PREPARATION IS KEY TO SAFE DELIVERY: A Review of The Factors Contributing to Birth Preparedness and Complication Readiness in Nigeria

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ABBREVIATIONS

AIDS	Acquired Immunodeficiency Syndrome
ANC	Antenatal Care
ARI	Acute Respiratory Infection
BCC	Behavioural Change Communication
BPCR	Birth Preparedness and Complication Readiness
CBR	Crude Birth Rates
CHEW	Community Health Extension Workers
CHW	Community Health Workers
EMOC	Emergency Obstetric Care
FIGO	International Federation of Gynaecology and Obstetrics
GDP	Gross Domestic Product
HCP	Health Care Provider
HIV	Human Immunodeficiency Virus
IEC	Information, Education and Communication
IMR	Infant Mortality Rate
INHP	Integrated Nutrition and Health Program
JHPIEGO	John Hopkins Program for International Education in Gynaecology and Obstetrics
LGA	Local Government Area
LMIC	Low-Middle-Income-country
MCHIP	Maternal and Child Health Integrated Program
MMR	Maternal Mortality Rate
MNCH	Maternal, Newborn and Child Health
MNHP	Maternal, Neonatal Health Program
NDHS	National Demographic Health Survey
NMR	Neonatal Mortality rate
PHC	Primary Health Care
PNC	Postnatal care
SBA	Skilled Birth Attendant
SEM	Socio-ecological Model
SNL	Saving Newborn Lives
SSA	Sub-Saharan Africa
TBA	Traditional Birth Attendants
TFR	Total Fertility Rate
U5MR	Under-5 Mortality Rate
UNFPA	United Nations Population Fund
UNICEF	United Nations Children's Emergency Fund
VHW	Village Health Worker
WHO	World Health Organisation

GLOSSARY OF KEY TERMS

Birth Preparedness and Complication Readiness: Birth Preparedness and Complication Readiness (BP/CR) is a strategy to promote the timely use of skilled maternal and neonatal care, especially during childbirth, based on the theory that preparing for childbirth and being ready for complications reduces delays in obtaining this care.[1]

Focus Antenatal Care: Focused antenatal care (FANC) is personalized care provided to a pregnant woman that emphasizes the women's overall health status, her preparation for childbirth, and readiness for complications or it is timely, friendly, simple safe services to pregnant women.[2]

Skilled Birth Attendant (Skilled Health Personnel): Competent maternal and newborn health (MNH) professionals educated, trained, and regulated to national and international standards to i) provide and promote evidence-based, human-rights-based, quality, sociocultural sensitive, and dignified care to women and newborns; ii) facilitate physiological processes during labour and delivery to ensure a clean and positive childbirth experience, and iii) identify and manage or refer women and/or newborns with complications.[3]

Maternal Mortality: Maternal death is the death of a woman while pregnant or within 42 days of termination of pregnancy, irrespective of the duration and site of the pregnancy, from any cause related to or aggravated by the pregnancy or its management but not from accidental or incidental causes.[4]

The Maternal Mortality Ratio (MMR): The number of maternal deaths during a given time period per 100,000 live births during the same time period.[5]

Community Health Workers: These are health workers who provide health education, referral and follow-up, case management, and basic preventive health care and home visiting services to specific communities. They provide support and assistance to individuals and families in navigating the health and social services system.[6]

Demographic transition: Demographic transition refers to the shift from high birth rates and high infant death in societies that have minimal technology, education, and economic development into low birth rates and low death rates in societies with advanced technology, education, and economic development.[7]

Epidemiological Transition: Epidemiological transition is the shift from acute infections and deficiency diseases characteristic of under-development to chronic non-communicable diseases characteristic of modernization and advanced levels of development.[8]

ABSTRACT

Introduction: Birth preparedness and complication readiness is a safe motherhood strategy aimed at increasing skilled birth attendant utilization and ultimately reducing maternal and neonatal morbidity and mortality. Nigeria currently has a high maternal mortality rate of 917 maternal deaths per 100 000 live births contributing to about 20% of maternal deaths around the world. Despite the huge benefit of birth preparedness, the knowledge, attitude, and practice remain low in Nigeria. This study aimed to explore the determining factors and barriers to birth preparedness and complication readiness in Nigeria.

Methodology: A descriptive literature review of published and grey literature on maternal health/birth preparedness and complication readiness in Nigeria, Sub-Saharan Africa, and other low-middle-income countries was conducted. The socioecological model was used to analyse the determining factors.

Results: The study showed a regional and an urban-rural variation in the scope and level of birth preparedness and complication readiness across Nigeria. The levels were higher in the South compared to the North and higher in urban compared to rural areas. Age and educational level of the mother, socioeconomic status, and parity were significant individual-level factors with male involvement being a significant inter-personal level factor. Quality of maternal care services was a major institutional level factor. Cultural and religious practices were identified as barriers at the community level.

Discussion: This study recommends a combination of strategies across the various levels of the socio-ecological model to ensure that all the identified determining factors are simultaneously addressed as this has been proven to be effective.

Key words: Birth preparedness, Complication readiness, Skilled birth, Maternal health, Nigeria

Word Count: 13 142 words

CHAPTER ONE

1. BACKGROUND

1.1. Geographic, Political and Demographic features of Nigeria

Nigeria is a Western African country bounded in the north by the Chad Republic and Niger Republic, the Atlantic Ocean in the south, the Benin Republic in the west, Republic of Cameroon in the East. The country is situated on the Gulf of Guinea with 923,768km^2 as a total area and a population density of 226 per km^2. Nigeria has a tropical climate with wet and dry seasons.[9]

Figure 1: Map of Nigeria showing the 36 states[10]

Nigeria runs a three-tiered federal governance system. It comprises 36 states, 774 Local Government Area (LGA), and the Federal Capital Territory also known as Abuja as the national capital. The LGAs are further divided into 9,565 political wards which are used by the primary health care system to achieve universal health coverage.[9,11] The country is divided into 6 geo-political zones namely North-East, North-West, North-Central, South-East, South-West, and South-South.

