun & Uthman, 2019). Abimbola et al. (2016) said that barriers to women using ANC and delivery services are poor

attitude of health workers and husbands not given their wives permission to go for health care services, lack of money, long waiting time at health facilities, distance of health facility from communities. Iberekodo et al. (2019) found that only 24% of mothers delivered in infant welfare clinics compared to 76% of those who delivered at nonhospital-based facilities.

Shehu et al. (2016) said 65% of urban women and 4.75% of rural women in Sokoto, Nigeria delivered in health facilities, while 70% of urban and 4.3% of rural women had skilled attendants at delivery. Home delivery is higher in rural compared to urban Nigeria, and factors responsible differ to varying degrees between rural and urban settings. Women in urban settings who are 36 years or older are less likely to deliver at home and prefer health facility delivery, while those under 20 are more likely to deliver at home (Adewuyi & Auta, 2017). The proportion of women who delivered at health facilities was 39.8%, and 67% of these were from urban settings compared to 30.2% from rural counterparts (Yaya et al., 2019). Ogbo et al. (2020) found that higher parental education, maternal employment, coming from a rich household, higher maternal age (35–49 years), frequent ANC visits, nearness of health facilities, and female autonomy in households contributed to lower odds of unskilled birth attendant use.

This quantitative cross-sectional study involved using national household NDHS data from 2018 to describe the influence of determinants of place of delivery on the three types of delays using the three delays model. These determinants include

sociodemographic factors and pregnancy risk factors as well as their influence on choice of place of delivery amongst women of reproductive age in Northern Nigeria.

Purpose of Study

The aim of this quantitative cross-sectional study was to determine the influence of sociodemographic factors and pregnancy risk factors on choice of place of delivery amongst women of reproductive age in Northern Nigeria. In this study, secondary data were reviewed and analyzed using Thaddeus and Maine's three delays model.

The dependent variable is place of delivery, and this is defined as any place where a woman delivered or had a childbirth. It can be a health facility or outside a health facility such as at home. Home can be a woman's home, in the house of a TBA, in church, or in homes of friends or relations or any non-healthcare facility. Independent variables are husband's occupation, household wealth, perceived cost of delivery, perceived cost of transportation, ANC usage, perception of quality of care at delivery, status of wanted pregnancy, and birth order. The control variables are age, residence (rural/urban), woman's education level, and husband's education level. Control variables were used to control for the independent variables to minimize potential interference of associations between independent variables and place of delivery, which may lead to errors in interpretation. However, control variables were also examined as independent variables, and associations with the dependent variable were determined.

Research Questions

RQ1: Is there an association between women's age, residence (rural/urban), education level, and husband's education level and choice of place of delivery among women of reproductive age in Northern Nigeria?

H_01: There is no association between women's age, residence (rural/urban), education level and husband's education level and choice of place of delivery among women of reproductive age in Northern Nigeria.

H_a1: There is an association between women's age, residence (rural/urban), education level, and husband's education level and choice of place of delivery among women of reproductive age in Northern Nigeria.

RQ2: Is there an association between husbands' occupation, household wealth, perceived cost of delivery at health facilities, perceived cost of transportation due to distance of health facilities, and choice of place of delivery among women of reproductive age in Northern Nigeria after controlling for women's age, residence (rural/urban), and education level as well as husbands' education level?

H_02: There is no association between husbands' occupation, household wealth, perceived cost of delivery at health facilities, perceived cost of transportation due to distance of health facilities, and choice of place of delivery among women of reproductive age in Northern Nigeria after controlling for women's age, residence (rural/urban), and education level as well as husbands' education level.

H_a2: There is an association between husbands' occupation, household wealth, perceived cost of delivery at health facilities, perceived cost of transportation due to distance of health facilities, and choice of place of delivery among women of reproductive age in Northern Nigeria after controlling for women's age, residence, and education level as well as husbands' education level.

RQ3: Is there an association between pregnancy risk factors (ANC use, perceived quality of care at delivery, status of wanted pregnancy, and birth order) and choice of place of delivery among women of reproductive age in Northern Nigeria after controlling for their age, residence (rural/urban), and education level as well as husbands' education level?

H_03: There is no association between pregnancy risk factors (ANC use, perceived quality of care at delivery, status of wanted pregnancy, and birth order) and choice of place of delivery among women of reproductive age in Northern Nigeria after controlling for their age, residence (rural/urban), and education level as well as husbands' education level.

H_a3: There is an association between pregnancy risk factors (ANC use, perceived quality of care at delivery, status of wanted pregnancy, and birth order) and choice of place of delivery among women of reproductive age in Northern Nigeria after controlling for their age, residence (rural/urban), and education level as well as husbands' education level.

Theoretical Foundation

Thaddeus and Maine's three delays model is the theoretical foundation for this dissertation. The theory involves factors associated with delays in choice of delivery place. The theoretical framework is a comprehensive approach applied to examine barriers to seeking obstetric care that when addressed can prevent maternal mortality.

Variables to consider for first delay are sociodemographic factors such as maternal age, marital status, religion, ethnicity, distance to nearest obstetric center, education levels, women's decision-making power regarding healthcare use, and husbands' choice of delivery place. Second delay variables include women and husbands' occupations, household wealth status, cost for transport, distance to health facilities, suitability of roads, and availability of transport services. Third delay variables include exposure to mass media, knowledge about complications during delivery, status of wanted pregnancy, ANC use during last pregnancy, perceived quality of care, previous hospital delivery status, length of time between births, birth order, and past pregnancy complications.

This study is a quantitative cross-sectional that involved using the three delays model to determine the influence of sociodemographic factors and pregnancy risk factors on the choice of place of delivery amongst women of reproductive age in Northern Nigeria. The control variables for this study are women's age, residence (rural/urban), and education levels as well as husbands' education levels. Influences of these variables

on place of delivery are described as well. More details regarding the theoretical foundation are described in Chapter 2.

Nature of the Study

This study was a quantitative cross-sectional study of women of reproductive age in Northern Nigeria. In this study, I used secondary data that were generated using the NDHS conducted by the National Population Commission of Nigeria in 2018 in states in Northern Nigeria. The aim of this study was to determine the influence of sociodemographic and pregnancy risk factors on the choice of place of delivery amongst women of reproductive age in Northern Nigeria. The dependent variable in this study is place of delivery which can either be public health facilities, private health facilities, or homes.

Variables involving making decisions to seek care include sociodemographic factors such as women's age, residence (rural/urban), and educational level as well as husbands' education level. Variables involving identifying and reaching health facilities include husbands' occupation, household wealth, perceived cost of delivery at health facility, and perceived cost of transportation due to distance from health facility. Variables for receiving quality care include ANC, perceived quality of care at delivery, status of wanted pregnancy, and birth order.

Data from the NDHS in 2018 was used as a secondary data source for this dissertation. As part of preparation for the analysis of secondary data, variables for this study were outlined, relabeled in terms of missing information, and recoded where

necessary in order to answer the research questions. Statistical software used for analysis in this study was SPSS version 25. This instrument is used to conduct descriptive and inferential statistics.

Descriptive statistics frequency distribution, means, cross-tabulation, and chi-square tests of independence. Binary logistic regression was used to analyze associations between independent and dependent variables. Statistical power was set at 80% and a beta value of 20% (Type II error). A confidence level was set at 95% (0.95) and alpha value of 5% (0.05), which was used to determine the statistical significance of associations between independent variables. An analysis of odds and odd ratios (OR) of health facility and home delivery was carried out.

Definitions

Age: The length of time in years that a living being has lived or existed.

Antenatal Care (ANC): Care provided to women when they are pregnant and before birth from skilled health personnel. This care includes health promotion, screening of risk factors, treatment of ailments and diseases, and management of pregnancy-related complications (Acharya et al., 2015).

Birth order: The order in which children are born into a family.

Educational level: The highest level of formal schooling that a human has attended.

Home Delivery: Any delivery or childbirth conducted outside a health facility either public or private. This can be in the woman's home, the house of a TBA, churches

or homes of friends or relations, or any non-healthcare facility. Delivery is usual attended to by those who are not formally trained as TBAs (Habte & Demissie, 2015)

Household wealth: Net worth of different groups or individuals. Net worth is determined after deducting total value of outstanding liabilities from the value of total assets and is expressed as a percentage of net disposable income.

Perceived cost of delivery: Perceptions of estimated amount of money to deliver children in health facilities. This can depend on factors such as medical condition of the baby at birth, duration of stay in the health facility, type of health facility (public or private), and state/province where the woman delivers.

Private Health Facility Delivery: Any delivery or childbirth conducted in a private-owned designated health facility. This can be individual owned, organization-owned, or faith-based. Delivery is usually attended by a skilled birth attendant (Stanley et al., 2016).

Public Health Facility Delivery: Any delivery or childbirth conducted in a government-owned designated health facility. This can be a hospital, primary health center, clinic, health post, or health center. Delivery is usual attended by a skilled birth attendant (Stanley et al., 2016).

Residence: Home that can be located in urban or rural settings.

Skilled Birth Attendants: Any healthcare worker who has formal knowledge, skills, and training to provide care to pregnant women, deliver children, and provide care

after delivery to mothers and newborns. They include nurses, midwives, and physicians (WHO, 2015).

Wanted pregnancy: A wanted pregnancy is when a woman wants to bear children. An unwanted or unintended pregnancy is a pregnancy that occurs when no children are desired. A pregnancy is mistimed when such pregnancy occurs earlier than desired.

Assumptions

It was assumed that respondents answered questions truthfully, sincerely, and accurately, and there was no bias in their responses. It was also assumed that the study population was representative of the general population of women of reproductive age in northern Nigeria. These assumptions are necessary so that findings from this study explain behavior of women of reproductive age in communities under study, and results can be generalized to outside this study population.

Scope and Delimitations

This study was intended to explain possible factors associated with choice of place of delivery. These factors that are described in this study include sociodemographic factors. Factors excluded in this study include exposure to media, knowledge about complications during delivery, previous hospital delivery, birth intervals, past pregnancy complications, and perceived threat of home delivery. Reasons why they were excluded are described in Chapter 2. Findings from this study may assist policy makers and health administrators to design appropriate interventions which could increase rates of facility delivery with the aim of improving maternal and new birth health outcomes.

This study involved using Thaddeus and Maine's three delays model to describe the determinants of place of delivery amongst women of reproductive age in northern Nigeria. This study did not study women of reproductive age from southern Nigeria and did not study neonates or infants of these women, even though they are closely- related. The choice of study in Northern and not Southern Nigeria was because the health indices of women in the Northern part of the country were poor compared to the Southern area (Ogbo et al., 2020). Because respondents were randomly selected and the sample size was adequate, findings from this study will be generalizable to women of reproductive age from Northern Nigeria.

Limitations

One limitation of using secondary data is that the validity and reliability of the NDHS was not tested in this study. Secondly, this study did not test effects of non-sampling or sampling errors on internal validity of the secondary data.

This study used data from 41,821 women aged between 15 and 49 years who were interviewed using the NDHS in Nigeria in 2018. Statistical power in this study was set at 80% along with a beta value of 20% (Type II error). A confidence level set at 95% (0.95) as well as an alpha value of 5% (0.05; Type I error), which was used to determine the statistical significance of associations between independent variables. These will prevent threats to statistical validity.

I discovered at the point of data collection and analysis that some of the independent variables I planned to study had no data; hence, these variables were excluded during analysis.

Significance

The study includes information regarding additional determinants of place of delivery amongst women of reproductive age in northern Nigeria. These determinants include husbands' education level, household wealth, ANC use, status of wanted pregnancy, and birth order. Findings from this study when fully implemented by policymakers and health managers may lead to increases in the proportion of women who deliver in health facilities, which may ultimately lead to reductions in morbidity and mortality amongst women and newborns. These findings also have the potential to support the design and implementation of population-based programs involving the lives of mothers and their newborns in Nigeria.

Summary

In 2017, 295,000 women died during pregnancy and childbirth worldwide (WHO, 2019). Ninety-four percent of these deaths are preventable and occur in low-resource settings. During the same year, approximately 810 women died each day from pregnancies and childbirth. One out of every 13 women in Nigeria die during childbirth (Egharevba et al., 2017). Most of these deaths are due to hemorrhage, infections, unsafe abortions, eclampsia, and obstructed labor, which are preventable (Egharevba et al., 2017). To prevent maternal and child morbidity and mortality during pregnancies and

childbirth, health facilities (Hospitals, Clinics and Primary Health Centers) provided antenatal care services to women who avail themselves (Abubakar et al., 2017).

SPSS version 25 was used to conduct descriptive and inferential statistics on the data set obtained from the NDHS conducted in Nigeria in 2018 to determine associations between independent variables and the dependent variable.

Chapter 2 includes literature search strategies, the conceptual framework, and a literature review related to key variables and concepts.

Chapter 2: Literature Review

Introduction

According to the WHO (2019), during 2017, about 295,000 women died during pregnancy and childbirth worldwide, and 94% of these deaths which occurred in low-income countries were preventable. About 196,000 and 58,000 maternal deaths occur in Sub-Saharan Africa and Southern Asia countries, respectively. The MMR in low-income countries in the year 2017 was 462 per 100,000 live births when compared with 11 per 100,000 live births in high-income countries (WHO, 2019). In Nigeria, one out of every 13 women die during childbirth (Egharevba et al., 2017). Deaths are mostly due to hemorrhage, unsafe abortions, infections, eclampsia, and obstructed labor, which are preventable (Egharevba et al., 2017). In Nigeria, over 80% of deliveries take place at home and are attended by an unskilled person, increasing the chances of perinatal mortality (Abubakar et al., 2017).

The aim of this quantitative cross-sectional study was to determine the influence of women's age, residence, and education level as well as husbands' education level and occupation and household wealth as well as perceived cost of delivery and transportation, ANC use, perceptions of quality of care at delivery, status of wanted pregnancy, and birth order on choice of place of delivery amongst women of reproductive age (15-49 years) in Northern Nigeria. This study will provide guidance to policymakers and health managers to develop appropriate interventions that could improve delivery at health facilities, which may ultimately lead to improved maternal health outcomes in Nigeria.

This chapter includes literature search strategies, information about the theoretical foundation, a literature review involving key variables, and conclusions. The literature review section involves synthesizing studies related to key research variables and theoretical foundation, methods and research questions. The conclusion section summarizes major themes in the literature, what is known and not known, gaps in literature that this study fills, and methods.

Literature Search Strategy

Most databases used for the literature review were accessed using the Walden University Library. These databases were BioMed Central, EBSCOHost, MEDLINE, ProQuest, PubMed, Science Direct. and Google Scholar. Key search words were *home delivery*, *health facility childbirth*, *influences on choice of place of delivery*, *models or theories applied in maternal health*, *mixed methods in childbirth*, *women of child bearing age*, and *women of reproductive age.* Literature included peer-reviewed studies regarding determinants of child delivery at health facility and at home published between 2015 and 2020 that were written in English and published in all regions of the world. All the articles were found electronically.

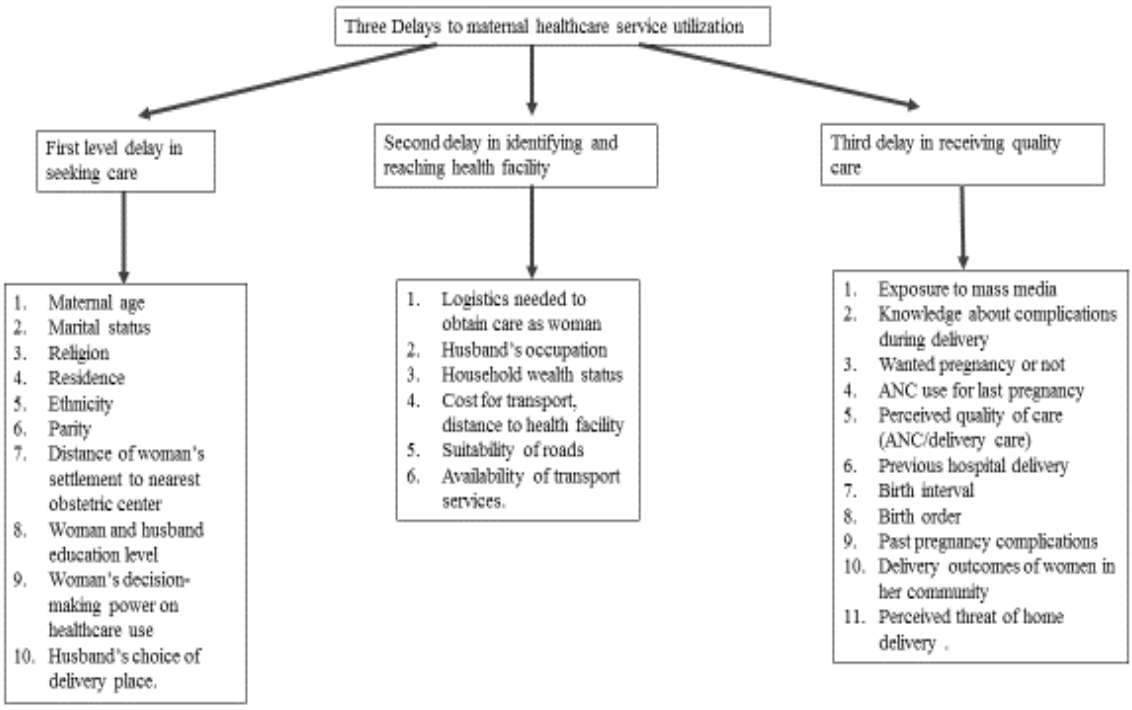
Theoretical Foundation

Thaddeus and Maine's three delays model is the theoretical foundation for this study. The three delays model involves factors associated with delays in the choice of delivery place. The first delay in seeking care involves predisposing characteristics, while the second delay in identifying and reaching health facility involves enabling

characteristics, and the third delay in receiving quality care in health facilities involves perceived benefits and needs. Variables involved with first delay include maternal age, marital status, religion, ethnicity, parity, residence, distance to nearest obstetric center, education levels, choice of delivery place. Second delay variables include occupation, household wealth status, costs for transport, distance to health facility, suitability of roads, and availability of transport services. Third delay variables are functional and health problems factors that generate the need for healthcare services, such as exposure to mass media, knowledge about complications during delivery, status of wanted pregnancy, ANC use in terms of last pregnancy, perceived quality of care, previous hospital delivery factors, birth intervals, birth order, past pregnancy complications, delivery outcomes, and perceived threats of home delivery (Kifle et al., 2018).

Figure 1

Three Delays Model



Delay in seeking maternal health care is one determinant of choice of place of delivery. Age, parity, educational status, occupation, and number of antenatal visits significantly affect place of delivery amongst women from tribal areas of the Block Hazratbal district of Srinagar (Mukhtar et al., 2018). Jackson et al. (2016) said factors related to reducing the first delay include tradition of home birth and distance of health facilities from communities. Women whose husbands are educated and jointly make decisions regarding place of delivery are more likely to deliver in health facilities.

Women who had means of transport in rural areas of Eritrea with medium to high wealth status are more likely to deliver in facilities within 2 kilometers (Kifle et al., 2018).

Men must be engaged to promote women and child health as decision makers (Jackson et al., 2016). Communities should be involved to identify problems women faced in achieving safe deliveries so they can support in the design of solutions to address them. There is the need for more research into the community maternal health needs and culturally appropriate strategies for safe childbirth. Addressing factors responsible for first delays alone will not improve the utilization of maternal care at health facilities, hence the need to determine factors associated with a woman identifying and reaching health facility to receive care.

Pregnancy risk factors responsible for identifying and reaching health facility or maternal care are considered as second delays. One major cause of second delays in Malawi was distance to a healthcare facility (Mgawadere et al., 2017). Ngoma-Hazemba et al., 2019 in a study carried out in Zambia, agrees with the fact that perceived distance to a health facility was responsible for second delay. Another factor closely related to distance of health facility to women is poor access roads (Ngoma-Hazemba et al., 2019). Other predictors of second delay to choice of place of delivery are decision to deliver at a hospital and transportation in Nigeria (Egharevba et al., 2017). Jackson et al. (2016) also found that distance of health facility from communities and unavailability of transport were responsible for second delay to utilization of maternal services in health facilities in three locations where the study was conducted in Ethiopia. In another study in Ethiopia,

health workers in some locations made effort to assist women to deliver in health facilities, whereas in other locations the health workers were discouraged from calling ambulances to take women to health facility to deliver (Tesfay et al., 2016). Ngoma-Hazemba et al. (2019) also found that fees charge on pregnant women was responsible for second delays to maternal care at health facilities.

To address the factors responsible for second delay, financial provision must be put in place to transport women with many children to deliver in health facility (Egharevba et al., 2017). Jackson et al. (2016) recommended that referral system must be strengthened at all levels with provision of transport to convey women free of charge. In addition, the provision of incentives or compensations to make up for transport cost that could address common barriers to transportation to health facilities to utilize maternal care by women (Kifle et al., 2018). Addressing factors responsible for first and second delays to utilization of maternal care at health facility without addressing factors responsible for third delay may not lead to the desired improvement in delivery at health facilities.

The third delay to the utilization of maternal care at facility is determined by the quality of care that a women received. The fear of being maltreated in hospitals, lack of awareness of signs of obstetric complications, lack of antenatal care, negative attitude of healthcare worker, and lack of blood availability were associated with third delays among women who were admitted in Women's Health Hospital in Assiut University, Egypt (Abdel‐Raheema et al., 2017). In addition, women who are literate and read newspapers,

knowledgeable about complications during delivery, had good perception on the quality of care they received, previously delivered in a facility, and perceive home delivery as life threatening, were more likely to deliver in health facility (Kifle et al., 2018).

Verbal autopsy and review of facility records at some facilities in Malawi indicated that almost all of the women (96.8%) who died were due to type three delays as long waiting hours before receiving treatment at a healthcare facility (14.6%), multiple delays at the time of admission, shortage of drugs (63.1%), non-availability (23.4%) and incompetence of skilled staff (16%) (Mgawadere et al., 2017). Ngoma-Hazemba et al. (2019) also agrees that perceived quality of care, shortage of health workers, equipment and infrastructures are third delay factors that influences healthcare-seeking behavior of women. Health facility infrastructures and equipment must be improved to address third delays to maternal care. To address third delay, there should be adequate blood banks and operating theaters, improvement in staff communication skills and improved referral systems (Abdel‐Raheema et al., 2017). Egharevba et al., 2017 found 75% of women who registered for ANC delivered at health facility. Therefore, women must be encouraged to book early for ANC so as to increase the chances of utilization of health facilities for delivery,

The only study in Nigeria that examined factors that influenced or determined utilization of healthcare facility delivery services among women who attended antenatal care (ANC) services using the three delays model was by Egharevba et al. (2017). However, Egharevba et al. (2017) did not examine residence, household wealth, cost of

delivery, perception of quality of care, wanted pregnancy and birth order along the three delays of Thaddeus and Maine's three delays model to describe their association with place of delivery and therefore, I examined these factors in this study.

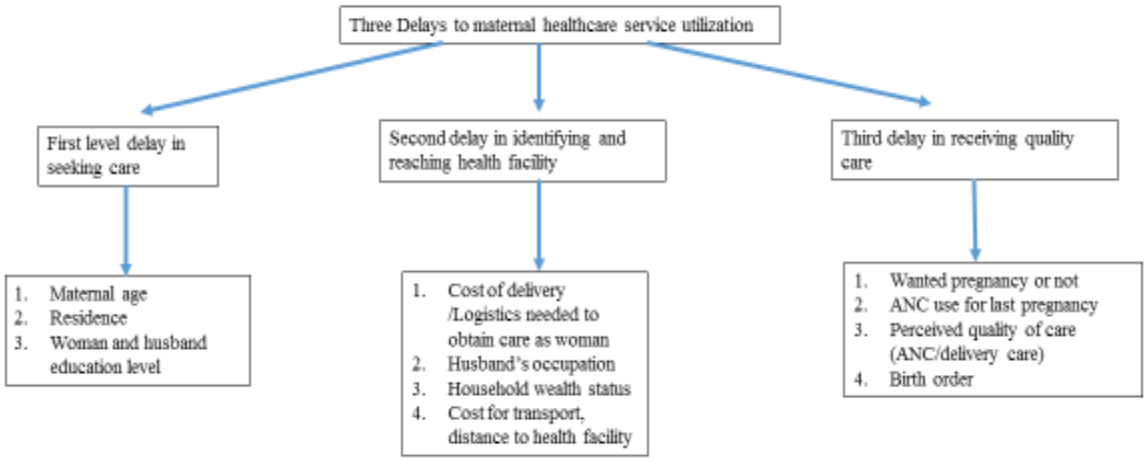
This study, is a quantitative cross-sectional that used the three delays model to determine the influence of women's age, residence, and education level as well as husbands' education level and occupation and household wealth as well as perceived cost of delivery and transportation, ANC use, perceptions of quality of care at delivery, status of wanted pregnancy, and birth order on choice of place of delivery amongst women of reproductive age (15-49 years) in Northern Nigeria. This study controlled women's age, residence, education level and husband's education level for independent variables husband's occupation, household wealth, antenatal care usage, status of wanted pregnancy and birth order to prevent their possible effect on place of delivery. The control variables' influence on place of delivery as independent variables was determined in this study.

The three delays model was applied in this study to explore the three types of delays to utilizing services at the hospital with the aim of designing the right intervention to improve childbirth at health facilities. To achieve this, the three research questions were developed using the three delays model as theoretical foundation (Figure 2). The secondary data used for this study selected variables to align with the Thaddeus and Maine's three delays model. The findings of this study will be used to design interventions to address delays in making decision to seek care at health facility (first

delay), delays associated with identifying and reaching health facility (second delay) and delays associated with receiving quality care (third delay).

Figure 2

Independent Variables



There are several variables in the three delays model that were not included in this study. These are sociodemographic factors (marital status, religion. ethnicity), parity, woman 'decision making power, distance of woman settlement to nearest health center and husband choice of delivery place associated with first delays. The second delay factors not included are suitability of road and availability of transport. Third delay

factors excluded in the study are exposure to media, knowledge about complications during delivery, previous hospital delivery, birth interval, past pregnancy complication, delivery outcome of women in her community and perceived threat of home delivery.

The first reason why these variables or factors were not used in this study, was woman decision making power, husband choice of place of delivery, distance of woman's settlement from health facility, suitability of road, availability of transport service, exposure to media, knowledge about complications during delivery, previous hospital delivery, birth interval, past pregnancy complication, delivery outcome of women in her community and perceived threat of home delivery were not captured in the National Demographic Health Survey database of 2018, which is the secondary data for this study.

The second reason was that Egharevba et al. (2017) studied factors such as age, ethnicity, religion, education, ANC visits, quality of care, distance of health facility to woman's settlement, transportation, previous experience with delivery, maternal economic status and husband education and so it is not necessary to study same factors in same country. Although these variables were studied by Egharevba et al. (2017), few of these variables were still included in this study. The factors included were woman's age, educational level, and husband educational level, ANC usage, transportation and perception of quality of care. The effect of these factors as independent variables on place of delivery was determined.

Third reason is that the aim of the study was primarily to study determinants of place of delivery that were never studied in Nigeria using the three delays model and these factors are residence (urban/rural), household wealth, perceived cost of delivery, perceived cost of transportation, status of wanted pregnancy and birth order.

Lastly, it is better to keep the study simple focusing on literature gaps to complement similar study in Nigeria.

Literature Review Related to Key Variables and Concepts

Studies Related to Constructs, Methodology, and Methods

Majority of pregnant women who came to in the health facility in Malawi for care but died were due to type three delays (delay in receiving quality care) such as long waiting hours before receiving treatment at a healthcare facility, multiple delays at the time of admission, shortage of drugs, and non-availability and incompetence of skilled staff. Mgawadere et al., 2017 found distance to a healthcare facility as a major cause of type 2 delay (delays in identifying and reaching health facility for care) in a study conducted in Malawi to determine the factors associated with maternal mortality in Malawi using the three delay model. determine. The authors reviewed verbal autopsy reports and facility-based medical record to determine the factors responsible for the death of women who died at a healthcare facility and at home but had previously received maternity care, and those who died at home and did not receive maternity care. Sixty-two percent of mothers died in a healthcare facility and 21.2% of mothers died at home after they had accessed care at a healthcare facility (Mgawadere et al., 2017). One limitation of

the finding is that it can only be localized in the health facility where the study was conducted, because hospital records were analyzed.

In both Ethiopia and Nigeria, over 45% of rural women believe delivery at health facility is unnecessary because of financial difficulties they faced and cost of transportation. To reduce maternal and newborn mortality, efforts must be put in place to understand why women feel child birth at health facility is not necessary in Nigeria and Ethiopia (Yaya et al., 2018). This were findings from a cross-sectional quantitative study that used demographic health survey (DHS) on women of child bearing age 15–49 years from Ethiopia and Nigeria.

In a similar cross-sectional quantitative study that reviewed the deliveries in the five-year survey period for women aged 15-49 using Demographic and Health Surveys in the 25 sub-Saharan countries between two periods of 2000-2007 and 2008-2016, the percentage of delivery at health facility varied across countries from 5%-85% and 22% to 92% in 2000-2007 and 2008-2016 respectively (Doctor et al., 2017). The lowest delivery rate in private facilities in 2000-2007 was in Ethiopia (0.3%) and the highest was in the Democratic Republic of Congo at 20.5%. The lowest delivery rate in private facility in 2008-2016, ranged from 0.6% in Niger to 22.3% in Gabon (Doctor et al., 2017). The largest number of deliveries in the 25 sub-Saharan countries was in the public health facility. Delivery at health facility was significantly lower in the poorest compared to wealthiest women (Doctor et al., 2017). To achieve the goal of universal health coverage

for a better quality services, private sector must be sensitized to enhance performance of the health care system (Doctor et al., 2017).

In another quantitative study conducted to identify factors influencing choice of place of birth among 100 women attending Infant Welfare Clinic at Iberekodo, Abeokuta, where participants were purposively selected and a closed-ended questionnaire was administered (Ihunanya et al., 2019). The authors found that only 24% of the mothers delivered in the hospitals compared to 76% who delivered at non–hospital-based facilities (religious centers 48%, home of traditional healers 26%). There was no significant relationship between mother's educational status, parity and her choice of place delivery. In addition, the influence of husband, parents, parent-in laws, cost and affordability, nearness to health facility, staff attitude and convenience are associated with a woman's choice of place of delivery. Hence, efforts should be put in place to reduce the cost of perinatal services in health facilities and take primary health center closest to the communities and address husband and family perception of place of delivery. However, because participants were purposively selected, the findings cannot be generalized, but only applied to area where the study was conducted.

Shehu et al. 2016 in a similar quantitative study conducted in Sokoto state, Nigeria to determine factors that influence the choice of place of delivery among women in urban and rural community, 65% of urban women and 4.75% of rural women delivered in health facilities, and 70% of the urban and 4.3% of the rural women had skilled attendants at delivery. The reasons for home deliveries amongst the urban women include

lack of consent from husband, lack of privacy in health facilities, far distance of communities to the nearest health facility and lack of delivery wards in the health facilities. These findings were in agreement with what Ihunanya et al. (2019) found in their study. Additionally, 53% of home deliveries were emergency in nature for urban groups and 15.4% for rural respondents, hence the reason for home delivery amongst them. To meet the International Conference on Population and Development target of achieving 90% deliveries attended by skilled attendants which was set in 2015, women residing in rural areas must be given health education or promotion (Shehu et al., 2016). The findings from Shehu et al. (2016) can be generalized, because the participants were randomly selected. Johnson et al., 2020 conducted a cross‐sectional quantitative study among mothers who attended Primary Health Center in West Itam, Itu, Nigeria with the aim to determine the choices and determinants of delivery locations among mothers. The authors found out that 64.9% of the women delivered at health facility, 23.3% delivered at traditional birth attendant's place (23.3%), 6.3% in their residences and 5.4% in the church (Johnson et al., 2020). Factors that influenced their choice of place of delivery include distance, cost of delivery, skills of healthcare workers, drug availability and attitude of healthcare workers in 45.4%, 34.6%, 30.3%, 27.6% and 26.5% respondents respectively (Johnson et al., 2020). These findings were similar to findings in the quantitative studies by Ihunanya et al., (2019) and Shehu et al. (2016) conducted in Nigeria.

Johnson et al. (2020) in addition found that level of education and income of respondents and spouses significantly increase the rate of utilization of healthcare facilities for delivery, which differ from finding by Ihunanya et al. (2016) that there was no significant relationship between mother's educational status and her choice of place delivery. To encourage women to delivery in health facilities, pregnant women should be offered free or highly subsidized healthcare services, health personnel to develop better relationship with clients and, women should be educated on the benefits of delivery at heath facility to be able to make an informed decision on choices of place of delivery and other health services (Johnson et al., 2020).

Health workers interviewed in rural health facility in Tanzania, reported that providing quality medical care was challenging because "It's hard to respect women's preferences", "Striving to fulfill women's needs with limited resources", and "Trying to facilitate women's access to services at the face of transport and cost barriers" (John et al., 2018). This has left health workers frustrated because of inadequate material and human resources, poor motivation and lack of supervision that are needed to ensure quality maternal health care services. Pregnant women can also not afford to pay for quality services due to high out-of-pocket costs for services, due to inadequate or lack of equipment or supplies that government was meant to make available free of charge to patient (John et al., 2018). This was finding from a qualitative study to understand maternal health services' delivery from the perspective of rural health workers', and determine barriers to quality maternal health care in rural Tanzania (John et al., 2018).

One advantage of the qualitative finding is that it provides and in-depth understanding of quality of care given to women at health facility in rural Tanzania, but the limitation is that the findings cannot be generalized, hence the need for a quantitative study that had participants randomly selected.

In a mixed method study design where quantitative and qualitative information around perceived quality of care were independently collected in the same location, the quantitative findings were 93% of women had confidence in the health personnel in the hospital, 61% of women felt required drugs and equipment were available, 60% of women reported that drinking water was accessible, even though interaction with staff was positive only 51% of the respondents were given time to ask health personnel questions, out-of-pocket expenditures were higher in hospitals, health centers and dispensaries as reported by 49%, 53% and 31% respondents respectively (Tancred et al., 2016). However, qualitative findings were that respondents lacked confidence in facility readiness, reported high out-of-pocket payments and difficulty accessing water and some respondents felt staff were disrespectful, not polite, which were the opposite of the quantitative findings except for high out-of-pocket expenditure reported by respondents (Tancred et al., 2016).

In a similar mixed method study design to identify and understand the determinants of persistently low institutional birth in rural Nepal, the quantitative findings were that 90% of respondents who had childbirth in the hospital reported safety and good care as the most important factors that determine location of birth, whereas 60

% of respondents who had childbirth at home reported distance from hospital as a key determinant of location of birth (Maru et al., 2016). Findings from qualitative analysis revealed that social support, financial resources, birth planning, awareness of services, perception of safety, and referral capacity are essential interventions to achieving an institutional birth (Maru et al., 2016). Mixed methods proved valuable in capturing the experiences of users of maternal and newborn health services, when compared with studies that were quantitative or qualitative alone, hence the need for a mixed method in future research (Maru et al., 2016).

Rationale for Study Variables

The dependent variable in this study is place of delivery among women of reproductive age (15-49) in Northern Nigeria. Places of deliveries are basically two: health facility and at home. Health facilities are sub-divided into public and private. In Nigeria, 26% of deliveries happen in public health facilities, 13% of deliveries in private health facilities and 59% take place at home (National Population Commission, Nigeria, 2019). To reduce maternal and newborn mortality, deliveries should take place either in public or private health facilities, where there are trained health officers or workers who can manage obstetric and newborn complications during delivery. In this study the dependent variables delivery place is categorized into two: namely health facility and home (National Population Commission, Nigeria, 2019).

This study has twelve independent variables as sociodemographic factors (woman's age, residence (rural/urban), education level, husband education level,

occupation, and household wealth), pregnancy risk factors (perceived cost of delivery, perceived cost of transportation, antenatal care usage, perception of quality of care at delivery, status of wanted pregnancy and birth order). These variables are grouped into three along the Thaddeus and Maine's three delays model, on maternal health care utilization which are delay in making decision to seek care at health facility (first delay), delay associated with identifying and reaching health facility (second delay) and delay associated with receiving quality care (third delay).

The variables for making decision to seek care are age, residence (rural/urban) and mothers educational level and husband education level. The age refers to the length of time in years that a living being has lived or existed as the time of survey. Residence is a woman's home or where she is living as at time of survey. It can be located in an urban or rural settings. Educational level is the highest level of formal schooling that a human has attended.

The variables for identifying and reaching health facilities are husband's occupation, household wealth, perceived cost of delivery at health facility, perceived cost of transportation due to distance of health facility. Husband occupation is the job or profession of the woman's husband. Household wealth is Net worth for a woman or the family and it I used in economics to compare the wealth of different groups or individuals. Net worth is determined after deducting total value of outstanding liabilities form from the value of total assets and is expressed as a percentage of net disposable income. Perceived cost of delivery at health facility is whether the amount of money a

woman spends (expenditure) to deliver in a health facility influenced her choice of place of delivery is perceptions of estimated amount of money she will spend (expenditure) to deliver her children in a health facility. Perceived cost of transportation due to distance of health facility is whether the amount of money that a woman will spend to go to a health facility to deliver and from health facility back home. The variables for receiving quality care are ANC usage, perceived quality of care at deliver, wanted pregnancy and birth order. ANC usage is the number of times a woman gets care from a health care provider or professionals during her pregnancy. WHO recommended that a woman receive at least 4 antenatal visits for the period of her pregnancy (Egharevba et al., 2017). Perceived quality of care at delivery is the woman's perception of the extent to which health care services provided to her improve her desired health outcomes. To achieve this the health care service must be safe, effective, timely, efficient, equitable, and people-centered (Bohren et al., 2017). Wanted pregnancy is when a woman wants to bear children and she got pregnant at the time it happened. Unwanted or unintended pregnancy is pregnancy that occurred when no children or more children is desired. A pregnancy is said to be mistimed, when such pregnancy occurred earlier than desired (CDC, 2019). Birth order is the order a child in born in a family. In this study the order of the child surveyed in the family of a women who participated in the survey was used.

Four of the independent variables will serve as control variables for other independent variables in this study. These control variables are woman's age, residence (rural/urban), educational level, and husband education level.