Nigeria is the most populous country in Africa with an estimated population of 211 million people which is equivalent to 2.64% of the total world population.[12] It has an annual growth rate of 2.2%.[13] The median age in Nigeria is 18.2 years making it a predominantly young population. The current total fertility rate (TFR) is 5.2 births per woman, a 1.3% decline from 2020.[14] There are roughly 1.04 males to every female in the country i.e. a sex ratio of 102.8 males per 100 females.[10]

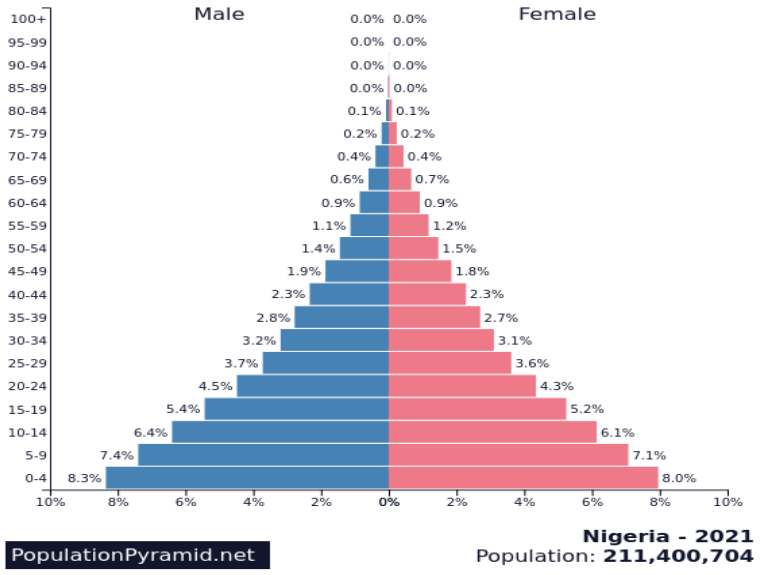

Figure 2: Population pyramid of Nigeria.[15]

Nigeria has a young population structure as evident in the population pyramid above. Children under the age of 15 years make up 45% of the population while young people aged 10-24 years make up 33% of the population. Women of reproductive age group 15-49 years, children under 5 years, and the elderly (65years and above) make up 22%, 20%, and 5% of the total population, respectively. The dependency ratio of Nigeria is quite high at 73.3% due to the high unemployment rate and high TFR.

1.2. Health Indicators

The current life expectancy for Nigeria is 55 years, a 0.57% increase from 2020.[12] It is estimated to be 54 years for males and 56 years for females. The crude birth rate (CBR) is currently 37 births per 1000 people, a 1.1% decline from 2020. [10,12]

Other health indicators are listed in the table below.

Table 1: Current Health Indicators in Nigeria.[12,16]

S/NO	Health Indicators	Data
1.	Infant Mortality Rate (IMR)	**74** infant deaths per 1000 live births
2.	Neonatal Mortality Rate (NMR)	**36** neonatal deaths per 1000 live births
3.	Under-5 Mortality Rate (U5MR)	**117** under-5 deaths per 1000 live births
4.	Antenatal coverage	**57%**
5.	Births attended by skilled personnel	**43%**
6.	Maternal Mortality Rate (MMR)	**917** deaths per 100 000 live births
7.	Total Fertility Rate (TFR)	**5.2** births per woman

1.3. Socioeconomic Profile

Nigeria's national revenue is predominantly from oil (90% of export earnings and greater than 75% of government revenue) however subsistent agriculture is the predominant occupation.[11] Nigeria's Gross Domestic Product (GDP) for 2019 was $448.12 billion, a 12.8% increase from 2018 with an annual GDP growth rate of 2.2%. The GDP per capita is $2,230.[17] Nigeria is currently the largest economy in Africa however the country went into recession in 2016-17 due to the sharp fall in crude oil global price.

1.4. Health Care System

Nigeria's health system comprises the public and private sectors as well as the formal and informal sectors. The public health sector is divided into three levels of government i.e., federal, state, and local. As depicted in the figure below, the Local Government Areas (LGAs) are responsible for primary health care services (PHC), the State Government are responsible for the secondary level of care i.e. the general hospitals while the Federal Government is responsible for the tertiary level of care i.e. teaching hospitals and specialist centers.[11] At the primary level, community-based health care is offered by various cadres of community health workers which include Volunteer Health Workers (VHW), Community Health Workers (CHW), and Community Health Extension Workers (CHEW).

The private sector which is divided into formal/informal and for-profit/not-for-profit provides 60% of the health care services in Nigeria. The informal private-for-profit health sector includes the traditional medicine providers, patent and proprietary medicine vendors, drug shops, complementary and alternative health providers.[11]

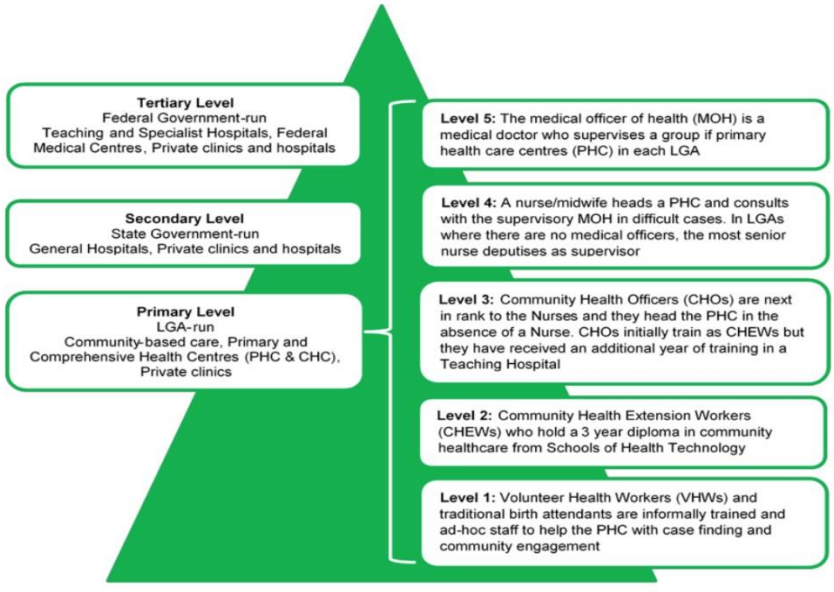

Figure 3: Nigeria's Health System.[11]

1.5. The Burden of Disease in Nigeria

Nigeria has a double burden of disease in which the communicable diseases (66%) of the total burden of morbidity) are still high and there is an increasing burden of non-communicable diseases. The prevalent communicable diseases in Nigeria include malaria, acute respiratory infections (ARI), tuberculosis, diarrhoea, measles, human immunodeficiency virus/acquired immunodeficiency disease syndrome (HIV/AIDS), and neglected tropical diseases like schistosomiasis, trachoma, filariasis.[9]

The burden of disease in Nigeria has also increased due to outbreaks of epidemic-prone diseases such as covid-19, Lassa fever, Ebola virus disease, cholera in recent years. The morbidity and mortality due to non-communicable diseases like cardiovascular diseases, cancers, diabetes mellitus, and chronic obstructive pulmonary diseases are on the rise due to the demographic transition of the population and epidemiological transition of diseases in Nigeria.[9,11] In recent times, Nigeria has experienced intermittent violence and social unrest, which have contributed to an increase in mental health disorders, injuries, and disabilities.