Place of Delivery

Most of the cause of maternal death are hemorrhage, unsafe abortion, sepsis, hypertension and obstructed labor. These are difficult to predict and occur during delivery. However, these can be managed and prevented through health facility delivery by a skilled birth attendant with necessary facilities in place. A skilled birth attendance can conduct delivery at health facilities and at home, but preferable at health facilities with reliable referral system (Kifle et al., 2018). World Health Organization recommended all deliveries be attended to by a skilled birth attendant, who is trained to identify and manage normal labor and delivery, provide basic care and treat complications and refer when necessary (Kifle et al., 2018). Proper antenatal care couple with the choice of a place of delivery, enhances the quality of child delivery. Place of delivery is one of the determinants of neonatal mortality. Despite good antenatal coverage, delivery at health facilities still remain low in developing countries. Inadequate resources and services has been attributed as the major cause of underutilization of maternal health services. In some settings where services are readily available, women of some socio-economic classes do not have access maternal health services (Gebregziabher, 2019).

Health Facility Delivery Versus Home Delivery

Delivery at health facility is a major contributor to improved outcomes in maternal and child health. (Adedokun & Uthman, 2019). In Europe, Central and East Asia, the Pacific, Latin America and the Caribbean, nine in every ten deliveries take

place in health facility, however, only 56% of all births occur in health facility in sub-Saharan Africa (Adedokun et al., 2019). In spite of global outcry to address the problem of maternal and child mortality through the provision of adequate antenatal care and skilled deliveries, quite huge number of deliveries are attended to by unskilled persons in many African countries (Adedokun et al., 2019; Ugboaja et al., 2018). In addition, researchers found out that traditional birth attendances (TBAs) are unable to identify the signs of a critical pregnancy or labor and delivery danger signs that significantly endanger a mother's life and so training of TBAs is recommended in addition to an increase of hospital births (Amutah-Onukagah et al., 2017).

In Nigeria particularly in northern region, cultural beliefs relating to childbirth negatively affects government efforts to address maternal mortality. In a study conducted in Nigeria, only 26% of 6,882 women surveyed received antenatal care, of which only 13% had delivery at institution with skilled birth attendants, and 86% of the women had their delivery at home under unskilled care (Abubakar et al., 2017). In another study conducted in northern Nigeria, over 70% of women reported culture as a major obstacle to institutional delivery (Abubakar et al., 2017). Several studies have showed that about 500,000 planned home deliveries were attended to by unskilled person amongst low risk women. This indicates that perinatal mortality rates for home deliveries tripled deliveries conducted in hospitals. It also connotes that unskilled home delivery is associated with high obstetric complications in mother and child, and so skilled institutional delivery is healthier and safer for the mother and child (Abubakar et al., 2017).

In Nigeria, strategies such as the SURE-P maternal and child health programme was designed to give women access to quality maternal health care through the provision of adequate manpower, renovation of existing health facilities, adequate essential drugs, materials and equipment, reduction of cost of antenatal care, deliveries and, postnatal care and increase community awareness (Nsofor, 2015). Another strategy to reduce maternal and child morbidity and mortality in Nigeria is Nigeria States Health Programme Investment Project (NSHIP). This project provides funds for operational costs, drugs, maintenance and repair and incentives to health workers (Eeshani et al., 2019). However, despite huge amount of resources committed to these projects, only 39% of births took place in health facilities. Forty-three percent of all deliveries were attended to by skilled birth attendance (SBA) in Nigeria (National Population Commission, Nigeria, 2019).

Kifle et al. (2018), found that improving women knowledge on the benefit of delivery at health facility, engaging husbands in the use of maternity service, raising women decision making power, addressing the issue of lack of transport by compensating transport expenses can improve child birth by women at health facilities. Similarly, a cross-sectional data on demographic health survey (DHS) on 13, 053 and 24, 033 women of child bearing age 15–49 years from Ethiopia and Nigeria respectively, showed that in both Ethiopia and Nigeria, over 45% of rural women believe delivery at health facility is unnecessary and complain about transportation and financial difficulties. To reduce maternal and newborn mortality, efforts must be put in place to understand why women

feel child birth at health facility is not necessary in Nigeria and Ethiopia (Yaya et al., 2018). Similarly, 69.4% of the women that delivered at health facilities had high satisfaction (Nwankwo et al., 2019). However, Nwankwo et al. (2019) did not explore the reason why the remaining 30.6% women delivered at home, hence the need for future study, to explore reasons why women deliver at home so as to develop strategies that make women deliver in health facilities.

The percentage of delivery at health facility varied across countries from 5%-85% and 22% to 92% in 2000-2007 and 2008-2016 respectively (Doctor et al., 2017). The largest number of deliveries in the 25 sub-Saharan countries was in the public health facility. Delivery at health facility was significantly lower in the poorest compared to wealthiest women (Doctor et al., 2017).

Age and Place of Delivery

Sociodemographic factors such as age of a woman and age at marriage was found to be important predictors of utilization of health facility services by women (Paul & Chouhan, 2020). Women in urban settings that are age ⩾ 36 years are less likely to deliver at home and so will prefer health facility delivery, while maternal age < 20 years have increased likelihood of delivering at home (Adewuyi & Auta, 2017). This finding was collaborated by Ogbo et al. (2020) who revealed that higher maternal age (35–49 years) were associated with lower odds of unskilled birth attendants' utilization and lower maternal age (15–24 years) has a higher odds of unskilled birth attendant assisted

deliveries. The chances of non-utilization of health facility for delivery increases with women aged 25–34 years (Adedokun & Uthman, 2019).

Residence and Place of Delivery

Home delivery are much higher in rural than urban and factors responsible differ to varying degrees between rural and urban settings (Adewuyi & Auta, 2017). Paul and Chouhan (2020) also agrees that sociodemographic factors such as rural-urban residence was an important predictors of utilization of health facility services by women. Women who live in urban area are likely to deliver in a health facility compared to women in rural areas. This is so because urban women attend higher levels of education and have easy access to public and private health care facilities compared to rural women who most time are denied these opportunities (Paul & Chouhan, 2020). Similarly, Yaya et al. (2019) reported that higher proportion of rural women delivered at home than at health facility. About 40% of women delivered at health facility of which 67% of these were from the urban setting compared to 30.2% from the rural setting. Associated with higher odds of unskilled birth attendant assisted deliveries is seen with women in rural residence (Ogbo et al., 2020). Likewise, the chances of non-utilization of health facility for delivery increases with women who lived in the most socioeconomically disadvantaged communities (Adedokun & Uthman, 2019). Therefore, to improve the utilization of maternal health services, policymaker and program managers must address socio-economic and demographic issues facing women (Paul & Chouhan, 2020).

Educational Level and Place of Delivery

Paul and Chouhan (2020) said educational status of women and household wealth status are very significant predictors of maternal health care utilization at health facilities. Yaya et al. (2019) said that women who had primary, secondary and higher level of education were 2.2 and 3.3 times more likely to have their baby delivered at a health facility. The higher the educational level of a woman, the more likely she will deliver in a health facility. Similarly, the higher the education level of the husbands' the higher the odds of their wives delivering in a health facility as reported by Gebregziabher et al. (2019). Ogbo et al. (2020) said that higher parental education was associated with lower odds of unskilled birth attendants' utilization. Likewise, over three-quarter of those who did not have formal education did not utilize health service for delivery (Adedokun & Uthman, 2019).

Husband's Occupation and Place of Delivery

Occupation of husbands has influence on the choice of place of delivery of their wives. Women whose husbands were civil servants had their delivery at the health facility compared to those whose husbands were artisans or farmers (Abimbola et al., 2016). The reason is that civil servants had at least secondary education which makes them more literate as such a positive predictor of utilization of maternal health services. The occupation of husbands determines family income and socio-economic status of the family which has an influence on utilization of health services (Abimbola et al., 2016).

Household Wealth and Place of Delivery

Women coming from a rich household have lower odds of unskilled birth attendants' use (Ogbo et al., 2020). In addition, Paul and Chouhan (2020) said that women household wealth status is a very significant predictors of maternal health care utilization at health facilities. Therefore, the odds of delivery at health facilities is highest with women from wealthy household (Yaya et al., 2019). The chances of non-utilization of health facility for delivery increases with poor households (Adedokun & Uthman, 2019). To improve delivery at health facility, there is the need to improve the women's socioeconomic status and policy makers develop plan to address the issue of unskilled delivery services at health facilities particularly among rural women.

Cost of Delivery at Health Facility and Place of Delivery

Most respondents reported that they preferred delivery outside hospitals because they are cheaper. This is so because majority of them pay for services out of pocket considering that majority were low income earners. Eighty percent (80%) of women in a rural community in Delta State, Nigeria gave high cost as a major reason for their decision not to use the Health facility (Johnson et al. 2020). Similarly, a significant proportion of the women would like to deliver in private health facilities if not for the high cost of delivery services (Ajah et al., 2019).

Cost of Transportation Due to Distance of Health Facility and Place of Delivery

Distance from communities to health facility, and means of transportation were found to be significantly associated with the second delay which is identifying and

reaching health facility for maternal care (Wanaka et al., 2020). Abimbola (2016) also found that barriers to women utilizing ANC and delivery services were lack of money and distance of health facility from communities. Nearness of health facilities to a woman's location contributed to a lower odds of unskilled birth attendants' utilization (Ogbo et al., 2020). More research to identify factors associated with maternal delays in other countries is needed to collaborate findings in this study (Wanaka et al., 2020).

ANC Use and Place of Delivery

ANC is the care that trained health care workers or professionals provide to women for the period of their pregnancy. The health care workers who provide the service include doctors, midwives and nurses. Statistics have shown that that ANC coverage was indirectly correlated with MMR worldwide (Fagbamigbe & Erhabor, 2015). It means the higher the ANC coverage the lower the MMR of a country. The essence of ANC is to detect early and manage medical conditions that could threaten the life of mother and her unborn child (Fagbamigbe & Erhabor, 2015). The services provided include treatment of infections, anaemia, hypertension, eclampsia, excessive bleeding during pregnancy, ectopic pregnancy, premature labour, obstructed labour, preparation for birth and identify signs of danger in pregnancy and plans to manage them of refer to next level of care (Fagbamigbe & Erhabor, 2015).

The more the number of ANC visit by a pregnant woman, the more likely that she will deliver in a health facility. Those with four or more visits are more likely to deliver in a health facility compared to those with who had less than four visits as reported by

Gebregziabher et al. (2019) in a study carried out in Akordet, cultural diverse lowland town of Gash-Barka Region, Eritrea, where they assessed the factors influencing facility delivery. Ogbo et al. (2020), investigated trend and factors that drive the utilization of unskilled birth attendants during democratic governance in Nigeria from 1999 to 2018 and found that frequent antenatal care (ANC) visits was associated with lower odds of unskilled birth attendants' utilization. This finding was support by Ajah et al. (2019) that found that 60.2% of the women attended at least one antenatal clinic in the public hospitals and approximately 43.8% of the respondents were delivered by the skilled birth attendants.

Fagbamigbe and Erhabor (2015), revealed that mothers or women who used ANC services were mostly rural dwellers (82.5%) and those who had no formal education (57.3%). Over half gave lack of money to attend ANC as reason, followed by unavailability of transport (44.3%). Another reason is that ANC providers did not treat clients or patient fairly. In a similar study conducted in Afon community in North Central Nigeria, the authors found that barriers to women utilizing ANC and delivery services are poor attitude of health workers and husbands not given their wives permission to go for health care services (Abimbola et al., 2016). Ninety-two percent women who did not attend ANC did not utilize health facility for delivery (Adedokun & Uthman, 2019). To improve ANC coverage in Nigeria, there is the need to address issues of transportation for women, economic empowerment and the quality of ANC provided by health care workers (Fagbamigbe & Erhabor, 2015). And to improve utilization of health care

services, there is need to train ante-natal care providers on how to improve quality of care (Abimbola et al., 2016).

Perceived Quality of Care at Delivery and Place of Delivery

Ajah et al. (2019) found the common determinants of delivery place are familiarity of healthcare providers and improved services at the health facilities. Most women preferred to go to public health facilities because they have more skilled health personnel and more drugs than private health facilities (Ajah et al., 2019). Availability of skilled health provider were found to be significantly associated with the third delay for institutional delivery (Abimbola et al., 2016). Therefore, improving women empowerment and provision of resource at health facilities is necessary (Abimbola et al., 2016). Health facility quality is positively related to perceptions of quality and utilization of obstetric services by women. The quality of service comprises of structural, process and outcome dimensions, and the strong relationship was only between utilization and structural dimensions. Abimbola (2016) also found that 15.5% of women reported long waiting time as barriers to their utilization of ANC and delivery services at health facilities. However, the authors did not indicate if these women preferred place of delivery is health facilities in view of long waiting time in health facility. To improve the quality of care, effort must be put into investing in dimensions that are more easily observed by households which include structural and outcomes that will ultimately influence utilization. (Peet & Okeke, 2019).

Wanted Pregnancy Status and Place of Delivery

Wanted pregnancy is when a woman wants to bear children and she got pregnant at the time it happened. Unwanted or unintended pregnancy is pregnancy that occurred when no children or more children is desired. A pregnancy is said to be mistimed, when such pregnancy occurred earlier than desired (CDC, 2019). Kasaye et al. (2017) found that unplanned pregnancy was a determinants of home delivery in a study conducted in North West, Ethiopia. However, Tebekaw et al. (2015) said women with intended pregnancy were found to be 1.75 times more likely to deliver at private healthcare facilities in a study in Addis Ababa, Ethiopia. There is paucity of studies conducted to described the effect or influence of un-wanted pregnancy and place of delivery. Hence the need to carry out studies to determine the kind of association wanted pregnancy or not has with place of delivery in Nigeria.

Birth Order and Place of Delivery

Mothers whose last child's birth order was 4th to 6th were less likely to deliver at health facility compare with mothers whose last child's birth order was 1st to 3rd. Therefore, as the birth order of a child increases, the likelihood of facility delivery decreases (Gebregziabher et al., 2019). Adewuyi et al. (2017) in a study in Nigeria using secondary data also found that birth order one decreases the likelihood of home delivery.

Mixed Findings Across Study Research Questions

There were several studies that studied factors such as age, woman education, residence location, husband education, household wealth, cost of delivery, cost of

transportation, antenatal care usage, perceived quality of care, wanted pregnancy or not and birth order and their association with utilization of health facility for delivery in Nigeria and outside Nigeria. Below is a synthesis of such studies that described the determinants of places of birth across this study's research questions.

Adedokun and Uthman, 2019, analyzed data of 20,192 women who had delivery within 5 years of survey done as reported in Nigeria Demographic and Health Survey (DHS) of 2013, and shows that approximately 62% of the women did not deliver at health facility. And 92% of them that did not attend ANC did not utilize health facility for delivery. Likewise, over three-quarter of those who did not have formal education did not utilize health service for delivery. The chances of non-utilization of health facility for delivery increases with poor households, aged 25–34 years, unmarried, women who lived in the most socioeconomically disadvantaged communities (Adedokun & Uthman, 2019). Ogbo et al. (2020), found that higher parental education, maternal employment, coming from a rich household, higher maternal age (35–49 years), frequent antenatal care (ANC) visits, nearness of health facilities, and female autonomy in households contributed to a lower odds of unskilled birth attendants' utilization. Associated with higher odds of unskilled birth attendant assisted deliveries were rural residence, geopolitical region, lower maternal age (15–24 years), and higher birth interval. Frequent antenatal care (ANC) visits were associated with lower odds of unskilled birth attendants' utilization.

Ihunanya et al. (2019) in a study in an Infant Welfare Clinic at Iberekodo, Abeokuta, found that only 24% of the mothers delivered in the hospitals compared to

76% who delivered at non–hospital-based facilities (religious centers 48%, home of traditional healers 26%). There was no significant relationship between mother's educational status, parity and her choice of place of delivery. However, husband, parents, cost and affordability, nearness to health facility, staff attitude and convenience had influence on woman's choice of place of delivery. Therefore, efforts should be put in place to reduce the cost of perinatal services in health facilities and take primary health center closest to the communities (Ihunanya et al., 2019). Shehu et al., 2016 in a quantitative study in Sokoto, Nigeria said 65% of urban women and 4.75 of rural women delivered in health facilities, and 70% of the urban and 4.3% of the rural women had skilled attendants at delivery. The reasons for home deliveries amongst the urban women include lack of consent from husband, lack of privacy in health facilities, far distance of communities to the health facility and lack of delivery wards in the health facilities. Meanwhile, emergency nature of labor was the reason for home delivery amongst the urban group. To improve women delivery at health facilities by 90%, women residing in rural areas must be given health education or promotion (Shehu et al., 2016).

Johnson et al. (2020) conducted a cross‐sectional study among mothers who attended Primary Health Center in West Itam, Itu, Nigeria with the aim to determine the choices and determinants of delivery locations among mothers. The authors found out that 64.9% of the women delivered at health facility, 23.3% delivered at traditional birth attendant's place (23.3%), 6.3% in their residences and 5.4% in the church. The five major reasons that influenced their choice of place of delivery include distance, cost of

delivery, skills of healthcare workers, drug availability and attitude of healthcare workers. Level of education and income of respondents and spouses significantly increase the rate of utilization of healthcare facilities for delivery. To encourage women to delivery in health facilities, pregnant women should be offered free or highly subsidized healthcare services, health personnel to develop better relationship with clients and women should be educated on the benefits of delivery at heath facility to be able to make an informed decision on choices place of delivery and other health services (Johnson et al., 2020). In a study in Kano, Nigeria, Nwankwo et al. (2019) revealed that 69.4% of the women that delivered at health facilities had high satisfaction. And that involvement of husbands and women's parent, improvement of women level of education can lead to increased child birth at the facility. This study did not explore the reason why the remaining 30.6% women delivered at home, hence the need for future study, to explore reasons why women deliver at home so as to come up with strategies that can address this problem.

Adewuyi and Auta, 2017 said whether rural or urban residence birth order one decreases the likelihood of home delivery. However, home delivery is much higher in rural than urban Nigeria and factors responsible differ to varying degrees between rural and urban settings. Women in urban settings that are age 36 and above are less likely deliver at home will prefer health facility delivery, while maternal age less than 20 years have increased likelihood of delivering at home, birth order one decreases the likelihood of home delivery (Adewuyi & Auta, 2017). Abimbola et al., 2016 found that occupation of husbands of women was statistically significant with place of delivery. Respondents'

whose husbands were civil servants had their delivery at the health facility compared to those whose husbands were artisans or farmers. The occupation of husbands determines family income and socio-economic status of the family which has an influence on utilization of health services (Abimbola et al., 2016). Abimbola et al. (2016) also found that barriers to women utilizing ANC and delivery services are poor attitude of health workers and husbands not given their wives permission to go for health care services, lack of money, long waiting time at health facilities, distance health facility from communities. To improve utilization of health care services, there is need to train ante-natal care providers on how to improve quality of care. Availability of skilled health provider were found to be significantly associated with the third delay for institutional delivery. Improving women empowerment and provision of resource at health facilities is necessary.