Pregnancy and delivery-related complications also contribute to the increasing burden of disease in Nigeria leading to the high maternal mortality ratio of 917 per 100 000 live births.[18] The direct causes of the high maternal mortality include haemorrhage, unsafe abortion, sepsis, eclampsia, and obstructed labour.[9] Malaria, pneumonia, diarrhoea, HIV/AIDS, malnutrition all increase the burden of disease in the under-5 population.[9]

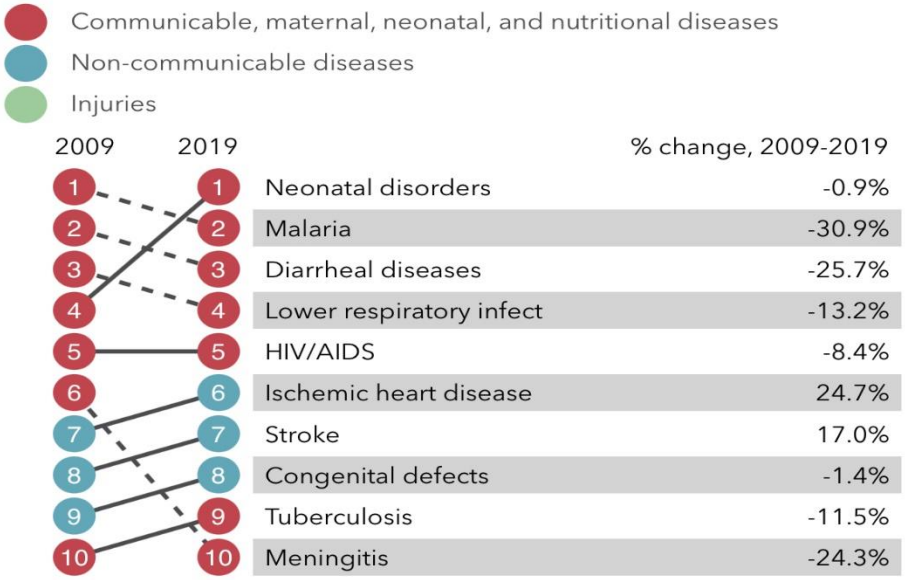

Figure 4: Top 10 causes of deaths in Nigeria in 2019 and %change from2009-2019, all ages combined.[19]

CHAPTER TWO

2. INTRODUCTION

Birth preparedness and complication readiness (BPCR) is an approach that encourages the prompt use of skilled birth attendants during pregnancy, delivery, and post-natal period based on a theory that when a pregnant woman prepares for childbirth and is aware of pregnancy and delivery complications, it will reduce unnecessary delays in accessing maternal and newborn health services.[20] The factors that contribute to BPCR and subsequent maternal services utilization have been identified at the individual, family, community, provider, facility, and policy level, and when lacking, it contributes to increased maternal mortality in developing countries like Nigeria.[21] BPCR at the individual level includes recognizing danger signs of pregnancy, delivery, and the post-partum period, identifying a place of delivery and a skilled birth attendant, saving money, and making transport arrangements.[20] Focused antenatal care gives pregnant women the opportunity of health counseling and education. It also provides the opportunity for the development and review of the BPCR plan with a skilled birth attendant.[21,22]

When BPCR is adequate, it can contribute to the survival of a pregnant woman and the baby when maternal or neonatal complications occur.[23] BPCR as a safe motherhood strategy has proven to reduce delays in seeking maternal care and contributes significantly to reducing maternal deaths.[24] The delays BPCR aim to prevent include delays in seeking care, reaching care, and receiving adequate care as depicted in the figure below. If the pregnant woman and her family plan and decide to seek skilled delivery care before labour starts and can execute this plan, pregnancy complications will be prevented. Being aware of danger signs also improves recognition of pregnancy complications and reduces the delay to seek care.[20] Making transport available, saving money to pay for maternal services reduce delay in reaching care while the delay in receiving appropriate care can be reduced at the provider and facility level by putting adequate preparations in place to attend to deliveries and likely complications.[20]

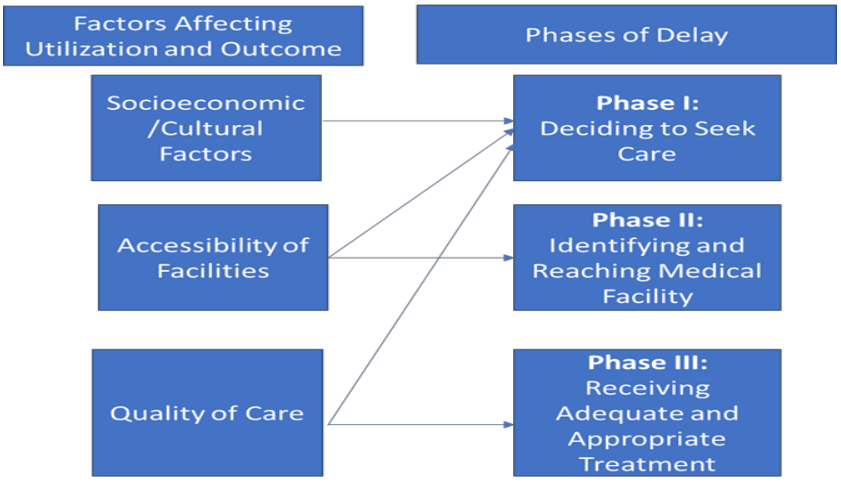

Figure 5: The three-delay model [25]

2.1. Problem Statement

The World Health Organization (WHO) estimates that approximately 536,000 women die from pregnancy and childbirth-related complications each year with 95% of these deaths occurring in sub-Saharan Africa and Asia.[26] Nigeria is a leading contributor to the maternal death figure in sub-Saharan Africa due to its high maternal mortality ratio (MMR) and not just because of the large population size of approximately 200 million people.[26,27] Nigeria has an estimated MMR of 917 maternal deaths per 100,000 live births.[28,29] The lifetime risk of dying in pregnancy during pregnancy, childbirth, post-partum/post-abortion in Nigeria is 1 in 22 in contrast to 1 in 4900 in developed countries.[30] About 20% of maternal deaths around the world occur in Nigeria. WHO estimated that above 600 000 maternal deaths and an average of 900 000 maternal near-miss cases occurred in Nigeria between the years 2005 and 2015.[31]

These high maternal deaths are a reflection of inequities in the access to healthcare and highlight the disparities between the rich and the poor and the rural and urban parts of countries e.g. Nigeria. The women in the rural, remote area are less likely to have access to skilled health care workers and subsequently receive adequate healthcare.[31] The top causes of maternal mortality in Nigeria include haemorrhage, sepsis, unsafe abortion, eclampsia, and prolonged obstructed labour.[32,33] Contributing factors and barriers that prevent women from seeking care from skilled health personnel include poverty, long distance to health facilities, inadequate information, lack of education, poor quality of services, cultural beliefs and practices.[34] These barriers contribute to the low utilization of skilled birth attendants and ultimately maternal morbidity and mortality.[4] Maternal mortality ratios vary considerably between states in Nigeria and have rural and urban variations. It is considerably higher in rural (approximately 1271 per 100 000 live births) than urban areas.[35] There is also a regional variation between the Northern part of Nigeria and the Southern part. The MMR was recorded as 166 maternal deaths per 100 000 live births in the South-West compared to 1549 maternal deaths per 100 000 live births in the North-East. This is due to the difference in the level of education, utilization of health services, traditional and cultural beliefs, and norms that are linked to health outcomes.[36,37]

Maternal Mortality has also been attributed to the three delays as proposed by Thaddeus and Maine.[25] The first delay is the delay in deciding to seek health care, the second is the delay in getting to the health facility while the third is the delay in receiving quality care at the health facility.[25] Adequate awareness and knowledge of danger signs in pregnancy/delivery and the practice of BPCR by pregnant women, their communities, and health care facilities will help anticipate and minimize the three delays.

High maternal morbidity and mortality have remained a huge problem and persist in Nigeria despite efforts and strategies aimed at reducing them. Some of these strategies include the promotion of facility-based/institutional deliveries, training, and re-training of skilled birth attendants, and subsequent deployment to areas of high need.[32] Although these strategies have resulted in having 67% of Nigerian women attending ANC, only 41% of births were attended to by a skilled provider based on the National Demographic Health Survey(NDHS) conducted in

2017.[27] Twenty-two percent of births are attended to by traditional birth attendants in Nigeria. At the health facility level, emergency obstetric care is available in only 4% of public health facilities, and these are mostly situated in the urban areas with a caesarean section rate of 2% indicating an unmet need for caesarean section with resulting delay in providing emergency maternal care.[38]

A key strategy that has been identified to reduce maternal morbidity and mortality is BPCR and this has been included as an essential component of safe motherhood programs globally. Inadequate BPCR contributes to the delays in seeking skilled birth attendants which ultimately leads to bad obstetric outcomes.[20] utilization of maternal health services and health-seeking behaviour have been shown to increase through the promotion of BPCR.[39]

Despite the huge benefit of BPCR in the reduction of the three phases of delay and thus reducing maternal and neonatal morbidity and mortality, BPCR levels are still very low in Nigeria. Studies done across Nigeria have shown that most pregnant women have poor knowledge of obstetric danger signs and they are not adequately birth prepared and complication ready.[40–42]

2.2. Justification of Study

Maternal mortality in Nigeria is still very high and most of these deaths can be avoided and prevented if women have access to timely high-quality care in pregnancy, during, and after childbirth. Access to adequate skilled care during these periods will contribute to preventing unnecessary maternal and neonatal deaths.[43] Maternal deaths can affect the health and well-being of children in various ways and it also has detrimental effects on the socio-economic development of a nation.[44] Improving and promoting BPCR in a country like Nigeria can improve the survival of a pregnant woman and her unborn child when maternal emergencies and complications occur.[23]

A systematic review conducted on the effect of BPCR on reducing maternal and neonatal mortality showed that BPCR interventions are effective in reducing the deaths of pregnant women and neonates in developing countries through the increase in the utilization of skilled birth attendants (SBA).[45] However, utilization of SBA in Nigeria remains low, which is symptomatic of the low levels of BPCR by expectant mothers. Figure six (6) below is a conceptual framework that shows the possible pathways with which BPCR can reduce delays and increase SBA utilization.

To increase the utilization of SBA and subsequently reduce maternal and neonatal morbidity and mortality, it is pertinent to identify and explore the various factors and barriers that contribute to BPCR. Several studies in Nigeria have accessed the level of knowledge and practices of women concerning BPCR.[21,46–51] However, most of these studies did not explore the determining factors and the barriers these women face which either aid or prevent BPCR. This study will therefore focus on the various factors and barriers influencing BPCR using findings from different original research work. The identification and exploration of these factors will contribute significantly to policy development and strategic planning specifically targeted at increasing BPCR, increasing SBA utilization, and ultimately reducing maternal morbidity and mortality.