Peet and Okeke (2019) examined the association between health facility quality, perceptions, and utilization of obstetric care in Nigeria after reviewing a survey data that described and reported that health facility quality is positively related to perceptions of quality and utilization of obstetric services by women. The quality of service comprises of structural, process and outcome dimensions, and the authors found that the strong relationship was only between utilization and structural dimensions. To improve the quality of care, effort must be put into investing in dimensions that are more easily observed by households which include structural and outcomes that will ultimately influence utilization (Peet & Okeke, 2019). Fagbamigbe & Erhabor (2015), in their study

amongst mothers or women who used ANC services in Nigeria, said 60.2% of the women attended at least one antenatal clinic in the public hospitals and approximately 43.8% of the respondents were delivered by the skilled birth attendants. Over 50% women gave lack of money to attend ANC as reason, followed by unavailability of transport (44.3%). Another reason is that ANC providers did not treat clients or patient fairly. To improve ANC coverage in Nigeria, there is the need to address issues of transportation for women, economic empowerment and the quality of ANC provided by health care workers.

Ajah et al. (2019) found the common determinants of place of delivery as nearness of the health facilities, familiarity of healthcare providers, improved services at the health facilities, and cost of delivery. Most women preferred to utilize public health facilities because they have more skilled health personnel and more drugs than private health facilities. Proportion of women who delivered at health facility was 39.8%, and 67% of these were from the urban setting compared to 30.2% from the rural counterparts (Yaya et al., 2019). The multivariable analysis shows that women who had primary, secondary and higher level of education were 2.2 and 3.3 times more likely to have their baby delivered at a health facility (Yaya et al., 2019). The odds of delivery at health facilities is highest with women from wealthy household. To improve delivery at health facility, there is the need to improve the women's socioeconomic status and policy makers develop plan to address the issue of unskilled delivery services at health facilities particularly among rural women (Yaya et al., 2019). In a study in Gamo zone, Southern Ethiopia, unemployed women, child birth preparedness, husband's decisions making

were found to be significantly associated with first delay. Distance to health facility, and means of transportation were found to be significantly associated with the second delay (Wanaka et al., 2020).

Gebregziabher et al. 2019 in a study carried out in Akordet, cultural diverse lowland town of Gash-Barka Region, Eritrea, where they assessed the factors influencing facility delivery, found that the more the number of ANC visit by a pregnant woman, the more likely that she will deliver in a health facility. Those with four or more visits are more likely to deliver in a health facility compared to those with who had less than four visits. The higher the educational level of a woman, the more likely she will deliver in a health facility. Similarly, the higher the education level of the husbands' the higher the odds of their wives delivering in a health facility as reported by Gebregziabher et al. (2019). Mothers whose last child's birth order was 4th to 6th were less likely to deliver at health facility compare with mothers whose last child's birth order was 1st to 3rd. Paul and Chouhan, 2020 in a study in India, reported that educational status of women and household wealth status are very significant predictors of maternal health care utilization at health facilities. Women who live in urban area are likely to deliver in a health facility compared to women who were rural areas. This is so because urban women attend higher levels of education and have easy access to public and private health care facilities compared to rural women who most time are denied these opportunities. Therefore, to improve the utilization of maternal health services, policymaker and program managers

must address socio-economic and demographic issues facing women (Paul & Chouhan, 2020).

Summary and Conclusions

In this section, the major themes are maternal mortality during pregnancy and childbirth and its association with place of delivery globally, in low income countries in African including Nigeria, key studies that established the association of place of delivery and the factors that influence the choice of place of delivery that needs to be addressed, the purpose of this study, literature search strategies, the choice of Thaddeus and Maine's three delays model as this study's theoretical foundation, its application and rationale, previous studies that apply the three delays model in maternal health to determine the factors responsible for the three types of delays associated with maternal healthcare services and how it influence a woman's choice of place of delivery, literatures reviewed related to constructs of the study and methods, literatures reviewed related to independent and dependent variables, literatures reviewed related to place of delivery either health facility or home delivery, literature reviewed related to the variables in the study research questions.

In 2017, it was estimated that about 295 000 women died during pregnancy and childbirth world-wide (WHO, 2019). Ninety-four percent of these deaths are preventable and occur in low-resource settings. In the same year, approximately 810 women died each day from pregnancy and childbirth. Countries in Sub-Saharan Africa, Southern Asia accounted for 196 000 and 58 000 maternal deaths respectively (WHO, 2019). One out of

every 13 women in Nigeria die during childbirth (Egharevba et al., 2017). Most of these deaths are due to hemorrhage, infections, unsafe abortions, eclampsia, and obstructed labor, which are preventable (Egharevba et al., 2017).

There have been several studies in Nigeria, that examined factors such as age, woman education, residence location, husband education, household wealth, cost of delivery, cost of transportation, antenatal care usage, perceived quality of care, wanted pregnancy or not and birth order and their association with utilization of health facility for delivery

This study provided information on additional determinants of place of delivery amongst women of reproductive age in northern Nigeria. These additional determinants of place of delivery which have not been previously studied using the three delays model in Nigeria. The additional determinants are husband's education level, wanted pregnancy status, and birth order. Therefore, findings from this study will guide policy makers and health managers to develop appropriate intervention that could improve women delivery at health facilities so as to improve maternal health outcomes in Nigeria.

Chapter 3 describes in detail the research design and rationale, methodology, and threats to validity. Chapter 3 ends with a summary of the design and methodology of the study.

Chapter 3: Research Method

Introduction

The aim of this quantitative cross-sectional study was to determine the influence of sociodemographic factors (women's age, residence, and education level; husband's education level and occupation; household wealth) and pregnancy risk factors (perceived cost of delivery and transportation, antenatal care usage, perception of quality of care at delivery, status of wanted pregnancy, and birth order) on the choice of place of delivery amongst women of reproductive age (15-49 years) in Northern Nigeria. In this study, secondary data were reviewed and analyzed using Thaddeus and Maine's three delays model. This study will provide guidance to policymakers and health managers to develop appropriate interventions that will improve delivery at health facilities and maternal health outcomes in Nigeria.

This chapter includes the research design and rationale, methodology, threats to validity, and a summary of the chapter.

Research Design and Rationale

This study is a quantitative cross-sectional study of women of reproductive age in Northern Nigeria. The study involved using secondary data that were generated from the NDHS conducted in Northern Nigeria by the National Population Commission of Nigeria in 2018. The aim of this study was to determine the influence of sociodemographic and pregnancy risk factors on the choice of place of delivery amongst women of reproductive age in Northern Nigeria.

A cross-sectional study design is used to measure outcomes and exposure in participants in a study at the same time. Participants in this study were selected based on inclusion and exclusion criteria, unlike case or cohort studies where participants are selected based on outcome or exposure status. A population-based survey was used in this study to describe associations between independent and dependent variables.

Some of the limitations of cross-sectional studies are that it is difficult to determine causal relationships because it is a one-time measurement of exposure and outcome, and is therefore prone to certain biases. The choice of a cross-sectional design in this study is appropriate because my study is a population based study that is a one-time measurement of an outcome which is the place of delivery among women of child bearing age (15-49 years) in Northern Nigeria. Moreover, the secondary that used in this study was generated using a cross-sectional design.

Thaddeus and Maine (1994) said there were three delays on maternal health care which were delays in making decisions to seek care at health facilities (first delay), delays associated with identifying and reaching health facilities (second delay), and delays associated with receiving quality care (third delay). Table 1 shows definitions, values, and measurements for the independent variables.

Table 1

Definition and Measurements of Study Independent Variables

Variable name	Definition of variable	Value	Measure of variable
Husband Occupation	Job or profession of the woman's husband	0 = Did not work 1 = Professional/Technical/Managerial 2 = Clerical 3 = Sales 4 = Agricultural=self-employed 5 = Agricultural – employed 6 = Household & domestic 7 = Service 8 = Skilled manual 9 = Un-skilled manual 96 = others 98 = Don't know Recode as 0 = Did not work 1 = Professional/Technical/Managerial 2= Non- Professional/Non-Technical/Non-Managerial	Ordinal
Household Wealth	The net worth for a woman or the family and it I used in economics to compare the wealth of different groups or individuals. The net worth is after deducting total value of outstanding liabilities form the value of total assets and expressed as a percentage of net disposable income.	1 = Poorest 2 = Poorer 3 = Middle 4 = Richer 5 = Richest	Nominal
Perceived cost of delivery at health facility	If the amount of money a woman spends (expenditure) to deliver in a health facility influenced her choice of place of delivery	0 = No 1 = Yes	Nominal

(table continues)

Variable name	Definition of variable	Value	Measure of variable
Perceived cost of transportation due to distance from health facility	If the amount of money that a woman will spend to go to a health facility to deliver and from health facility back home influenced her decision on place of delivery	0 = No 1 = Yes	Nominal
Antenatal care usage	The number times a woman gets care from a health care provider or professionals during her pregnancy	0 = No antenatal visit 1 = Antenatal visit 98 = Don't know Recode as; 0= No antenatal visit 1 =1 antenatal visit 2= 2-3 antenatal visit 3= 4+ antenatal visit 4= Don't know.	Nominal
Perceived quality of care at delivery	The woman's perception of the extent to which health care services provided to her improve her desired health outcomes	0 = Don't trust facility 1 = Poor services 2 = Good services	Nominal
Wanted Pregnancy or not		1 = Then 2 = Later 3 = No more	Nominal
Birth Order	the order a child in born in a family. In this study is the order of the child surveyed in the family of a women who participated in the survey used for this study.	1, 2,3 4,5 etc. Recode as; 1=1-2 2=3-4 3= 5+	Scale Nominal

Four of the independent variables as shown in Table 2 were controlled with variable woman's age, residence, education level and husband's education level to minimize their potential influence of control variable on association between independent and dependent variables. The independent variables to be controlled are husband's

occupation, household wealth, perceived cost of delivery at health facility, perceived cost of transportation due to distance of health facility, antenatal care usage, perceived quality of care at delivery, status of wanted pregnancy and birth order. The control variables influence on place of delivery as independent variables was determined in this study.

Table 2

Definition and Measurement of Study Control Variables

Variable name	Definition of variable	Value	Measure of variable
Age	Refers to the length of time in years that a woman has lived or existed as the time of survey	1 =15 – 19 Years 2 =20 -24 Years 3 =25 – 29 Years 4 =30 – 34 Years 5 =35 – 39 Years 6 =40 – 44 Years 7 =45 – 49 Years	Ordinal
Residence	Woman's home or where she is living as at time of survey. It can be located in an urban or rural settings	1 = Urban 2 = Rural	Nominal
Woman's Educational level	The highest level of formal schooling that a woman has attended.	0 = No Education 1 = Primary 2 = Secondary 3 = Higher	Nominal
Husband Educational level	The highest level of formal schooling that a woman has attended.	0 = No Education 1 = Primary 2 = Secondary 3 = Higher	Nominal

The dependent variable in this study is place of delivery which appears in NDHS, 2018 data set as home, public sector and private sector among women of reproductive age (15-49) in Northern Nigeria. For purpose of this study, the place of deliveries was described as health facility (merging public and private sectors) or home (merged at

woman's home, in the house of a traditional birth attendant (TBA), in the church or in the homes of friends or relations or any non-healthcare facility) as shown in Table 3.

Table 3

Definition and Measurement of Dependent Variables

Variable name	Definition of variable	Value	Measure of variable
Place of delivery	Any place that a women delivered or had a childbirth. It can be in a health facility or outside a health facility such as at home. Home can be a woman's home, in the house of a traditional birth attendant (TBA), in the church or in the homes of friends or relations or any non-healthcare facility.	1 = Home 2 =Public Sector 3= Private Sector Recode as: 0 = Home 1 = Health Facility	Nominal

Methodology

Population

Nigeria is the most populous country in Africa with an estimated population of approximately 170 million people (Koffi et al., 2017). The secondary data used for this study was data generated during NDHS conducted in Nigeria in 2018. It is a population based survey. One of the target age group that was interviewed on maternal health indicators were women of reproductive age 15-49 years sampled across all the states in the country. The 2018 NDHS included all women age 15-49 in the sample households. The survey interviewed women who were either permanent residents of the selected households or visitors who stayed in the households the night before the survey was

conducted. Nigeria is divided into 36 states and a federal Capital Territory (FCT). Each state is subdivided into local government areas (LGAs), and each LGA is divided into wards. However, FCT is sub-divided into area councils which is the equivalent of an LGA. The area councils are sub-divided into wards like in LGAs.

The Population and Housing Census of the Federal Republic of Nigeria (NPC) sub-divided the LGAs into areas called census enumeration areas (EAs). Therefore, the primary sampling unit (PSU), referred to as a cluster for NDHS 2018, was determined from the 2006 EA census frame. There are 774 LGAs across the states in the country. The LGA population estimates from the census was used to identify the list of EAs, estimated the number of households, and distinguished EAs as urban or rural. Any locality with more 20,000 or more populations is considered as urban and a population of less than 20,000 people as rural.

Sampling and Sampling Procedures

The sampling method used in NDHS, 2018 was a stratified sample selected in two stages. Thirty-six states and FCT were first stratified into urban and rural areas. A total of 74 sampling strata were identified. Samples were selected independently in every stratum via a two-stage selection. Probability proportional to size was used in the first sampling stage to select 1,400 EAs. The size of an EAs was determined by the number of households in the EA. Household listing was carried out using tablets in all selected EAs, and these lists of households became the sampling frame for the selection of households in the second stage. In the second stage's selection, a fixed number of 30 households was

selected in every cluster using probability systematic sampling which gave a total sample size of approximately 42,000 households. A computer programming was used to randomly select households. Interviews were conducted only in the pre-selected households. No replacements or changes of the pre-selected households was allowed at the point of data collection so as to prevent bias. Because samples were non-proportionally allocated states which may possible cause differences in response rates, sampling weights were determined and applied to all states so that the results would be representative at the national level as well as the domain level.

Sampling weights were also calculated separately for each sampling stage and for each cluster because the survey was a two-stage stratified cluster sample selected from the sampling frame. All women age 15-49, either permanent residents of the selected households or visitors who stayed in the households the night before the survey, were included in the household were sampled and interviewed. The survey was carried out in 1,389 clusters after 11 clusters were dropped due to disruption of law-and-order situations during fieldwork. In the households a total of 42,121 women age 15-49 were identified for individual interviews and 41,821 were interviewed which represents a response rate of 99% (National Population Commission, Nigeria, 2019).

For the NDHS 2018, the following parameters were used in the determination or estimation of the sample size (total number of households interviewed) while taking non-sampling errors into account:

Figure 3

Formula for Sample Size Estimation

$$n = \text{Deft}^2 \times \frac{(1/P\text{-}1)}{\alpha^2} \Big/ (R_1 \times R_h \times d)$$

In the formula for sample size estimation: *n* is the sample size in households; Deft is the design effect (a default value of 1.8 is used because it is a multiple indicator and multi-stage sampling); *P* is the estimated proportion (0.20); α is the desired relative standard error (0.10); *Ri* is the individual response rate (set at 0.97 for women 15-49 years based on the 2013 survey); *Rh* is the household gross response rate (0.95 based on the 2013 survey); and *d* is the number of eligible individuals per household (1.05 for women 15-49 years based on the 2013).

The design effect (DEFT) for each estimate is calculated and it was set at 1.8 because of possible increase in sampling error that may occur as a result of the more complex and less statistically efficient design (multiple indicator survey, multi-stage sampling) used in the NDHS conducted in 2018 in Nigeria. The confidence limit was set at 95%.

Procedures for Archival Data

The questionnaire used for the NDHS, 2018 NDHS for women was based on The Demographic Health Survey (DHS) Program's standard Demographic and Health Survey (DHS-7) questionnaires. It was adapted to Nigerian context of population and health issues (National Population Commission, Nigeria, 2019). The questionnaire was reviewed with various stakeholders which include government ministries and agencies, development partners in health and international donors. The Nigeria Demographic and Health Survey of 2018 was implemented by the National Population Commission (NPC) in collaboration with the National Malaria Elimination Programme (NMEP) of the Federal Ministry of Health, Nigeria. Funding was provided by the United States Agency for International Development (USAID), Global Fund, Bill and Melinda Gates Foundation (BMGF), the United Nations Population Fund (UNFPA), and World Health Organization (WHO). ICF provided technical assistance through the DHS Program, a USAID-funded project providing support and technical assistance in the implementation of population and health surveys in countries worldwide.

The survey had protocol which was reviewed and approved by the National Health Research Ethics Committee of Nigeria (NHREC) and the ICF Institutional Review Board. The questionnaire was initially in English, but translated into the three major languages in Nigeria namely; Hausa, Yoruba, and Igbo. Computer-assisted personal interviewing (CAPI) was used for data collection (National Population Commission, Nigeria, 2019). The questionnaire had basic demographic information as

age, sex, marital status, education, and relationship to the head of the household. Information on characteristics of the household's dwelling unit as source of drinking water; type of toilet facilities; materials used for flooring, external walls, and roofing; ownership of various durable goods; and ownership of mosquito nets. Woman's Questionnaire was administered all eligible women age 15-49 (National Population Commission, Nigeria, 2019).

These women were asked the following: background characteristics (including age, education, and media exposure); birth history and child mortality; knowledge, use, and source of family planning methods; antenatal, delivery, and postnatal care; vaccinations and childhood illnesses. Other area of where questions were asked include breastfeeding and infant feeding practices; women's minimum dietary diversity; marriage and sexual activity; fertility preferences (including desire for more children and ideal number of children); women's work and husbands' background characteristics amongst others (National Population Commission, Nigeria, 2019).

A pretest on the application of questionnaire was conducted for field staff that collected data from the field. This prepared them to ensure that they were well versed with the NDHS questionnaires and procedures and able to test the questionnaires in the different languages of English, Hausa, Yoruba, and Igbo to be sure that it measure what it intend to measure. Finding from the pretest was used to refine the questionnaire (National Population Commission, Nigeria, 2019). As soon as data collection was completed in each cluster, all electronic data files were transferred via the IFSS to the NPC central

office in Abuja. The data file was checked for inconsistencies, incompleteness, and outliers and feedback provided to field teams to correct and resubmit. The central office in Abuja does the secondary editing by resolving inconsistencies and coding the open-ended questions. Data entry and editing were carried out using the CSPro software package. This process of current processing of the data helped to minimize error in data and improve it accuracy (National Population Commission, Nigeria, 2019).

A total of thirty-seven teams were selected after a thorough exercise, quizzes assessment and observations made during field practice. Each team consisted of one supervisor, one field editor, two male interviewers, three female interviewers, one lab scientist, and one nurse. A team was assigned to different cluster. The teams were closely monitored by state coordinators and the quality controllers. Data collection lasted for four months from 14 August to 29 December 2018 (National Population Commission, Nigeria, 2019).

Procedure for Gaining Access to the Dataset

A request to access the Nigeria NDHS data for 2018 was put across by email to DHS office in USA. The datasets are free and can be accessed when a request is made by filing a request format on their web site. Approval was granted after a week as seen in appendix. DHS provided the data that was exported to Statistical Package for Social Sciences (SPSS) software where the necessary coding was done. The SPSS dataset for NDHS, 2018 was analyzed for this study. Guidance on data set analysis as secondary data for this study was gotten from the Walden University through committee Chair.

Instrumentation and Operationalization of Constructs

To address the issues of external validity, the National Demographic and Health Survey conducted in Nigeria in year 2018, which is the secondary data for this study, was a nationwide survey with a nationally representative sample of approximately 41, 821 women selected randomly (National Population Commission, Nigeria, 2019). All the women age 15-49 as respondents were either members of the selected households or who spent the night before the survey in the selected households. A two stage stratified sampling was applied in the survey to identify respondents as such findings for this survey can be generalized.

DHS Program's standard Demographic and Health Survey (DHS-7) questionnaires were adapted, training of interviewers for three weeks, pre-testing of questionnaire prior to data collection, supervision and monitoring by monitors from higher administrative level and data cleaning to minimize errors. Sampling errors was applied in the statistical evaluation. In the 2018 NDHS, the Taylor linearization method was used to estimate variances for survey estimates as means, proportions, or ratios (National Population Commission, Nigeria, 2019).

This study used data from 41, 821 women aged between 15 and 49 years that were interviewed during the national demographic survey in Nigeria in 2018, which is considered to be adequate. The dataset for this study is the SPSS dataset for NDHS, 2018 came with coding of the variables. The SPSS dataset has information on women of reproduction age 15-49 years who had delivery within five years to the time of this

survey in 2018 (National Population Commission, Nigeria, 2019). The information about women that are on the dataset related to this study are woman's age, residence (rural/urban), education, husband's education, and occupation, household wealth, perceived cost of delivery, perceived cost of transportation, ANC usage, perception of quality of care at delivery, status of wanted pregnancy and her birth order and where she had her delivery. The SPSS dataset had information for women of reproductive age (15-49 years) across all the states in the country, but for the purpose of this study, focus was on states in Northern Nigeria.

Operationalization of Each Variable

Independent Variables

The independent variables are household wealth, perceived cost of delivery, perceived cost of transportation, antenatal care usage, perception of quality of care at delivery, status of wanted pregnancy and birth order.

Husband's Occupation

The dataset included information about Job or profession of the woman's husband as did not work, professional/technical/managerial, clerical, sales, agricultural=self-employed, agricultural – employed, household & domestic, service, skilled manual, un-skilled manual, others or don't know. This was recoded into three: did not work, professional/technical/managerial and non-professional/ non- technical/non managerial (clerical, sales, agricultural=self-employed, agricultural – employed, household & domestic, service, skilled manual, un-skilled manual, others or don't know).

Household Wealth

The dataset included information about the net worth for a woman or the family as poorest, poorer, middle, richer and richest.

Cost of Delivery at Health Facility

The dataset included information, if the amount of money a woman spends (expenditure) to deliver in a health facility influenced her choice of place of delivery as "No" or "Yes".

Cost of Transportation Due to Distance from Health Facility

The dataset included information, if the amount of money that a woman will spend to go to a health facility to deliver and from health facility back home influenced her decision on place of delivery as "No" or "Yes".

ANC Use

The dataset included information on the number times a woman gets care from a health care provider or professionals during her pregnancy as no antenatal visit, antenatal visit or don't know. This was recoded in this study as no antenatal visit, 1 antenatal visit, 2-3 antenatal visit, 4+ antenatal visit or don't know.

Perceived Quality of Care at Delivery

The dataset included information about the woman's perception of the extent to which health care services provided to her improve her desired health outcomes as don't trust facility, poor services or good services.

Wanted Pregnancy

The dataset included information about when a woman wants to bear children and she got pregnant at the time it happened as I wanted then, wanted later or wanted no more.

Birth Order

The dataset included information about the order a child is born in a family as 1, 2, 3, 4, 5 and so on.

Dependent Variable

The dependent variable is delivery site and it is defined as any place that a women deliver or had a childbirth. It can be in a health facility or outside a health facility such as at home. Home can be a woman's home, in the house of a TBA, in the church or in the homes of friends or relations or any non-healthcare facility. The dataset values Home as; respondent home and other Home: Public sector; government hospital, government health center, government health post & other public sector: Private sector; private hospital and other private sector and Others. This was recoded a home and health facility. The values of place of delivery was re-coded by grouping public sector (government hospital, government health center, government health post and other public sector) and private hospitals (private hospital/clinics and other private sectors) as health facility and home (respondent home, other homes) and others as home delivery.

Control Variables

The control variables are woman's age, residence (rural/urban), education level and husband's education level. The control variables were added in the study so as to minimize their potential interference of the association between independent variables and dependent variables which may lead to error in interpretation. The control variables were controlled for the independent variables husband's occupation, household wealth, antenatal care usage, status of wanted pregnancy and birth order. The control variables influence on place of delivery as independent variables was determined in this study.

Woman's age

The dataset included information about woman's age in completed years.

Woman's Residence

The dataset included information about woman's home or where she is living as at time of survey. It is coded urban or rural settings.

Woman's education level

The dataset included information about the mother's highest level of formal schooling that she has attended as no education, primary, secondary or higher.

Husband education level

The dataset included information about the husband's highest level of formal schooling that a woman has attended as no education, primary, secondary or higher.

Data Analysis Plan

The statistical software used for analysis in this study is SPSS version 25. The SPSS was used to conduct a descriptive and inferential statistics (Wagner, 2016; Creswell & Creswell, 2018). The data from National Demographic Health Survey of 2018, which comes in SPSS format was used as secondary data source for this dissertation (National Population Commission, Nigeria, 2019). As part of preparation for the analysis of secondary data, the needed variables for this study were outlined, re-labeled for missing information, recoded where necessary, to be able to answer the dissertation questions. During NDHS, 2018 in Nigeria, data files were registered and checked for inconsistencies, incompleteness, and outliers. Field teams which includes supervisors and surveyors were alerted to any inconsistencies and errors. The central office conducted secondary data editing to resolve inconsistencies that may still arise and coding the open-ended questions (National Population Commission, Nigeria, 2019).

The statistical analysis conducted were descriptive statistics for all variables (i.e., frequencies percentage for categorical variables and mean/standard deviation for continuous variables) and bivariate analysis and chi-square test for independent variable (IV), dependent variable (DV) place of delivery for research questions 1, 2 and 3. Multivariable analysis (i.e., binomial logistic regression) was conducted for research questions 1, 2 and 3 (Table 4).

Table 4

Description of Research Questions and Variables by Level of Measurement and Statistical Analysis

Research Questions	Independent Variables (IV) and Measurement	Dependent Variables (DV) and Measurement	Statistical Analysis
RQ1	Sociodemographic factors • Woman's Age-categorical • Woman's Residence - categorical • Woman's Education level- categorical • Husband's Education level	Place of Delivery - categorical	• Descriptive (Frequency distribution, Cross Tabulation & Chi-Square Tests) • Multivariate logistic regression (Binary Logistic Regression)
RQ2	• Husband's occupation-categorical • Household wealth-categorical • Perceived cost of delivery at health facility-categorical • Perceived cost of transportation-categorical	Place of Delivery - categorical	• Descriptive (Frequency distribution, Cross Tabulation & Chi Square Test) • Multivariate logistic regression (Binary Logistic Regression)
RQ3	Pregnancy risk factors • Antenatal care usage-categorical • Perceived quality of care at deliver-categorical • Wanted pregnancy or not-categorical • Birth order-categorical	Place of Delivery - categorical	• Descriptive (Frequency distribution, Cross Tabulation & Chi Square Test) • Multivariate logistic regression (Binary Logistic Regression)

The statistical significance level was set at $p < 0.05$.

Research Questions and Hypotheses

RQ1: Is there an association between women's age, residence (rural/urban), education level, and husband's education level and choice of place of delivery among women of reproductive age in Northern Nigeria?

H_01: There is no association between women's age, residence (rural/urban), education level and husband's education level and choice of place of delivery among women of reproductive age in Northern Nigeria.

H_a1: There is an association between women's age, residence (rural/urban), education level, and husband's education level and choice of place of delivery among women of reproductive age in Northern Nigeria.

RQ2: Is there an association between husbands' occupation, household wealth, perceived cost of delivery at health facilities, perceived cost of transportation due to distance of health facilities, and choice of place of delivery among women of reproductive age in Northern Nigeria after controlling for women's age, residence (rural/urban), and education level as well as husbands' education level?

H_02: There is no association between husbands' occupation, household wealth, perceived cost of delivery at health facilities, perceived cost of transportation due to distance of health facilities, and choice of place of delivery among women of reproductive age in Northern Nigeria after controlling for women's age, residence (rural/urban), and education level as well as husbands' education level.

H_a2: There is an association between husbands' occupation, household wealth, perceived cost of delivery at health facilities, perceived cost of transportation due to distance of health facilities, and choice of place of delivery among women of reproductive age in Northern Nigeria after controlling for women's age, residence, and education level as well as husbands' education level.

RQ3: Is there an association between pregnancy risk factors (ANC use, perceived quality of care at delivery, status of wanted pregnancy, and birth order) and choice of place of delivery among women of reproductive age in Northern Nigeria after controlling for their age, residence (rural/urban), and education level as well as husbands' education level?

H_03: There is no association between pregnancy risk factors (ANC use, perceived quality of care at delivery, status of wanted pregnancy, and birth order) and choice of place of delivery among women of reproductive age in Northern Nigeria after controlling for their age, residence (rural/urban), and education level as well as husbands' education level.

H_a3: There is an association between pregnancy risk factors (ANC use, perceived quality of care at delivery, status of wanted pregnancy, and birth order) and choice of place of delivery among women of reproductive age in Northern Nigeria after controlling for their age, residence (rural/urban), and education level as well as husbands' education level.

Descriptive Statistics

Descriptive statistics include a frequency distribution table and cross tabulation for the variables based on their measurements distributed as either delivery at health facility or delivery at home delivery (Wagner, 2016; Creswell & Creswell, 2018).). The distribution was in the form of counts and percentages. The descriptive statistics include determining the mean, variance and standard deviation, chi-square test of the dependent and independent variables for those who delivered at health facility and those who delivered at home (Wagner, 2016; Creswell & Creswell, 2018). The dependent variable place of delivery which has nominal measurement was represented as (1 = Health facility and 0 = Home). Table 5 is a descriptive statistics of dependent variable, the place of delivery that was used to display the results.

Table 5

Descriptive Statistics for Dependent Variable

Variables	Total Women	Delivery at Health Facility	Delivery at Home	Chi-Square	Degree of Freedom (df)	*P*-value
	n (%)	n (%)	n (%)			
Place of delivery						

The ordinal variable woman's age as (15 to 19 years, 20 to 24, 25 to 29 … 44 to 49 years); nominal measurement woman's residence as (1 = Urban, 0 = Rural); Woman's education level as (0 = No Education, 1 = Primary, 2 = Secondary, 3 = Higher); Husband's education level as (0 = No Education, 1 = Primary, 2 = Secondary, 3 =

Higher). Table 6 is a descriptive statistics of variables for first delay to utilization of maternal services at health facility. The control variable here was treated as independent variable to determine their influence on place of delivery.

Table 6

Descriptive Statistics for Variables for First Delay of Use of Maternal Services in Health Facilities

Variables	Total Women	Delivery at Health Facility	Delivery at Home	Chi-Square	Degree of Freedom (df)	P-value
	n (%)	n (%)	n (%)			
Age						
15 – 19 Years						
20 -24 Years						
25 – 29 Years						
30 – 34 Years						
35 – 39 Years						
40 – 44 Years						
45 – 49 Years						
Total						
Residence						
Urban						
Rural						
Total						
Woman's Educational level						
No Education						
Primary						
Secondary						
Higher						
Total						
Husband's Educational level						
No Education						
Primary						
Secondary						
Higher						
Total						

Table 7 includes descriptive statistics of independent variables for second delay to use of maternal services at health facilities.

Table 7

Descriptive Statistics for Variables for Second Delay of Use of Maternal Services in Health Facilities as Independent Variables

Variables	Total Women	Delivery at Health Facility	Delivery at Home	Chi-Square	Degree of Freedom (df)	*P*-value
	n (%)	n (%)	n (%)			
Husband's occupation						
Did not work						
Professional/Technical/ Managerial Non-Professional/Non-Technical/Non-Managerial						
Total						
Household wealth						
Poorest						
Poorer						
Middle						
Richer						
Richest						
Total						

(table continues)

Variables	Total Women	Delivery at Health Facility	Delivery at Home	Chi-Square	Degree of Freedom (df)	*P*-value
	n (%)	n (%)	n (%)			
Perceived cost of delivery at health facility influence on choice of place of delivery						
Yes						
No						
Total						
Perceived cost of transportation due to distance from health facility influence on choice of place of delivery						
Yes						
No						
Total						

The frequency table assisted to check any coding errors, missing data, and outliers. Table 8 includes descriptive statistics of independent variables involving third delay to use of maternal services at health facilities.

Table 8

Descriptive Statistics for Variables for Third Delay of Use of Maternal Services in Health Facilities as Independent Variables

Variables	Total Women	Delivery at Health Facility	Delivery at Home	Chi-Square	Degree of Freedom (df)	*P*-value
	n (%)	n (%)	n (%)			
Antenatal care usage						
No antenatal visit						
1 antenatal visit						
2-3 antenatal visit						
4+ antenatal visit						
Don't know.						
Total						
Perceived quality of care at delivery						
Don't trust facility						
Poor services						
Good services						
Total						
Wanted Pregnancy or not						
I wanted then						
Wanted later						
Wanted no more						
Total						
Birth Order						
1-2						
3-4						
5+						
Total						

Inferential statistic

Inferential statistics conducted include binary logistic regression to test the hypotheses that was set by this study. The dependent variable place of delivery was dichotomized as health facility delivery and home delivery. The values of place of

delivery was re-coded by grouping public sector (government hospital, government health center, government health post and other public sector) and private hospitals (private hospital/clinics and other private sectors) as health facility and home (respondent home, other homes) and others as home delivery. The values for some independent variables were recoded appropriately such as perceived quality of care (0 = Don't trust facility, 1 = Poor services, 2 = Good services), antenatal usage (0= no antenatal visit, 1 =1 antenatal visit, 2= 2, 3 antenatal visit, 3= 4+ antenatal visit, 98= Don't know) (Wagner, 2016).

Statistical power was set at 80% and a beta value of 20% (Type II error). A confidence level set at 95% (0.95) and alpha value of 5% (0.05) (Type I error), which was used to determine the statistical significance of the association between independent variables husband's occupation, household wealth, cost of delivery, cost of transportation, antenatal care usage, perception of quality of care at delivery, wanted pregnancy or not and birth order and the place of delivery amongst women of reproductive age (15-49 years) in Northern Nigeria, after controlling women's age, residence (rural/urban), education level and husband's education level. Control variables for this study women's age, residence (rural/urban), educational level, and husband's education level were included in the inferential analysis so as to reduce their potential interference with the outcome of the analysis which might bias interpretations of results. These variable, if left un-controlled, will create external and internal validation issues. The association between the control variables women's age, residence (rural/urban),

education level and husband's education level as independent variables and the dependent variable place of delivery were described in this study.

The interpretation of results was based on *p*-value of 0.05. A *p*- value less than 0.05 ($p < 0.05$), means null hypothesis will be rejected, and *p*-value greater than 0.05 ($p > 0.05$), means null hypothesis will be accepted signifying there was no association between independent variable and dependent variable. An analysis of odds of outcome variable health facility delivery and home delivery was carried out. An odd can either be greater than 1, 1 or less than 1. When odd is less than 1, the particular place of delivery (health facility or home) is less likely to happen than the alternative outcome (Wagner, 2016). When odds are greater than 1, the particular place of delivery (health facility or home) is more likely to happen than the alternative outcome. When the odds exactly equal 1, it means health facility delivery or home delivery have an equal chance of happening versus not happening.

Tables 9, 10 and 11 was the outputs from the SPSS analysis for logistics regression conducted to determine the association between each independent and control variables and the dependent variable place of delivery. These outputs were generated for each independent after controlling variables women's age, residence, education level and husband's education level to determine their association with dependent variable in this study. The same table was used to determine the association of variable women's age, residence, education level and husband's education level as independent variable and place of delivery. Table 9 shows the Cox and Snell R square and Nagelkerke R square,

which are coefficient of determination. They are PRE (proportional reduction in error) statistic which shows the proportional reduction in error when dependent variable is introduced, in this case place of delivery. The R^2 value is interpreted as the percentage of variation in dependent variable is explained by the variation in an independent variable.

Table 9

Model Summary for Variables in Research Question

Step 1	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square

Table 10 shows the predictive effect of independent and control variables on place of delivery.

Table 10

Classification Table

		Predicted		Percentage Correct
Observed		Home	Health Facility	
Step 1 Place of Delivery	Home			
	Health Facility			
Overall percentage				

The variables in equation in table 11, reveals the logistics coefficients "B," and the exponentiated coefficient "Exp(B)." These values tell how much more or less likely a value of an independent variable in the designated category is to be in the affirmative category on the dependent variable (place of delivery) than a value for same independent

variable in the omitted reference category. To conduct this analysis one value of an independent variable was made the reference that other values of same independent variables make reference to in their association with the dependent variable. The Exp (B) coefficient tells about odds ratio of a value of an independent variable to the values on dependent variable and its statistical significant set at $p \leq 0.05$.

Table 11

Logistics and Exponentiated Coefficient of Independent Variables

	B	S.E.	Wald	Df	Sig.	Exp(B)	95.0% CI for Exp(B)	
							Lower	Upper
Step 1 Variable								
Constant								

Threats to Validity

External Validity

Threat to external validity occurs when a researcher generalizes findings from a study: to groups in the experiment; to other racial or social groups not under study; to settings not examined; or to past or future situations. The threats come due to the characteristics of individuals sampled, the uniqueness of the setting, and the timing of the experiment (Creswell & Creswell, 2018).

The Nigeria Demographic and Health Survey conducted 2018, which is the secondary data for this study, was a nationwide survey with a nationally representative sample of approximately 41, 821 women were selected randomly (National Population

Commission, Nigeria, 2019). All the women age 15-49 as respondents were either members of the selected households or who spent the night before the survey in the selected households. As two stage stratified sampling was applied in the survey to identify respondents as such findings for this survey can be generalized. As such the issues of external validity may not arise. However, due to extreme security issues in Borno, 11 of its LGAs which represents 39% of households in the state were dropped from the survey. The clusters dropped in these security compromised LGAs were replaced with other clusters from the remaining 16 LGAs in Borno (National Population Commission, Nigeria, 2019).

Therefore, at provincial level, the estimates for Borno were not representative because of the dropped LGAs. Because of non-proportional allocation of samples to the different states and the possibility of differences in response rates across the 36 states and Federal Capital territory (FCT), sampling weights was added to analysis of the 2018 NDHS data to ensure the actual representativeness of the survey results at the national level as well as the domain level. To prevent bias, no replacements and no changes of the pre-selected households were allowed in the implementing stages (National Population Commission, Nigeria, 2019).

Internal Validity

Threat to internal validity occur from experimental procedures, treatments, or experiences of the participants which threatens the ability of a researcher to draw correct

inferences from data on population being studied. A researchers need to identify these threats and design approaches to stop or minimize them (Creswell & Creswell, 2018). Estimates from any survey could be affected by either non-sampling errors and or sampling errors. Non-sampling errors occurs during data collection by interviewers which come from failure to locate and interview the right household, misunderstanding of the questions by interviewers or respondents, data entry errors and during data processing (National Population Commission, Nigeria, 2019).