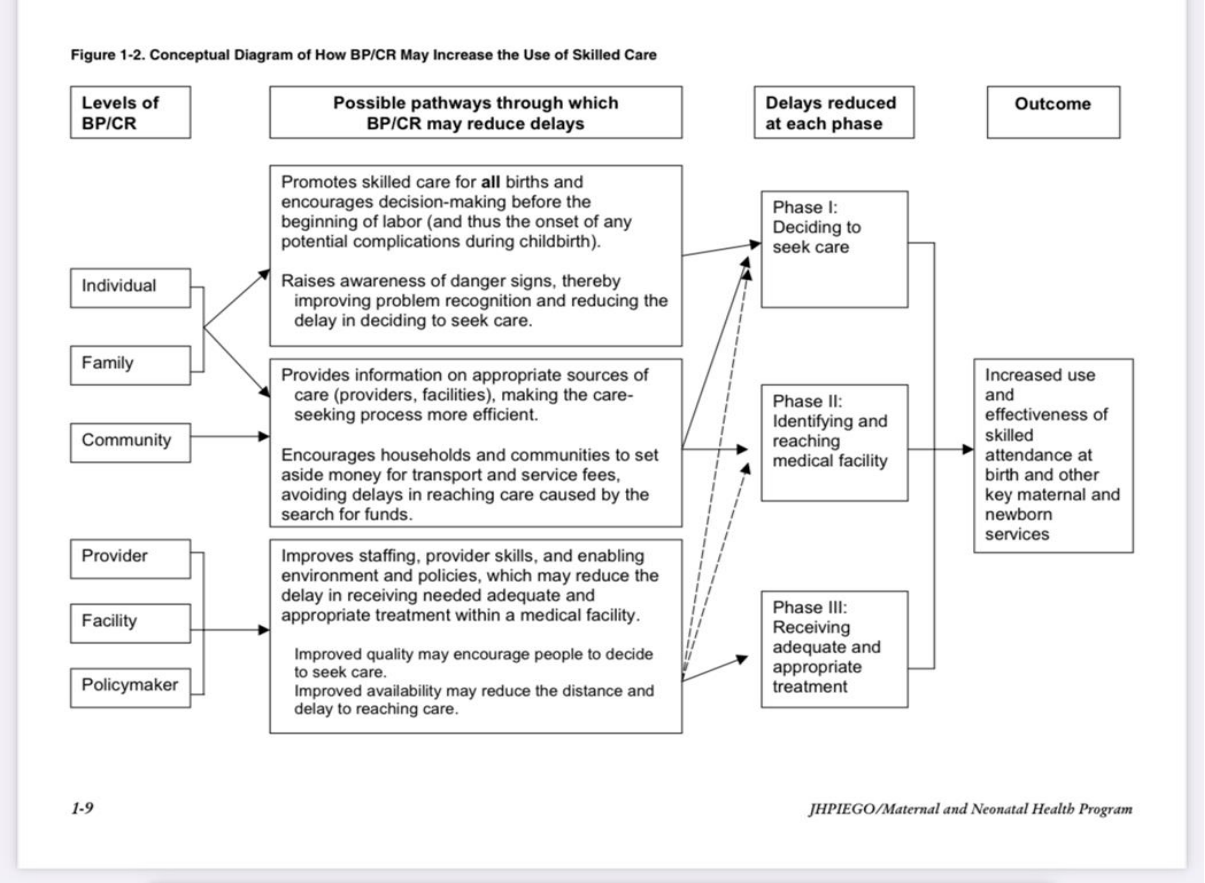

Figure 6: Conceptual framework of how BPCR may increase skilled birth attendance[52]

2.3. Research question

What are the determining factors and barriers of Birth Preparedness and Complication Readiness (BPCR) in Nigeria?

2.4. General objective:

To explore the determining factors and barriers of Birth Preparedness and Complication Readiness (BPCR) in Nigeria to provide policy and programme recommendations targeted at increasing BPCR and subsequently skilled birth attendance utilization.

2.5. Specific objectives:

1. To describe the level and scope of BPCR in Nigeria.

2. To identify and discuss the individual, family, and community factors that influence BPCR in Nigeria.

3. To explore and discuss the health-service-related factors that influence BPCR in Nigeria.

4. To review and discuss BPCR strategies that have enhanced the use of Skilled Birth Attendants in Nigeria and other low-middle-income countries (LMIC)

5. To make recommendations to the Ministry of Health and other relevant stakeholders on how to improve BPCR and ultimately utilization of skilled birth attendants.

CHAPTER THREE

3. METHODOLOGY

A descriptive literature review on birth preparedness and complication readiness and its determining factors in Nigeria was carried out. The search was conducted using the Vrije Universiteit electronic library to gain access to published articles and numerous databases like Pub-med, Scopus, and the Cochrane Library for systematic reviews. Search engines like google scholar were used for more published articles. Grey literature was used by accessing the websites of the ministry of health of Nigeria, local and international government, and non-government organisations multi-lateral agencies like WHO, World Bank, United Nations Population Fund (UNFPA), others like The International Federation of Gynaecology and Obstetrics (FIGO), etc. Policy documents such as the Nigerian National Health Policy, National Health Act, National Strategic Health Development Plan were also used. The snowballing technique was used to get more useful articles. Articles published between 2010 -2020 in the English language were selected except for articles that were relevant to the study and not considered outdated.

3.1. Criteria for inclusion and exclusion

Articles, reports, studies on maternal health (with emphasis on BPCR) in Nigeria that have been peer-reviewed and published between the year 2010 -2021 as well as grey literature in the English language were included. Other relevant published articles on BPCR from Sub-Saharan Africa (SSA) and other LMIC with similar context as Nigeria were also included.

Articles that were excluded were articles published earlier than 2010 (except very important articles needed to reference the framework), articles not in English language, articles on BPCR outside SSA and LMIC, and articles with abstracts only with limited access to the full version.

3.2. Search Strategy, Search Terms, and Combinations

The search strategy would involved pairing keywords for the different objectives. These keywords include: “BIRTH PREPAREDNESS’, “BIRTH PLAN”, “SAFE MOTHERHOOD”, “PREGNANCY”, “CHILDBIRTH’, “DELIVERY”, “COMPLICATION READINESS”, “DANGER SIGNS”, ‘KNOWLEDGE”, “ATTITUDE”, “PRACTICE”, “EDUCATION”, “BELIEFS”, “FACTORS”, “NIGERIA”, “SUB-SAHARAN AFRICA” and so on. A comprehensive list showing the combination of keywords has been attached in the annex.

About 200 articles were retrieved using keyword combinations and articles that did not meet the inclusion criteria and articles that were not relevant were removed after reading their abstracts.

3.3. Limitations of Methodology

Few studies had evaluated BPCR strategies in Nigeria, therefore the literature review had to be extended to Sub-Saharan African (SSA) and eventually Low- and middle-income countries with similar characteristics as Nigeria. The unpublished literature on BPCR in Nigeria could not be accessed so there was a heavy reliance on published literature therefore prone to publication bias. Only literature published in the English language was used. Therefore, when effective BPCR

strategies from SSA were being reviewed, francophone countries could not be included despite having similar characteristics as Nigeria. Finally, the data was mainly from secondary data sources with no primary data collection which would have enhanced triangulation.

3.4. Conceptual Framework

Several frameworks were considered such as Thaddeus and Maine's three-delay model, the socio-ecological model (SEM) and the Anderson and Newman (2005) framework for healthcare utilization.

The three-delay model looks at the causes of delays in seeking care from pregnancy to labour, delivery, and complications. Delays fall into three categories: delays in deciding to seek care in a health facility, delays in accessing a health facility, and delays in obtaining appropriate care after arriving at the facility. This model was not selected because it did not broadly cover the determinants of BPCR. Policy-level factors will not fit appropriately into this model.