Even though non-sampling errors are impossible to avoid and difficult to evaluate statistically, several efforts were taken address them during the implementation of the 2018 Nigeria Demographic and Health Survey (NDHS), through training of interviewers for three weeks, pre-testing of questionnaire prior to data collection, supervision and monitoring by monitors from higher administrative level and data cleaning to minimize errors. Sampling errors was applied in the statistical evaluation. In the 2018 NDHS, the Taylor linearization method was used to estimate variances for survey estimates as means, proportions, or ratios. The Jackknife repeated replication was used for variance estimation of more complex statistics such as fertility and mortality rates (National Population Commission, Nigeria, 2019).

The questionnaires administered to generate the secondary data used for this study, was based on DHS Program's standard Demographic and Health Survey (DHS-7) questionnaires. This was adapted to the population and health issues context for Nigeria (National Population Commission, Nigeria, 2019). The adaptation was done with

contribution from various stakeholders representing government ministries and agencies, non-governmental organizations, and international donors. The questionnaires were pretested by 45 participants comprising five zonal and 20 state National Population Commission (NPC) coordinators, five national Malaria Elimination Programme (NMEP) coordinators, two senior laboratory scientists from the Lagos University Teaching Hospital (LUTH), four laboratory scientists, four nurses, two enumerators and three data processing staff members.

Two-stage stratified sampling was applied in the survey to identify respondents (National Population Commission, Nigeria, 2019). A total of 42,121 women age 15-49 were identified for individual interviews out of which interviews were completed for 41,821 women, yielding a response rate of 99% (National Population Commission, Nigeria, 2019). This adds to the strength of the study internal validity.

Construct Validity

Threats to construct validity arise when investigators use inadequate definitions and measures of variables (Creswell & Creswell, 2018). When the definition and measurement of variables are inadequate, construct validity is threatened. In this study the same definition and measures of variables used in previous studies on factors that influence the place of delivery were maintained.

All questionnaires were originally finalized in English, but then translated into three major languages in Nigeria namely Hausa, Yoruba, and Igbo. Computer-assisted personal interviewing (CAPI) was used for data collection, which minimized data

manipulation, data lost, data validation and guaranteed long time archiving of data. Nigeria is a multi-ethnic country with cultural diversity but the questionnaires were translated only to three major languages in Nigeria yet administered to several diverse communities causing the content validity of the instruments including the questionnaire lacked completeness of tailored cultural competency components.

For this study, data for the independent variables husband's occupation, household wealth, perceived cost of delivery, perceived cost of transportation, antenatal care usage, perception of quality of care at delivery, status of wanted pregnancy and birth order and control variables (as independent variables) women's age, residence (rural/urban), education level, and husband education level, were analyzed along the three constructs (first, second and third delays) of Thaddeus and Maine's three delays model.

Statistical Conclusion Validity

Threats to statistical conclusion validity happens when experimenters draw inaccurate inferences from the data because of inadequate statistical power or the violation of statistical assumptions (Creswell & Creswell, 2018). Threats to statistical conclusion validity is influenced by statistical power when it is inadequate, inadequate sample size, effect size, and validity of measurement. In this study a total number of 41, 821 women 15 – 49 years old were interviewed, which is considered to be adequate (National Population Commission, Nigeria, 2019). Because of non-proportional allocation of samples to the different states and the possibility of differences in response

rates across the 26 states and Federal Capital territory (FCT), sampling weights was added to analysis of the 2018 NDHS data to ensure the actual representative of the survey results at the national level as well as the domain level (National Population Commission, Nigeria, 2019).

Statistical power in this study was set at 80% and a beta value of 20% A confidence level set at 95% (0.95) and alpha value of 5% (0.05), which was used to determine the statistical significance of the association between independent variables. In order to meet the requirement for a binary logistics regression statistical test, the dependent variable place of delivery was dichotomized as health facility delivery and home delivery. The values of place of delivery was re-coded by grouping public sector (government hospital, government health center, government health post and other public sector) and private hospitals (private hospital/clinics and other private sectors) as health facility and home (respondent home, other homes) and others as home delivery.

Ethical Procedures

The survey protocol used for NDHS conducted in 2018 was reviewed and approved by the National Health Research Ethics Committee of Nigeria (NHREC) and the ICF Institutional Review Board (National Population Commission, Nigeria, 2019). The consent of participants was gotten before the questionnaire were administered. This study will have no issues with participant's privacy because it used a secondary data on national demographic health survey conducted in Nigeria in 2018 (National Population Commission, Nigeria, 2019). This secondary dataset does not have personal identifiers of

women and their child to avoid linking the data to the study participants. Walden University Independent Review Board (IRB) gave approval for use of NDHS, 2018 as the secondary data for this study, which signifies that it met the ethical requirement. The secondary data used for this study will be stored safely and confidentially electronically for five years after approval of dissertation and it will be destroyed thereafter. The result of this study shall be shared with Federal Ministry of Health, Nigeria so that actions can be taken to address all the issues leading to low rate of health facility delivery with the aim of improving delivery in health facility which will ultimately improve health outcomes in Nigeria.

Summary

This study was a quantitative cross-sectional survey which used secondary data on the National Demographic and Health Survey conducted in Nigeria in 2018, which was a nationwide survey with a nationally representative sample of approximately 41, 821 women aged 15 – 49 years were selected randomly. This study was approved by the Walden University IRB for data collection (to use NDHS, 2018 as secondary data for the study). The independent variables are household wealth, cost of delivery, cost of transportation, antenatal care usage, perception of quality of care at delivery, status of wanted pregnancy and birth order. The dependent variable was place of delivery as health facility or home. The control variables are women's age, residence (rural/urban), education level, and husband's education level. The statistical software used for this study was IBM SPSS Statistical software version 25. The analysis includes a descriptive

analysis and binary logistics regression of determinants of place of delivery amongst women 15 – 49 years of age in northern Nigeria.

Chapter 4 includes an analysis and presentation of results of the secondary data based on the methodology in Chapter 3.

Chapter 4: Results

Introduction

The purpose of this study was to determine the influence of sociodemographic factors (women's age, residence, and education level; husband's education level and occupation; household wealth) and pregnancy risk factors (perceived cost of delivery and transportation, antenatal care usage, perception of quality of care at delivery, status of wanted pregnancy, and birth order) on the choice of place of delivery amongst women of reproductive age (15-49 years) in Northern Nigeria This study involved analyzing NDHS data from 2018 as secondary data to answer the study's research question and hypotheses using Thaddeus and Maine's three delays model. I ran analyses using IBM SPSS version 25 to answer the following research questions and hypotheses:

RQ1: Is there an association between women's age, residence (rural/urban), education level, and husband's education level and choice of place of delivery among women of reproductive age in Northern Nigeria?

$H_0 1$: There is no association between women's age, residence (rural/urban), education level and husband's education level and choice of place of delivery among women of reproductive age in Northern Nigeria.

$H_a 1$: There is an association between women's age, residence (rural/urban), education level, and husband's education level and choice of place of delivery among women of reproductive age in Northern Nigeria.

RQ2: Is there an association between husbands' occupation, household wealth, perceived cost of delivery at health facilities, perceived cost of transportation due to distance of health facilities, and choice of place of delivery among women of reproductive age in Northern Nigeria after controlling for women's age, residence (rural/urban), and education level as well as husbands' education level?

H_02: There is no association between husbands' occupation, household wealth, perceived cost of delivery at health facilities, perceived cost of transportation due to distance of health facilities, and choice of place of delivery among women of reproductive age in Northern Nigeria after controlling for women's age, residence (rural/urban), and education level as well as husbands' education level.

H_a2: There is an association between husbands' occupation, household wealth, perceived cost of delivery at health facilities, perceived cost of transportation due to distance of health facilities, and choice of place of delivery among women of reproductive age in Northern Nigeria after controlling for women's age, residence, and education level as well as husbands' education level.

RQ3: Is there an association between pregnancy risk factors (ANC use, perceived quality of care at delivery, status of wanted pregnancy, and birth order) and choice of place of delivery among women of reproductive age in Northern Nigeria after controlling for their age, residence (rural/urban), and education level as well as husbands' education level?

H_03: There is no association between pregnancy risk factors (ANC use, perceived quality of care at delivery, status of wanted pregnancy, and birth order) and choice of place of delivery among women of reproductive age in Northern Nigeria after controlling for their age, residence (rural/urban), and education level as well as husbands' education level.

H_a3: There is an association between pregnancy risk factors (ANC use, perceived quality of care at delivery, status of wanted pregnancy, and birth order) and choice of place of delivery among women of reproductive age in Northern Nigeria after controlling for their age, residence (rural/urban), and education level as well as husbands' education level.

Chapter 4 includes data collection procedures, time frames, and steps for data collection, cleaning, and preparation for analysis. This chapter also includes discrepancies in data collection, characteristics of study participants, and information about the representativeness of the sample in terms of the population of interest. This section contains descriptive and inferential analytical findings organized using the research questions.

Data Collection

This study involved using secondary data that was generated during the NDHS conducted in Nigeria in 2018, which was a population-based survey. One of the target age group that was interviewed on maternal health indicators were women of reproductive age 15-49 years sampled across all the states in the country. In the primary

study, women of reproductive age 15-49 years were sampled & interview in identified census enumeration areas (EAs) in all 36 states and Federal Capital Territory (FCT) in the country. The women 15-49 years interviewed were either permanent residents of the selected households or visitors who stayed in the households the night before the survey. A total of 41, 821 women were interviewed across the country of which 15, 243 are from the northern states that this study focused on, representing 36% of total sampled targeted population. In the households, a total of 42,121 women age 15-49 were identified for individual interviews and 41,821 were interviewed which represents a response rate of 99% (National Population Commission, Nigeria, 2019). I received approval from Walden University IRB to commence data collection. After what I started analyzing the NDHS 2018 data set I got from DHS office in USA via email request. The datasets are free and can be accessed when a request is made by filing a request format on their web site. I got approval from DHS office in USA within one week of request. Details of how NDHS, 2018 data were collected is in Chapter 3.

There were no discrepancies in the data collection from the plan presented in Chapter 3. However, I discovered at the point of data collection that some of the independent variables I planned to study had no data on the NDHS, 2018 data set, hence they were not part of the analysis in this study. These independent variables are: (a) perceived cost of delivery at health facility, (b) perceived cost of transportation due to distance of health facility, and (c) perceived quality of care at deliver.

The sampling method used in the 2018NDHS was a stratified sample selected in two stages. Thirty-six states and FCT were first stratified into urban and rural areas. Seventy-four sampling strata were identified and samples were selected independently in every stratum via a two-stage selection. A total of 1400 EAs were randomly selected and in each EA 30 households from the list of household were randomly selected and women 15-49 years of age in households were interviewed. Sampling weights were also calculated separately for each sampling stage and for each cluster because the survey was a two-stage stratified cluster sample selected from the sampling frame. Based on the randomization applied in the selection of this study participants, findings from analysis of 15, 243 women 15-49 years of age from the northern states (representing 36% of total sampled targeted population) as contained in this study, is a representative of the total population of the target age group women 15-49 years of age.

Results

Descriptive Statistics

In Table 12, a total of 15,243 women of reproductive age (15-49 years) from the Northern region of Nigeria were the participants for this study. However, only 14,598 of these women responded to the control variable "Husband's Education level" and independent variable "Husband's Occupation". Women age 20-34 years were 71.2% of participants and they constitute 73.7% and 69.1% of health facility and home deliveries respectively (Table 12). Women from rural areas were more (71.2%) and contributed to 80% of home deliveries and 60% of health facility deliveries. Most of the women

(55.8%) had no formal education and the contributed to the highest rate of home deliveries (70.3%). Similarly, women whose husband's had no formal education were more (43.1%) and they constituted the highest home deliveries (56.3%) (Table 12). A *p* value of < .05 for the chi-square (X^2) value for all the independent variables and the dependent variables, is an indication that the independent variables are independent of the dependent variable place of delivery (see Table 12).

Table 12

Distribution Frequency of Independent and Control Variables and Categories of Place of Delivery

Variables	Place Delivery			Chi-Square	df	*p*-value
	Home n(%)	Health Facility n(%)	Total n(%)			
Age in 5-year groups						
15-19	486 (4.9)	227 (4.3)	713 (4.7)			
20-24	2185 (21.8)	1135 (21.7)	3320 (21.8)	19.197	6	.004
25-29	2790 (27.9)	1550 (29.6)	4340 (28.5)			
30-34	2044 (20.4)	1095 (20.9)	3139 (20.9)			
35-39	1499 (15.0)	770 (14.7)	2269 (14.9)			
40-44	715 (7.1)	354 (6.8)	1069 (7.0)			
45-49	291 (2.9)	102 (1.9)	393 (2.6)			
Total	10010	5233	15243			
Type of place of residence						
Urban	1998 (20)	2086 (39.9)	4084 (26.8)			
Rural	8012 (80)	3147 (60.1)	11159 (73.2)	693.991	1	.001
Total	10010	5233	15243			

(table continues)

Variables	Place Delivery			Chi-Square	Df	*p*-value
	Home n(%)	Health Facility n(%)	Total n(%)			
Woman's educational level						
No Education	7035 (70,3)	1470 (28.1)	8505 (55.8)			
Primary	1452 (14.5)	953 (18.2)	2405 (15.8)			
Secondary	1372 (13.7)	2078 (39.7)	3450 (22.6)	3076.704	3	.0001
Higher	151 (1.5)	732 (14.0)	883 (5.8)			
Total	10010	5233	15243			
Husband/partner's education level						
No Education	5435 (56.3)	862 (17.4)	6297 (43.1)			
Primary	1211 (12.6)	557 (11.2)	1768 (12.1)	2550.824	4	.0001
Secondary	2136 (22.1)	2110 (42.6)	4246 (29.1)			
Higher	737 (7.6)	1378 (27.8)	2115 (14.5)			
Don't Know	127 (1.3)	45 (0.9)	172 (1.2)			
Total	9646	4952	14598			

(table continues)

Variables	Place Delivery			Chi-Square	Df	*p*-value
	Home n(%)	Health Facility n(%)	Total n(%)			
Husband/Partner Occupation						
Did not Work	207 (2.1)	107 (2.1)	314 (2.2)			
Professional/Technical/Managerial	519 (5.4)	824 (16.6)	1343 (9,2)	497.811	2	.001
Non Professional/Technical/Managerial	8920 (92.5)	4021 (81.2)	12941 (88.6)			
Total	9646	4952	14598			
Household Wealth						
Poorest	4125 (41.2)	672 (12.8)	4797 (31.5)			
Poorer	2806 (28)	1085 (20.7)	3891 (25.5)	2493.643	4	.001
Middle	1837 (18.4)	1285 (24.6)	3122 (20.5)			
Richer	946 (9.5)	1207 (23.1)	2153 (14.1)			
Richest	296 (3)	984 (18.8)	1280 (8.4)			
Total	10010	5233	15243			

(table continues)

Variables	Place Delivery			Chi-Square	df	*p*-value
	Home n(%)	Health Facility n(%)	Total n(%)			
Number of Antenatal Visits During Pregnancy						
No Antenatal Visit	2361 (37.9)	181 (5.2)	2542 (26.2)			
1 Antenatal Visit	224 (3.6)	70 (2)	294 (3)	1588.324	4	.001
2-3 Antenatal Visits	1298 (20.8)	580 (16.7)	1878 (19.4)			
4+ Antenatal Visits	2324 (37.3)	2615 (75.3)	4939 (50.9)			
Don't Know	21 (0.3)	27 (0.8)	48 (0.5)			
Total	6228	3473	9701			
Wanted Pregnancy or not						
Then	9378 (93.7)	4722 (90.2)	14100 (92.5)			
Later	490 (4.9)	404 (7.7)	894 (5.9)	59.438	2	.001
No More	142 (1.4)	107 (2)	249 (1.6)			
Total	10010	5233	15243			
Birth Order						
1-2	3087 (30.8)	2306 (44.1)	5393 (35.4)			
3-4	2803 (28)	1460 (27.9)	4263 (28)	331.471	2	.001
5+	4120 (41.2)	1467 (28)	5587 (36.7)			
Total	10010	5233	15243			

Statistical Assumptions

The analysis for this study includes binary logistic regression for an outcome variable place of delivery and independent variables husband's occupation, household wealth, antenatal care usage, status of wanted pregnancy and birth order and controlled variables woman's age, residence (rural/urban), education level, and husband's education level. I reviewed key binary logistics regression analysis such as dichotomous dependent

or outcome variable, Linearity, Multicollinearity, outliers, Independent error, missing data and having minimum of 10 cases per variable category.

To perform a binary regression analysis, I had to recode the dependent variable place of delivery to two outcomes as “Health Facility” and “Home”. And because I have some variables in the data set that had more than two categories, I had to create dummy variables with a reference category for each variable. In the binary regression analysis, I created reference categories for all independent and control variables.

Linearity

I used the model fit statistics and pseudo R^2 to test for linearity in binary logistic regression. The Cox & Snell *R* square and Nagelkerke *R* square carried out for all research questions showed that there was a correlation between the explanatory variables and the logit of the outcome variable place of delivery (health facility or home). The Hosmer & Lameshow test was carried out for all research question and it showed a Chi-Square values that was not statistically significant (> .05), meaning the model used in this study is a good fit for the data used.

Multicollinearity

A correlation matrix using the Pearson test was carried out to test for multicollinearity. The assumption is that predictor variables should not be highly correlated with each other. A Pearson’s values of $r = .8$ or more is a cause for concern. The correlation matrix test for all the independent and control variable showed a Pearson

r values < .8, meaning the predictor variables did not show any high correlation with each other and so it is no concern.

Missing Data

After running the descriptive analysis, I realized that only three variables had some missing data. These variables are Husbands education level (4.2%), husband's occupation (4.2%) and number of antenatal visits (36.4%). Although the missing data for number of antenatal visits seem high, the data set had 9701 respondents with complete data representing 63.6%, which is good enough to give some useful information that will guide decision making. The missing data were excluded from the cross tabulation analysis and binary logistic regression analysis carried out in this study. Analysis was not done for the independent variables: (a) perceived cost of delivery at health facility, (b) perceived cost of transportation due to distance of health facility and (c) perceived quality of care at deliver, because data was not available in the data set used for this study. Descriptive analysis of the outcome variable place of delivery did not show any outliers.

RQ1

Table 13 is the model summary for RQ1. The NagelKerke *R* Square of .304, means that 30.4% of the variance on the outcome variable place of delivery is explained by the model as a result of the combine influence of the explanatory variables woman's sociodemographic risk factors age, residence (rural/urban), education level, husband's education level.

Table 13

Model Summary For RQ1

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	15080.273[a]	.220	.304

a. Estimation terminated at iteration number 5 because parameter estimates changed by less than .001.

Table 14 classification table for research question 1 indicates that the predictive variables woman's sociodemographic risk factors age, residence (rural/urban), education level, husband's education level, predicted correctly 85.6% of deliveries at home and 53.2% of deliveries at health facilities. The overall correction prediction was 74.6% (Table 14).

Table 14

Classification Table for RQ1

			Predicted		
			Place of Delivery		
	Observed		Home	Health Facility	Percentage Correct
Step 1	Place of Delivery	Home	8254	1392	85.6
		Health Facility	2318	2634	53.2
	Overall Percentage				74.6

Table 15 shows that the association between women's sociodemographic risk factors residence (rural/urban) (*Wald*=91.890, *df*=1, *p*=.001), education level

(*Wald*=709.583, *df*=3, *p*= .001), and husband's education level (*Wald*=472.999, *df*=4, *p*=.001) and the place of delivery was statistical significant at a *p* value of .001. The association between these variables and place of delivery was statistically significant (*p*=.001) at all the categories (Table 15). However, the overall association of age was statistically significant (*Wald*=18.318, *df*=6, *p*=.005) but not statistically significant (*p* > .05) at the different age categories (Table 15).

Women who were 20-24 years of age (OR=.9), 25-29 years of age (OR=.8), 30-34 years of age (OR=.8), 35-39 years of age (OR=.9) and 45-49 years (OR= .8) were less likely than women who were 15-19 years to deliver in health facility (Table 15). However, women who were 40-44 years of age were 1.1 time more likely than women 15-19 years of age to deliver in health facility (OR=1.1). The women in the rural area are significantly less likely than the urban women to deliver at the health facility (OR=.647) (Table 15). Women who had higher education were 8.9 times (OR=8.9), secondary education 3.6 times (OR=3.6) and primary education 2 times (OR=2.0) more likely than women who had no education to deliver in health facility. Similarly, women whose husband's had higher education were 3.5 times (OR=3.5), secondary education 3.1 times (OR=3.1) and primary education 2 times (OR=2.0) more likely than their counterparts whose husband's had no education to deliver in health facility (Table 15).

Table 15

Variables in RQ1

							95% C.I. for EXP(B)	
		B	S.E.	Wald	Df	Sig.	Exp(B)	Lower	Upper
Step 1[a]	Age in 5-year groups			18.318	6	.005			
	Age in 5-year groups(20-24)	-.086	.104	.697	1	.404	.917	.749	1.124
	Age in 5-year groups(25-29)	-.201	.102	3.912	1	.048	.818	.670	.998
	Age in 5-year groups(30-34)	-.164	.105	2.447	1	.118	.849	.692	1.042
	Age in 5-year groups(35-39)	-.097	.108	.814	1	.367	.907	.734	1.121
	Age in 5-year groups(40-44)	.115	.120	.911	1	.340	1.122	.886	1.420
	Age in 5-year groups(45-49)	-.222	.163	1.856	1	.173	.801	.583	1.102
	Type of place of residence(Rural)	-.435	.045	91.890	1	.000	.647	.592	.708
	Woman's highest educational level			709.583	3	.000			
	Woman's highest educational level(Primary)	.690	.057	147.270	1	.000	1.994	1.784	2.229
	Woman's highest educational level(Secondary)	1.272	.055	526.816	1	.000	3.569	3.201	3.978
	Woman's highest educational level(Higher)	2.181	.109	403.392	1	.000	8.856	7.158	10.957

(table continues)

							95% C.I. for EXP(B)	
		B	S.E.	Wald	Df	Sig.	Exp(B)	Lower	Upper
Step 1[a]	Husband's education level			472.999	4	.000			
	Husband's education level(Primary)	.708	.068	109.244	1	.000	2.029	1.777	2.317
	Husband's education level(Secondary)	1.128	.056	407.596	1	.000	3.090	2.769	3.448
	Husband's education level(Higher)	1.276	.072	315.388	1	.000	3.582	3.111	4.123
	Husband's education level(Don’t Know)	.566	.183	9.529	1	.002	1.762	1.230	2.524
	Constant	-1.505	.106	200.994	1	.000	.222		

a. Variable(s) entered on step 1: Age in 5-year groups, Type of place of residence, Highest educational level, Husband/partner's education level.

Predicted Probability is of Membership for Health Facility.

RQ2

Table 16 is the model summary for research question 2. The NagelKerke *R* Square of .327, means that 32.7% of the variance on the outcome variable place of delivery is explained by the model as a result of the combine influence of the explanatory variables husband's occupation, household wealth after controlling for women's age, residence (rural/urban), education level, and husband's education level. Unfortunately, perceived cost of delivery at health facility and perceived cost of transportation due to distance of health facility was not analyzed in this section because information or data on these variables were not available on the secondary data set used for this study.

Table 16

Model Summary of RQ2

Step	-2 Log likelihood	Cox & Snell *R* Square	Nagelkerke *R* Square
1	14765.120[a]	.236	.327

a. Estimation terminated at iteration number 5 because parameter estimates changed by less than .001.

Table 17 is a classification table for research question 2 which indicates that the predictive variables husband's occupation, household wealth after controlling for women's age, residence (rural/urban), education level, and husband's education level, predicted correctly 85.7% of deliveries at home compared to 85.6% by control variables only and 55.6% of deliveries at health facilities compared to 53.2% by control variables only (Table 17 & Table 14). The overall correction prediction was 75.5%, which is an improvement over that for control variables only of 74.6% (Table 17 & Table 14). This means that the control variables had little or no influence on the effect of the independent

variable husband's educational level and household wealth on the outcome variable place of delivery.

Table 17

Classification Table for RQ2

Observed			Predicted Place of Delivery		
			Home	Health Facility	Percentage Correct
Step 1	Place of Delivery	Home	8269	1377	85.7
		Health Facility	2200	2752	55.6
	Overall Percentage				75.5

a. The cut value is .500

Table 18 shows that the association between husband's occupation (*Wald*=.047, *df*=2, *p*= .977), household wealth (*Wald*=303.455, *df*=4, *p*=.001) and the place of delivery. The association between husband's occupation and place of delivery was not statistical significant at a *p* value of .977 (*p*> .05) but statistically significant for household wealth at *p* value of .001 after controlling for women's age, residence (rural/urban), education level and husband's education level. The association between household wealth variables and place of delivery was statistically significant (*p*=.001) at all the categories (Table 18).

Women from richest households (OR= 5.1) are significantly five times, richer household (OR=3.0) three times, middle household (OR=2.2) twice and those from the poorer homes (OR= 1.6) were 1.6 times more likely than those from the poorest household to deliver at the health facility (Table 18). Women whose husbands were professionals/technical/managerial were 1.0 times (OR=1.0) more likely than their counterparts whose husband did not work to deliver in health facility (Table 18).

However, women whose husbands were nonprofessionals/non-technical/non managerial were less likely (OR=.994) than their counterparts whose husband did not work to deliver in health facility (Table 18).

Table 18

Variables in RQ2

							95% C.I. for EXP(B)	
		B	S.E.	Wald	df	Sig.	Exp(B)	Lower	Upper
Step 1[a]	Age in 5-year groups			21.746	6	.001			
	Age in 5-year groups(20-24)	-.119	.104	1.294	1	.255	.888	.724	1.090
	Age in 5-year groups(25-29)	-.273	.103	7.079	1	.008	.761	.623	.931
	Age in 5-year groups(30-34)	-.254	.106	5.758	1	.016	.776	.631	.955
	Age in 5-year groups(35-39)	-.170	.109	2.424	1	.120	.844	.681	1.045
	Age in 5-year groups(40-44)	.023	.122	.035	1	.852	1.023	.805	1.299
	Age in 5-year groups(45-49)	-.296	.165	3.219	1	.073	.743	.538	1.028
	Type of place of residence(Rural)	.004	.054	.006	1	.938	1.004	.904	1.116
	Woman’s highest educational level			485.589	3	.000			
	Woman’s highest educational level(Primary)	.620	.058	115.871	1	.000	1.859	1.660	2.081
	Woman’s highest educational level(Secondary)	1.094	.057	370.660	1	.000	2.986	2.671	3.338
	Woman’s highest educational level(Higher)	1.835	.112	267.997	1	.000	6.267	5.031	7.807
	Husband's education level			251.521	4	.000			
	Husband's education level(Primary)	.571	.069	68.274	1	.000	1.770	1.546	2.027
	Husband's education level(Secondary)	.907	.058	243.764	1	.000	2.477	2.210	2.776
	Husband's education level(Higher)	.870	.081	115.050	1	.000	2.386	2.035	2.797
	Husband's education level(Don’t Know)	.329	.187	3.098	1	.078	1.389	.963	2.003

(table continues)

		B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I. for EXP(B) Lower	Upper
Step 1[a]	Household Wealth			303.455	4	.000			
	Household Wealth (Poorer)	.463	.060	58.801	1	.000	1.590	1.412	1.790
	Household Wealth (Middle)	.774	.065	143.596	1	.000	2.168	1.911	2.461
	Household Wealth (Richer)	1.093	.077	199.268	1	.000	2.984	2.563	3.473
	Household Wealth (Richest)	1.628	.102	254.279	1	.000	5.093	4.169	6.221
	Husband's Occupation			.047	2	.977			
	Husband's Occupation(Professional/Technical/Managerial)	.010	.159	.004	1	.949	1.010	.740	1.379
	Husband's Occupation(Non Professional/Non-Technical/Non Managerial)	-.006	.144	.002	1	.964	.994	.749	1.318
	Constant	-2.129	.181	138.998	1	.000	.119		

a. Variable(s) entered on step 1: Age in 5-year groups, Type of place of residence, Highest educational level, Husband/partner's education level, Wealth index combined, Husband/Partner Occupation.

Predicted Probability is of Membership for Health Facility.

RQ3

Table 19 includes a model summary for RQ3. The NagelKerke *R* Square of .378, means that 37.8% of the variance on the outcome variable place of delivery is explained by the model as a result of the combine influence of the explanatory variables antenatal care usage, wanted pregnancy or not and birth order after controlling for woman's age, woman' residence (rural/urban), woman's education level and husband's education level. Perceived quality of care at deliver was not analyzed in this section because information or data on these variables were not available on the secondary data set used for this study.

Table 19

Model Summary of RQ3

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	8983.097[a]	.275	.378

a. Estimation terminated at iteration number 5 because parameter estimates changed by less than .001.

Table 20 indicates that the predictive variables husband's occupation, household wealth after controlling for woman's age, woman' residence (rural/urban), woman's education level and husband's education level, predicted correctly 84.4% of deliveries at home compared to 85.6% by control variables only and 59.8% of deliveries at health facilities compared to 53.2% by control variables only. The overall correction prediction was 75.7%, which is an improvement over that for control variables only of 74.6%. This means that the control variables had little or no influence on the outcome variable place of delivery.

Table 20

Classification Table for RQ3

Observed			Predicted Place of Delivery		
			Home	Health Facility	Percentage Correct
Step 1	Place of Delivery	Home	5020	930	84.4
		Health Facility	1306	1939	59.8
	Overall Percentage				75.7

a. The cut value is .500

Table 21 shows that the association between antenatal care usage (*Wald*=544.100, *df*=4, *p*= .001), wanted pregnancy or not (*Wald*=4.594, *df*=2, *p*=.101), birth order (*Wald*=31.730, *df*=2, *p*=.001) and the place of delivery. The association between antenatal care usage, birth order and place of delivery was statistical significant (*P*< .05), but the association between wanted pregnancy or not was not statistical significant at a *p* value of .101 (*p*> .05) after controlling for woman's age, woman' residence (rural/urban), woman's education level and husband's education level (Table 21). The association between antenatal care usage, birth order variables and place of delivery was statistically significant (*P*=.001) at all the categories (Table 21).

Women with four or more antenatal visits (OR= 7.73) are significantly eight times, two to three antenatal visits (OR=4.22) four times and one antenatal visit (OR=3.71) four times more likely than those women who did not have any antenatal visit to deliver at the health facility (Table 21). Women who wanted pregnancy later (OR= 1.05) were one time, wanted no more pregnancy (OR=1.46) were 1.5 times more likely than women who became pregnant then to deliver in health facility (Table 21). Women

who had 3rd and 4th birth order (OR= .724), 5th and more birth order (OR= .591), were less likely than their counterparts with 1st and 2nd birth order to deliver in health facility (see Table 21).

Table 21

Variables in Equation for RQ3

							95% C.I. for EXP(B)	
		B	S.E.	Wald	df	Sig.	Exp(B)	Lower	Upper
Step 1[a]	Age in 5-year groups			25.911	6	.000			
	Age in 5-year groups(20-24)	.073	.124	.350	1	.554	1.076	.844	1.373
	Age in 5-year groups(25-29)	.085	.130	.427	1	.513	1.089	.843	1.406
	Age in 5-year groups(30-34)	.325	.144	5.097	1	.024	1.384	1.044	1.834
	Age in 5-year groups(35-39)	.434	.152	8.096	1	.004	1.543	1.144	2.080
	Age in 5-year groups(40-44)	.607	.167	13.126	1	.000	1.834	1.321	2.547
	Age in 5-year groups(45-49)	.335	.208	2.599	1	.107	1.398	.930	2.101
	Type of place of residence(Rural)	-.298	.059	25.322	1	.000	.742	.661	.834
	Woman's highest educational level			242.667	3	.000			
	Woman's highest educational level(Primary)	.516	.073	49.646	1	.000	1.676	1.452	1.935
	Woman's highest educational level(Secondary)	1.001	.073	186.043	1	.000	2.721	2.357	3.143
	Woman's highest educational level(Higher)	1.649	.140	139.401	1	.000	5.203	3.957	6.842

(table continues)

							95% C.I. for EXP(B)	
		B	S.E.	Wald	df	Sig.	Exp(B)	Lower	Upper
Step 1[a]	Husband's education level			146.440	4	.000			
	Husband's education level(Primary)	.448	.087	26.316	1	.000	1.565	1.319	1.856
	Husband's education level(Secondary)	.815	.073	125.569	1	.000	2.260	1.960	2.607
	Husband's education level(Higher)	.915	.093	96.584	1	.000	2.497	2.081	2.997
	Husband's education level(Don’t Know)	.322	.237	1.842	1	.175	1.380	.867	2.199

(table continues)

							95% C.I. for EXP(B)	
		B	S.E.	Wald	df	Sig.	Exp(B)	Lower	Upper
Step 1[a]	Number of Antenatal Visit During Pregnancy			544.100	4	.000			
	Number of Antenatal Visit During Pregnancy(1 antenatal visit)	1.310	.173	57.357	1	.000	3.705	2.640	5.200
	Number of Antenatal Visit During Pregnancy(2-3 antenatal visits)	1.440	.100	206.367	1	.000	4.220	3.468	5.136
	Number of Antenatal Visit During Pregnancy(4+ antenatal visits)	2.045	.090	513.293	1	.000	7.731	6.477	9.227
	Number of Antenatal Visit During Pregnancy(Don’t Know)	1.949	.335	33.766	1	.000	7.022	3.639	13.551

(table continues)

								95% C.I. for EXP(B)	
		B	S.E.	Wald	df	Sig.	Exp(B)	Lower	Upper
Step 1[a]	Wanted pregnancy when became pregnant			4.594	2	.101			
	Wanted pregnancy when became pregnant(Later)	.049	.108	.203	1	.653	1.050	.849	1.298
	Wanted pregnancy when became pregnant(No more)	.378	.179	4.463	1	.035	1.460	1.028	2.074
	Birth Order			31.730	2	.000			
	Birth Order(3-4)	-.322	.077	17.694	1	.000	.724	.623	.842
	Birth Order(5+)	-.526	.095	30.652	1	.000	.591	.490	.712
	Constant	-2.819	.147	367.841	1	.000	.060		

a. Variable(s) entered on step 1: Age in 5-year groups, Type of place of residence, Highest educational level, Husband/partner's education level, Number of Antenatal Visit During Pregnancy, wanted pregnancy when became pregnant, Birth Order.

Summary

In this study, I determined the influence of sociodemographic factors (woman's age, residence (rural/urban), education level, and husband's education level, occupation, and household wealth), pregnancy risk factors (antenatal care usage, status of wanted pregnancy and birth order) on the choice of place of delivery amongst women of reproductive age (15-49 years) in Northern Nigeria. Descriptive analysis in terms of count and percentages using the cross tabulation to determine the distribution of independent and control variable in the two categories of the outcome variable place of delivery. An inferential analysis was conducted using the binary regression and odds ratios to determine how much the independent and the control variables predicted the place of delivery.

For RQ1, there was an association between women's sociodemographic risk factors residence (rural/urban) (p=.001), education level (p= .001), and husband's education level (p=.001) and the place of delivery, which was statistical significant. However, the overall association of age was statistically significant (p=.05) but not statistically significant ($p > .05$) at the different age categories.

For RQ2, the association between husband's occupation and place of delivery was not statistical significant at a p value of .977 ($p> .05$) but statistically significant for household wealth at p value of .001 after controlling for woman's age, residence (rural/urban), education level and husband's education level. The association between

household wealth variables and place of delivery was statistically significant (p=.001) at all the categories.

Lastly for RQ3, the association between antenatal care usage, birth order and place of delivery was statistically significant (P< .05), but the association between status of wanted pregnancy was not statistical significant at a p value of .101 (p> .05) after controlling for woman's age, residence (rural/urban), education level, and husband's education level. The association between antenatal care usage, birth order variables and place of delivery was statistically significant (p=.001) at all the categories.

Chapter 5 includes interpretations of results, limitations of the study, recommendations, implications for positive social change, and a conclusion.

Chapter 5: Discussion, Conclusions, and Recommendations

Introduction

This was a quantitative cross-sectional study to determine the influence of sociodemographic factors (women's age, residence, and education level; husband's education level and occupation; household wealth) and pregnancy risk factors (perceived cost of delivery and transportation, antenatal care usage, perception of quality of care at delivery, status of wanted pregnancy, and birth order) on the choice of place of delivery amongst women of reproductive age (15-49 years) in Northern Nigeria. In this study, I analyzed national NDHS data from 2018 as secondary data to answer this study's research questions and hypotheses using Thaddeus and Maine's three delays model.

In this study, I found that the association between residence (p =.001), education level (p = .001), husbands' education level (p =.001), and place of delivery was statistically significant. The overall association of age was statistically significant (p =.005) in terms of different age categories. The association between husbands' occupation and place of delivery was not statistically significant with a p value of .977 (p > .05) but statistically significant in terms of household wealth (p = .001) after controlling for women's age, residence, and education level as well as husbands' education level. The association between household wealth variables and place of delivery was statistically significant (p =.001) in all categories. The association between ANC use, birth order, and place of delivery was statistically significant (p < .05), but the association between wanted pregnancy was not statistically significant with a p value of .101 (p > .05) after controlling for women's age, residence, and education level as well as

husbands' education level. Associations between ANC use, birth order variables, and place of delivery was statistically significant (p =.001) in all categories.

Interpretation of Findings

The association between women's residence (p = .001) and education level (p = .001) as well as husbands' education level (p = .001) and place of delivery was statistically significant. Although women's age as a continuous variable was statistically significant (p = .005), it not statistically significant (p > .05) as a categorical variable in terms of age categories.

The study results found that women between the ages of 20 and 34 constituted 73.7% and 69.1% of health facility and home deliveries, respectively. women who were 20-24 (*OR* = .9), 25-29 (*OR* = .8), 30-34 (*OR* = .8), 35-39 (*OR* = .9) and 45-49 (*OR* = .8) were less likely than those who were 15-19 years old to deliver in health facilities. Women aged 20-39 and those between 45 and 49 were more likely that women who were 15 to 19 years old to deliver at home as well as prone to risks associated with pregnancy and delivery by unskilled birth attendants. However, women who were 40 to 44 years of age were 1.1 time more likely than women 15 to 19 years of age to deliver in health facilities (*OR* = 1.1).