The Anderson and Newman Health Care Utilization Behavior Model/Framework is a conceptual model that highlights the various factors that lead to the utilization of health services. The goal of BPCR is to increase the utilization of skilled birth attendants, so the framework can help analyze the determinants. The framework links the utilization of health services to three factors: predisposing factors, enabling factors, and needs/illness factors.[53] The Anderson model will not be used because it does not adequately cover the five levels of interest that the research intends to use to analyze the factors that contribute to BPCR.

The Socio-Ecological Model (SEM) was developed in the middle of the 20th century to address issues in psychology and human development.[54] During this period, the model focused on environmental factors that influence human behaviour. Later, the model was extended to include interactions among individuals, communities, and friends in the environment. This perspective applies to social and environmental factors that hinder women from preparing for birth and seeking appropriate care during pregnancy, delivery or after childbirth. SEM will also consider a holistic public health approach to address BPCR.

The Socio-Ecological Model was chosen because it considers factors such as family, husband, peer factors, and responsiveness, which have a significant impact on women's full preparation for childbirth and preparation for complications. Other models do not consider these. SEM also considers five different levels (intrapersonal, interpersonal, community, institutional, and policy level) that are directly related to individuals, families, communities, providers, facilities, and the level of BPCR being considered in the objectives of this research.

The Socio-Eecological model comprises of five levels: community, intrapersonal/individual, interpersonal, organizational/institutional, and public policy.

1. **Community**: This level includes cultural beliefs, support systems, gender norms, and values related to BPCR that will be discussed.

2. **Interpersonal**: This includes husbands, peers, and families, decision-making processes and preparations for childbirth, and groups.

3. **Intrapersonal / Individual**: This includes past experiences that have affected women's preparations for childbirth and complications. At this level, the mother's age and parity, knowledge of danger signs, willingness to become pregnant, education level, previous experience in the healthcare system, attitudes towards BPCR, and beliefs that serve as barriers.

4. **Organisational / Institutiona**l: These are the health service-related factors that affect BPCR. At this level, the distance to health facilities, the availability of health workers, the quality of maternal health services, responsiveness, medicines, and medical supplies, and affordability are discussed

5**. Public policy**: This level includes policies related to sexual and reproductive health (especially maternal and child health), free health care services, transportation, and referrals.

The Socio-ecological model can be adapted and modified in content, without changing its original structure to fit the purpose and nature of specific research questions it's intended to answer. It is against this background the study is considering an adapted SEM, from the theory of glance by Bara et al., 2005.[55]

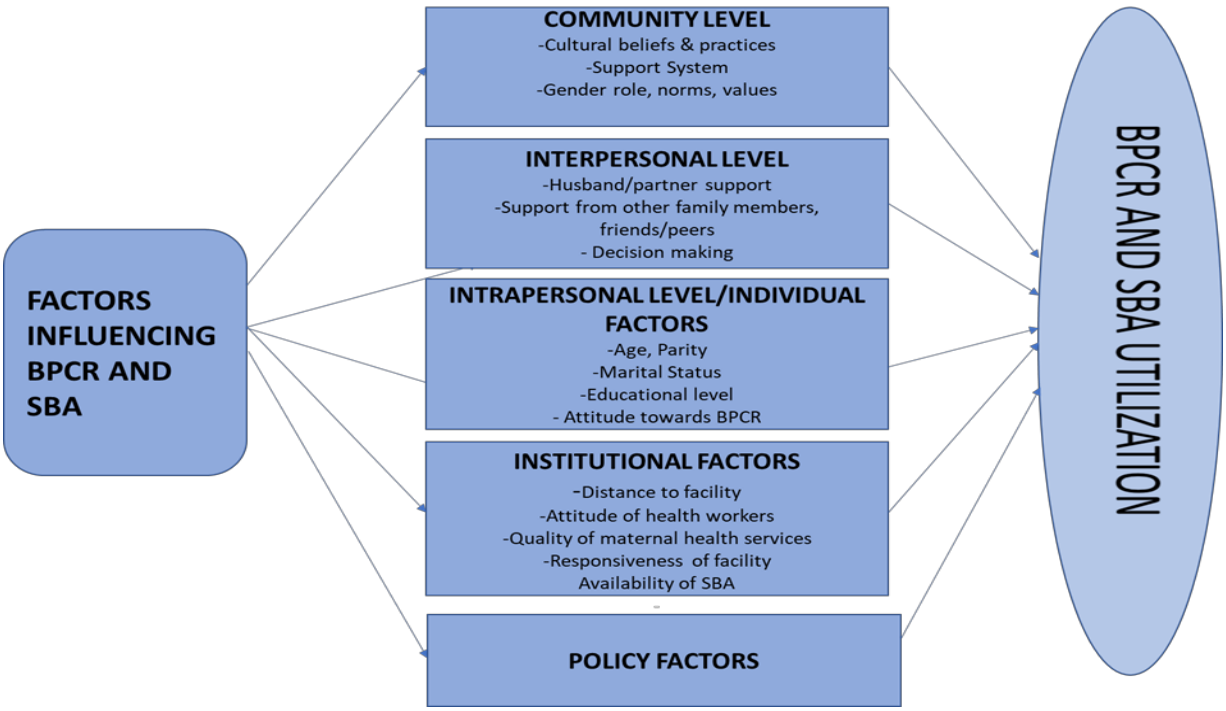

Figure 7: Adapted SEM of the factors influencing Birth preparedness and complication readiness

CHAPTER FOUR

4. RESULTS

4.1 Scope of BPCR in Nigeria

The level of BPCR in Nigeria has regional, state, and rural-urban variation and differs accordingly. In a study that compared the levels urban and rural areas in Lagos state, the level of BPCR was found to be low in both areas but slightly higher in the urban area (31.6%) compared with the rural area (13.2%) with a sample size of 205 persons per group.[56] However another study carried out in Lagos state among 360 pregnant women showed 64% of the respondents having good knowledge of BPCR with a majority of them (75%) having a positive attitude. Despite the good knowledge and positive attitude, the practice of BPCR was low (34.4%) among them.[48] The reason for this was not explored and explained by the authors therefore more studies will be required to explain this disparity.

In the Eastern part of Nigeria (Abia State) with 474 respondents, the level of BPCR which was calculated was found to be 44% but this was reduced to 33% when the community indicators (blood donation scheme, community financing, and transportation systems) were included. This was because only 0.4% of the respondents knew any form of community support system.[57] This may be as a result of the study being carried out in an urban city where there is a low reliance on community structures. A qualitative study in Enugu state, another Eastern state also found BPCR levels to be low among the pregnant women assessed. Their educational level, socio-economic status, and attitude towards ANC were identified as some of the barriers to BPCR in that community. [58] Another study in the East that assessed BPCR in secondary health facilities in Ebonyi State found the level to be below half at 41.9%. Upper social class, living in the urban cities, and age below 30years increased the odds of the respondents being adequately birth prepared.[59]

When BPCR was assessed among pregnant women in PHC centres in the southern part of Nigeria (Edo state), the Majority (87.4%) of them were found to be adequately prepared for birth.[60]. This was similar to a study in the Southeastern part of the country where there was a great awareness of BPCR (70.6% of the women). However, the knowledge of danger signs was poor among them. The high level of awareness of BPCR led to transportation plans being put in place for delivery.[39] The knowledge of birth preparedness (87.7%) and complication readiness (79.5%) was also very high among the women of reproductive age group in Ebonyi State (South east Nigeria). This was strongly associated with literate mothers. Women in the younger age group(25-29 years) and multiparous women.[46]

In Port-Harcourt, BPCR was assessed among the pregnant women attending the PHCs, (2520 68.9% of them were knowledgeable about BPCR but just (171) 46.2% of them practiced it by making adequate transport arrangements, identifying an SBA, and saving money for delivery.[61] The author attributed this to factors such as the current gestational age, number of ANC visits attended, and the parity of the respondents. This was similar to the findings from another study

among 460 pregnant women attending PHCs in another southern state (Ibadan, Oyo state) where 56.5% of the women had good knowledge of BPCR with 52.2% of them also having good knowledge of obstetric danger signs.[62]

In the Northern part of Nigeria, BPCR practice was extremely low. Only 6.2% of the husbands/partners of pregnant women assessed had identified a place of delivery for their pregnant wives, 19.5% of them had been able to save for delivery and emergencies while 24.2% of them had made transportation arrangements.[49] This was similar to the findings from another Northern Nigeria study which assessed the effect of a health promotion intervention on the involvement of males in BPCR. The baseline level of BPCR was 5.9% in the study group of 192 persons and 7.3% in the control group of 196 persons. After the intervention, there was no statistically significant change as it was 6.2% in the study group and 8.2% in the control group ($p=0.868$ and $p=0.740$ respectively). Religious and cultural barriers were identified as a determining factor as their religious and cultural beliefs were not in favour of BPCR.[63]

Another study in Northern Nigeria found only half (50%) of the 268 married male respondents with good knowledge of BPCR with less than half (48%) having a positive attitude towards it. Only 32% had made any form of preparation towards birth.[64] This was attributed to the society constructed traditional gender roles where pregnancy and childbirth are seen to be exclusively the female's role. Cultural and religious barriers also played a role in the low practice of BPCR. These findings were different in another northern study where a majority (89.2%) of the 408 pregnant women attending a tertiary hospital in Sokoto state had good knowledge of BPCR. Out of those with good knowledge, 92% of them had good practice of BPCR as 83% of them had identified a place of birth, 80% had made transportation arrangements, and saved money for delivery.[65] The difference here was in the higher level of education of the respondents and the facility-based nature of the study where most of the women were already attending ANC.

In the Southwestern part of Nigeria, a study done in Osogbo metropolis, Osun state found the level of BPCR to be as high as 82.1% among the pregnant women in the community under study. Being in the younger age group (20-25 years old) and having high educational levels were contributory factors. [66] However in the rural communities in the Southwest, more than half (52%) of the pregnant women were not adequately prepared for birth. In Ife, also in the South-West of Nigeria, 34.9% of the pregnant women attending antenatal care (ANC) were birth prepared while 66.1% were complication ready. When the BPCR components were further broken down, 84.8% of them had identified an SBA for delivery, 78.3% had made financial arrangements however, only 20% had made arrangements for blood donation.[40] High levels of BPCR knowledge (84.3% 0f 265 women) and BPCR practice (81.5%) were found in a study carried out among pregnant women attending a southwestern teaching hospital.[67]

4.2 Determining factors of BPCR

4.2.1. Intrapersonal level / Individual-level factors

i. Age

Age is one of the determining factors associated with birth preparedness and complication readiness. In a study among women of the reproductive age group in Ebonyi state to assess BPCR, it was discovered that the odds of birth preparedness increased by 1.09 for every unit increase in maternal age (95% CI: 1.0168-1.1610).[46] Another study in Osogbo metropolis which accessed BPCR among pregnant women found that being in the younger age group (25-29 years) was more significantly associated with being birth prepared.[66] Women within 25-29 years were also more likely to have chosen a health provider compared to the older age groups.[46]

A study by Iliyasu (2010) on BPCR and father's participation in maternity care in the Northern Nigeria community found that age was a predictor of men's participation in maternity care. Men above 30 years old were more birth prepared than complication ready compared to the men below 30 years old who were less birth prepared and also less ready for complications associated with pregnancy and childbirth.[49]

In summary, Age has been identified as a major predictor of the knowledge and practice of birth preparedness but no evidence exists on its relationship with complication readiness.[39,46,49,66]

ii. Place of residence

Several studies have been carried out to compare BPRC in the urban and rural parts of Nigeria and reported that the place of residence is a significant determining factor and a predictor of BPCR. A study that compared the knowledge of obstetric danger signs and the practice of BPCR between urban and rural Local Government Areas (LGAs) in Lagos was able to pick out a low level of BPCR in both urban and rural areas. However, the level of BPCR was higher among the women residing in urban areas (31.6%) than those in rural areas (13.2%).[50] Place of residence was also identified as a contributory factor to BPCR in a study done in the southeastern part of Nigeria.[39]