Adewuyi et al. (2017) found that women in urban settings who are older than 36 are less likely to deliver at home and so will prefer health facility delivery, while those under the age of 20 are increasingly likely to deliver at home. Ogbo et al. (2020) said that higher maternal age (35-49) was associated with lower odds of unskilled birth attendants while lower maternal age (15-24) led to higher odds of unskilled birth attendant-assisted

deliveries. The chances of nonuse of health facilities for delivery increases with women aged 25–34 (Adedokun & Uthman, 2019). This contradicts the findings in my study.

I found that women from rural areas constituted 80% of home deliveries and 60% of health facility deliveries. In addition, women in rural areas were significantly less likely than urban women to deliver at health facilities (*OR* = .647). Women from rural areas were more likely to deliver at home compared to their urban counterparts, which increased risks of complications associated with delivery.

Adewuyi et al. (2017) said home delivery is much higher in rural compared to urban areas. Paul and Chouhan (2020) said that women who live in urban areas are likely to deliver in health facilities compared to women in rural areas. Similarly, Yaya et al. (2019) said that 67% of women who delivered at health facilities are from urban settings compared to 30.2% of those from rural settings. Ogbo et al. (2020) said that there is a higher likelihood of unskilled birth attendant-assisted deliveries among women in rural residences.

In this study, I found that the 55.8% of women who had no formal education constituted 70.3% of home deliveries. The study results also show that women who had higher education were more likely than women who had no education to deliver in health facility. In a similar vein, Women whose husbands had higher education were more likely than their counterparts whose husbands had no education to deliver in health facilities. Women who had no formal education were more likely to deliver at home compared to women with formal education.

Similarly, women whose husbands had no formal education constituted the highest home deliveries (56.3%) compared to husbands with a formal education, increasing women's risk in terms of pregnancy and delivery-related problems. Gebregziabher et al. (2019) found that the higher the education level of husbands, the higher the odds of their wives delivering in health facilities.

Husband Occupations, Household Wealth, and Place of Delivery

In this study, I found that the association between husband's occupation and place of delivery was not statistically significant at a *p* value of .977 ($p > .05$) but statistically significant for household wealth at *p* value of .001 after controlling for woman's age, residence (rural/urban), education level and husband's education level. In this study also, women whose husband were non-professional/non-technical/non-managerial (clerical, sales, Agricultural self-employed, Agricultural-employed, household and domestic services, skilled manual, unskilled manual, others and Don't know), were 88.6% of the total participants and they constituted 92.5% of home deliveries and 81.2% of health facility deliveries. This is so because women whose husband were non-professional/non-technical/non-managerial constituted 88.6% of the total respondents which is greatly skewed.

I found that women whose husbands were professionals/technical/managerial were one time (*OR*=1.0) more likely than their counterparts whose husband did not work to deliver in health facility. However, women whose husbands were nonprofessionals/non-technical/non managerial were less likely (*OR*=.994) than their counterparts whose husband did not work to deliver in health facility. This agrees with the findings by Abimbola et al. (2016) that women whose husbands were civil servants

had their delivery at the health facility when compared to those whose husbands were artisans or farmers. The reason is that civil servants had at least secondary education which makes them more literate as such a positive predictor of utilization of maternal health services (Abimbola et al., 2016).

In this study women from poorest and poorer homes combined contributed to highest rate (69.2%) of home deliveries. In addition, women from richest households (*OR*= 5.1) are significantly five times, richer household (*OR*=3.0) three times, middle household (*OR*=2.2) twice and those from the poorer homes (*OR*= 1.6) were 1.6 times more likely than those from the poorest household to deliver at the health facility. This agrees with the finding in a study conducted in Nigeria using secondary data from 1999 to 2018 by Ogbo et al. (2020), which said women coming from a rich household have lower odds of unskilled birth attendants' utilization. Similar to the finding in my study, Yaya et al. (2019) found that the odds of delivery at health facilities is highest with women from wealthy household. Adedokun and Uthman (2019) found that the chances of non-utilization of health facility for delivery increases with poor households.

ANC Use, Wanted Pregnancy Status, Birth Order, and Place of Delivery

I found in my study that the association between ANC usage, birth order and place of delivery was statistically significant ($p < .05$), but the association between status of wanted pregnancy was not statistical significant at a p value of .101 ($p > .05$) after controlling for woman's age, residence (rural/urban), education level and husband's education level. I also found that 50.9% of the women who had more than four antenatal visits constituted the highest rate (75.3%) of health facility deliveries. On the other hand,

women who had no antenatal visits during last pregnancy were 26.2% and constituted the highest (37.9%) home deliveries.

In this study, women with four or more antenatal visits (*OR*= 7.73) are significantly eight times, two to three antenatal visits (*OR*=4.22) four times and one antenatal visit (*OR*=3.71) four times more likely than those women who did not have any antenatal visit to deliver at the health facility. These findings agree with findings by Gebregziabher et al. (2019) in a study carried out in Akordet, cultural diverse lowland town of Gash-Barka Region, Eritrea, who said those with four or more visits are more likely to deliver in a health facility compared to those who had less than four visits. Similarly, Ogbo et al. (2020), in a study where they investigated trend and factors that drive the utilization of unskilled birth attendants during democratic governance in Nigeria from 1999 to 2018, found that frequent ANC visits was associated with lower odds of unskilled birth attendants' utilization. The finding in my study was also collaborated by Ajah et al. (2019) who found most women who had at least one antenatal clinic in the public hospitals were delivered by skilled birth attendants.

In this study I found that most of the women (92.5%) became pregnant when they wanted, and 93.7% of them delivered at health facility deliveries and 90.2% at home. Women who wanted pregnancy later (*OR*= 1.05) were one time, wanted no more pregnancy (*OR*=1.46) were 1.5 times more likely than women who became pregnant then to deliver in health facility. Contrary to the finding in my study, Kasaye et al. (2017) found that unplanned pregnancy was a determinants of home delivery in a study conducted in North West, Ethiopia. However, the findings by Tebekaw et al. (2015) in a study in Addis Ababa, Ethiopia found that women with intended pregnancy were found

to be 1.75 times more likely to deliver at private healthcare facilities, which collaborated my findings.

I found that women who had 5th or more birth order constituted highest rates (44.1%) of home deliveries and women with 1st and 2nd birth orders constituted the highest (41.2%) health facility deliveries. Women who had 3rd and 4th birth order (*OR*= .724), 5th and more birth order (*OR*= .591), were less likely than their counterparts with 1st and 2nd birth order to deliver in health facility. These finding aligns with the findings in a study by Gebregziabher et al. (2019) that mothers whose last child's birth order was 4th to 6th were less likely to deliver at health facility compare with mothers whose last child's birth order was 1st to 3rd. Therefore, as the birth order of a child increases, the likelihood of facility delivery decreases. Adewuyi et al. (2017) in a study in Nigeria using secondary data also found that birth order one decreases the likelihood of home delivery which collaborated the findings in my study.

Findings from Application of the Theoretical Framework

This study involved using Thaddeus and Maine's three delays model as the theoretical framework to determine the association between the sociodemographic risk factors woman's age, residence (rural/urban), education level, and husband's education level, and household wealth), pregnancy risk factors (ANC usage, status of wanted pregnancy and birth order and place of delivery amongst women of reproductive age (15-49 years) in Northern Nigeria. The three delays model applied in this study enabled me to explore the three types of delays to utilizing services at the hospital with the aim of designing the right intervention to improve childbirth at hospital. These delays were delays in decision to seek care at health facility (first delay), delays associated with

identifying and reaching health facility (second delay) and delays associated with receiving quality care (third delay).

In this study, for the delay in seeking care (first delay) at health facility, I found that, there is an association between woman's sociodemographic risk factors residence (rural/urban) (p= .001), education level (p= .001), husband's education level (p=.001) and the place of delivery was statistically significant. Even though the overall association of woman's age as continuous variables and place of delivery was statistically significant (p=.005) but it was not statistically significant ($p > .05$) at the different age categories as categorical variable except for women between the ages of 40-44. Women who were 40-44 years of age were 1.1 time more likely than women 15-19 years of age to deliver in health facility. Women in the rural area are significantly less likely than the urban women to deliver at the health facility. I also found that women who had higher education were 8.9 times, secondary education 3.6 times and primary education 2 times more likely than women who had no education to deliver in health facility. Similarly, women whose husband's has higher education were 3.5 times, secondary education 3.1 times and primary education 2 times more likely than their counterparts whose husband's had no education to deliver in health facility.

For the delays associated with identifying and reaching health facility (second delay), I found that the association between husband's occupation and place of delivery was not statistically significant ($p > .05$) but statistically significant for household wealth at p value of .001 after controlling for woman's age, residence (rural/urban), education level and husband's education level. Women whose husbands were professionals/technical/managerial were one time more likely than their counterparts

whose husband does not work to deliver in health facility. Women from richest households are significantly five times, richer household three times, middle household twice and those from the poorer homes were 1.6 times more likely than those from the poorest household to deliver at the health facility.

And for delays associated with receiving quality care (third delay), I found in my study that the association between ANC usage, birth order and place of delivery was statistically significant ($p < .05$), but the association between status of wanted pregnancy was not statistical significant at a p value of .101 ($p > .05$) after controlling for woman's age, residence (rural/urban), education level and husband's education level. In this study, women with four or more antenatal visits were significantly eight times, two to three antenatal visits were four times and one antenatal visit were four times more likely than women who did not have any antenatal visit to deliver at the health facility. Women who wanted pregnancy later were one time, those who wanted no more pregnancy were 1.5 times more likely than women who became pregnant then to deliver in health facility. Women who had 3rd and 4th birth order and 5th and more birth order were less likely than their counterparts with 1st and 2nd birth order to deliver in health facility.

There were several studies that used the Thaddeus and Maine's three delays model as the theoretical framework to determine the factors responsible for delays to utilization of obstetric services at the health facilities. Similar to the findings in my study, Mukhtar et al. (2018), found that age, parity, educational status, occupation, and number of antenatal visits significantly affected the place of delivery amongst women from tribal areas of Block Hazratbal district Srinagar in rural and pastoralist areas in Kafa Zone of Southern Nation, Nationalities and Peoples' Region, and Adwa Woreda of Tigray

Region, in Ethiopia. Corroborating the finding in my study, Kifle et al. (2018) found that women whose husband are educated were more likely to deliver in health facilities and women with medium to high wealth status are more likely to delivery in facilities within 2 km distance. As indicated in my study, Abdel‐Raheema et al. (2017) also found lack of antenatal care, was associated with third delays among women who were admitted in Women's Health Hospital in Assiut University, Egypt compared with controls. Kifle et al. (2018) said that women who were literate and read newspapers and are knowledgeable about complications during delivery were more likely to deliver in health facility, which corroborated the finding in my study.

Limitations of the Study

A limitation involving secondary data was that the validity and reliability of the questionnaire used by original authors to generate information was not tested in this study. In addition, this study did not test effect of non-sampling errors and or sampling errors on internal validity of the secondary data.

However, the issues of external validity in the National Demographic and Health Survey conducted in Nigeria in year 2018 was addressed by making the survey nation-wide with a nationally representative sample of approximately 41,821 women that were selected randomly. Secondly, all the women age 15-49 sampled and interviewed were either members of the selected households or those that spent the night before the survey in the selected households. Thirdly, a two stage stratified sampling was applied in the survey to identify respondents as such findings from this survey can be generalized.

Efforts taken to address non sampling errors and sampling errors during the implementation of the 2018 Nigeria Demographic and Health Survey (NDHS) include,

adaptation of DHS Program's standard Demographic and Health Survey (DHS-7) questionnaires, training of interviewers for three weeks, pre-testing of questionnaire prior to data collection, supervision and monitoring by monitors from higher administrative level and data cleaning to minimize errors. Sampling errors was applied in the statistical evaluation. In the 2018 NDHS, the Taylor linearization method was used to estimate variances for survey estimates as means, proportions, or ratios. The Jackknife repeated replication was used for variance estimation of more complex statistics such as fertility and mortality rates.

To avoid threat to construct validity in this study, I maintained the same definition and measures of variables used in previous studies on factors that determine the place of delivery. A total of 41, 821 women were interviewed across the country of which 15, 243 are from the northern states that this study focused on, representing 36% of total sampled targeted population, which is considered adequate. To prevent threat to statistical conclusion validity, statistical power in this study was set at 80% and a beta value of 20%. A confidence level set at 95% (0.95) and alpha value of 5% (0.05), which was used to determine the statistical significance of the association between independent variables.

I discovered at the point of data collection and analysis that three of the independent variables I planned to study had no data on the National Demographic Health Survey for Northern Nigeria, 2018 data set, hence these variables were excluded during analysis in this study. The independent variables excluded from analysis in this study were: (a) perceived cost of delivery at health facility, (b) perceived cost of transportation due to distance of health facility, and (c) perceived quality of care at deliver.

Recommendations

Government interventions to improve health facility delivery should focus on women age 20-39 and those 45-49, who reside in rural areas, who had no formal education, from poorest and poorer homes, who had 5th or more birth order, and who had no antenatal visits during last pregnancy. This is because these groups are more likely to deliver at home, which makes them prone to risk associated with pregnancy and delivery by unskilled birth attendants. Individuals and family members should encourage their loved ones who become pregnant to utilize obstetric services at health facilities to minimize obstetric risk and complications that follows assistant by unskilled attendants.

More research should be conducted in Nigeria to understand the association between independent variables: (a) perceived cost of delivery at health facility, (b) perceived cost of transportation due to distance of health facility, and (c) perceived quality of care at deliver and place of delivery that I could not analyze because of lack of information in the secondary dataset for my study. There should also be research to determine the association between other variables and place of delivery along the three delays of Thaddeus and Maine's. Key amongst these variables are religion, marital status, woman decision making power and distance of a woman's settlement to nearest obstetric center and birth interval. My study which was a cross sectional quantitative study in Northern Nigeria, could only answer the question on what factors influence a woman's choice of place of delivery. Therefore, there is the need to conduct a qualitative research in Northern Nigeria to understand the reason why these factors influence a woman's choice of place of delivery.

Implications

Implications for Positive Social Change

This study determined the influence of sociodemographic factors (woman's age, residence (rural/urban), education level, and husband's education level, occupation, and household wealth), pregnancy risk factors (ANC usage, status of wanted pregnancy and birth order) on the choice of place of delivery amongst women of reproductive age (15-49) in Northern Nigeria. The findings from this study will guide program managers in health and policy makers to develop strategies that may improve deliveries at health facilities, which could positively impact on the health outcomes of pregnant women and their babies.

In addition, my study provides information on additional factors that can influence the choice of place of delivery amongst women of reproductive age in northern Nigeria. These additional factors which have not been previously studied in Nigeria using the three delays theoretical model includes husband's education level, household wealth, ANC usage, status of wanted pregnancy and birth order.

These findings also have the potential to support the design and implementation of population based programs to impact positive social change in the lives of mothers and their newborns in Nigeria. These findings will be disseminated to program managers in Ministry of Health, policy makers, development partners and donors in maternal and child health in Nigeria in coordination meetings and conferences. In addition, the findings from this study will be published in peer-reviewed journals so as to reach international public health communities and research institutions.

Implications for Practice

The findings from this study, when fully implemented by policy makers and health managers, may lead to increase in the proportion of women who deliver in health facility, which may ultimately lead to the reduction in morbidity and mortality amongst pregnant women and their newborns.

Conclusion

This quantitative cross-sectional study involved using national household secondary data of the NDHS in 2018. However, as previously designed in my proposal, I could not analyze the association between three independent variables due to lack of information in the secondary dataset for my study.

In this study, for research question one, the association between woman's sociodemographic risk factors residence (rural/urban), education level (p= .001), husband's education level (p=.001) and the place of delivery was statistically significant. However, the overall association of age as a continuous variable was statistically significant (p=.005) but not statistically significant (p > .05) when using age as a categorical variable using several age categories. So I accepted the alternate hypothesis and reject the null hypothesis.

For research question two, I found that the association between husband's occupation and place of delivery was not statistical significant at a p value of .977 (p> .05) but statistically significant for household wealth at p value of .001 after controlling for woman's age, woman' residence (rural/urban), woman's education level and husband's education level. I accepted the null hypothesis and rejected the alternate

hypothesis for husband's occupation but rejected null hypothesis and accepted alternate hypothesis for household wealth.

For research question three, I found that the association between antenatal care usage, birth order and place of delivery was statistically significant ($p < .05$), but the association between wanted pregnancy or not was not statistically significant at a p value of .101 ($p > .05$) after controlling for woman's age, woman' residence (rural/urban), woman's education level and husband's education level. Therefore, I rejected null hypothesis and accepted the alternate hypothesis for antenatal care usage, birth order, but accepted null hypothesis and rejected the alternate hypothesis for wanted pregnancy or not.

In addition, I found that women age 20-39 and those 45-49 , women who reside in rural areas, who had no formal education, from poorest and poorer homes, who had 5th or more birth order, who had no ANC l visits during last pregnancy were more likely to deliver at home, which makes them prone to risk associated with pregnancy and delivery by unskilled birth attendants, that may affect the health outcome of pregnant women and their babies.

The findings from this study, will assist the Ministry of Health in Nigeria, to develop policy, design and implement interventions that may improve the outcome of newborn deliveries at health facilities which ultimately may lead to reduction in morbidity and mortality amongst women and newborns. These findings when fully utilized by individuals, family members and health authorities, has the potential of positive social change in the lives of mothers and newborns in Nigeria. Further research

is needed to determine more determinants of place of deliveries and also the reasons for non-utilization of obstetric services my pregnant women in Nigeria.

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Appendix A: Approval to Use DHS Survey Dataset for Nigeria

Mar 26, 2020

Daniel Ali
Walden University
United States
Phone: +2348034022393
Email: aliniel2001@yahoo.com
Request Date: 03/25/2020

Dear Daniel Ali:

This is to confirm that you are approved to use the following Survey Datasets for your registered research paper titled: "Factors influencing the choice of place of childbirth among women of childbearing age in north centr": **Nigeria**
To access the datasets, please login at: https://www.dhsprogram.com/data/dataset_admin/login_main.cfm. The user name is the registered email address, and the password is the one selected during registration.

The IRB-approved procedures for DHS public-use datasets do not in any way allow respondents, households, or sample communities to be identified. There are no names of individuals or household addresses in the data files. The geographic identifiers only go down to the regional level (where regions are typically very large geographical areas encompassing several states/provinces). Each enumeration area (Primary Sampling Unit) has a PSU number in the data file, but the PSU numbers do not have any labels to indicate their names or locations. In surveys that collect GIS coordinates in the field, the coordinates are only for the enumeration area (EA) as a whole, and not for individual households, and the measured coordinates are randomly displaced within a large geographic area so that specific enumeration areas cannot be identified.

The DHS Data may be used only for the purpose of statistical reporting and analysis, and only for your registered research. To use the data for another purpose, a new research project must be registered. All DHS data should be treated as confidential, and no effort should be made to identify any household or individual respondent interviewed in the survey. Please reference the complete terms of use at: https://dhsprogram.com/Data/terms-of-use.cfm.

The data must not be passed on to other researchers without the written consent of DHS. However, if you have coresearchers registered in your account for this research paper, you are authorized to share the data with them. All data users are required to submit an electronic copy (pdf) of any reports/publications resulting from using the DHS data files to: references@dhsprogram.com.

Sincerely,

Bridgette Wellington

Bridgette Wellington
Data Archivist
The Demographic and Health Surveys (DHS) Program