Knowledge of BPCR has also been found to be significantly higher in urban residents (91.2%) when compared to rural residents (76.4%) with the mothers residing in rural areas having lower knowledge than their urban counterparts. BPCR practice was also higher among the urban residents (94.1%) when compared to rural residents (78.2%). [65,68] In a study assessing BPCR in Cross-river state by Ekabua (2011), urban dwellers were found to be more likely to have good knowledge of pregnancy, childbirth, and postpartum danger signs and use a skilled birth attendant compared to mothers who live in the rural areas.[39]

iii. Marital Status

Marital status is a contributing factor towards BPCR. A component of being complication-ready is the provision of blood donors and marriage was the only significant factor that influenced

identifying and making provisions for a blood donor in case of obstetric emergencies. The odds of complication readiness in a study carried out on 384 postnatal women was found to increase by 1.06 for every year increase in the duration of the marriage.[46] Other studies also found that BPCR practices were better among women who were married compared to single, separated or divorced women. The divorced and widowed women were found to be less likely prepared for birth and ready for obstetric complications.[40,48,69,70] A study done in Eti-Osa LGA found a higher proportion of married women 212 (72.6%) being birth prepared and complication ready compared to the single and widowed.[48] One of the studies however found that marital status was not a good predictor of planning to save money for childbirth, one of the components of birth preparedness.[39]

iv. Educational level

The maternal and paternal educational levels are major and significant contributory factors to BPCR in several studies.[39,40,46,48,59,66,69,71,72] Educational level was also identified as the most significant individual-level factor and a major predictor of BPCR and ultimately maternal services utilization.[21] There was a positive statistically significant association between level of education and knowledge of danger signs of pregnancy, childbirth, and neonatal health. Women who had tertiary education were three times more likely to have adequate knowledge of danger signs compared to those with primary education (OR=3.14; 95%CI: 1.76,5.93).[71]

Women without tertiary education had a 31% lesser chance of being complication-ready when compared with women with tertiary education.[59] In another study, the level of education was identified as the major predictor of birth preparedness however it didn't affect the intention to attend four antenatal care sessions.[39] In Northern Nigeria, the educational status of men was a determining factor to their participation in BPCR and offering ANC and Postnatal care (PNC) and accompanying the women to the health centres. The likelihood of educated men supporting maternal health services was four times higher than in their uneducated counterparts.[49]

Another component of BPCR, choosing a health care provider was significantly associated with women with tertiary education as they were 2.8 times more likely to be birth prepared when compared to women with no formal education (OR=2.8, 95% CI=1.02,7.72).[46] Another study found a progressive increase in BPCR to the educational level with BPCR increasing as the educational level increased. Those with tertiary education were better birth prepared and complication ready. BPCR was worse in women with no formal education (32.2%), unskilled or unemployed women (45.6%). This got better with women who had attained at least primary education (54.1%) and women who were either skilled or semi-skilled (74.1%).[69] Husband/spousal's level of education was also found to be a significant predictor of BPCR.[70,731,73]

A study done in Port-Harcourt among pregnant women however did not find a statistically significant association between the level of education and the practice of BPCR.[74] A significant association also exists between the knowledge of BPCR and the eventual practice of BPCR. A study done in Port Harcourt to assess BPCR found a significant positive association between the knowledge and practice BPCR.[61]

v. Employment Status

Women that are gainfully employed are more likely to prepare for birth and ready for complications due to their financial independence.[70] This was found in a study by Ekabua (2011) and another study by Iliyasu (2010) in South-Eastern and Northern Nigeria respectively. The likelihood of a mother who is employed to have increased knowledge of BPCR and subsequently utilize skilled birth attendants during pregnancy and childbirth was found to be quite high. Women who had partners that were employed were four times more likely to utilize skilled birth attendants compared to women with unemployed husbands/partners.[71]

vi. Parity

The number of pregnancies a woman has had (i.e. parity is) a contributory factor to BPCR. Women who have had 2 or more pregnancies were seen to be knowledgeable in at least one danger sign of pregnancy and childbirth in a study that assessed BPCR in Abia State.[57] On further exploration of the association between parity and the individual danger signs in pregnancy, it was discovered that parity was a significant predictor of the knowledge of severe vaginal bleeding. It was also found to be a predictor of the plan to save money for birth as well as choosing a healthcare provider.[46,72,75]

vii. Obstetric history

There is a positive significant association between women with a history of obstetric complications and BPCR as found in a study that assessed the determinant of BPCR in Delta State.[70] Those with a positive history of obstetric complications were more likely to be birth prepared and ready for pregnancy and delivery complications.[70]

viii. Knowledge of Danger signs (Pregnancy, Labour/Childbirth, Postpartum, Newborn)

Delays in seeking maternal health services can be reduced by the knowledge and awareness of danger signs in pregnancy, childbirth, and the postpartum period.[1] The knowledge of danger signs is associated with BPCR. A study revealed that those who had adequate knowledge of the danger signs of pregnancy, childbirth, and newborn health were 2 times more likely to be birth prepared and complication ready compared with those without adequate knowledge. (OR=1.95, 95% CI 1.12, 3.38).[71] The awareness of birth preparedness was high among pregnant women in a study carried out in Cross-river state however the knowledge of danger signs was poor among them leading to inadequate preparations made for birth and complications that could occur.[39]

ix. Attitudes/Perceptions on BPCR

None of the studies reviewed was able to establish a statistically significant association between the attitude towards BPCR and the practice of BPCR. A study revealed that less than half of the respondents studied (48.2%) had a positive attitude toward BPCR while another study showed that a majority of the respondents (75.3%) of the respondents had a positive attitude towards BPCR.[48]

4.2.2. Interpersonal level /Family level factors

i. Male participation

Family support especially spousal / husband support is an important determining factor of BPCR. Several studies have been conducted to assess and evaluate male participation in BPCR and the immediate outcomes. A high level of husband/spousal support was found in a study in Ebonyi state where 82.8% of the women interviewed admitted that their husbands provided financial and social support to them during pregnancy, delivery, and the postpartum period. This had a positive impact on their being birth prepared and complication ready.[46]

In a study done to assess male participation in maternal care in Northern Nigeria, 32.1%of the men accompanied their spouses for antenatal care. Young paternal age was found to be a predictor of male participation in maternal care.[49] Concerning decision-making in the home on maternal service utilization, the husband/partner's influence is high as discovered in a study done in Abia State where the decision on when to start ANC and where to go was made by the husband in 73.4% of the cases.[57] In a Northern Nigerian study to assess father's participation in BPCR, less than 30% of the participants had made any plans towards their wives/partner's delivery.[49] Transportation arrangements had been made by only 24 % with just 23% being adequately prepared for birth.[49]

4.2.3. Community-level factors

Cultural beliefs and practices were found to play a major role in BPCR especially in northern Nigeria where birth preparedness was hardly discussed and practiced by the men in the community and their wives.[49,63] In such communities, it was a cultural and religious practice to 'rely on God' for the safe delivery of pregnant women. The women in the communities were expected to deliver at home and it was felt that BPCR was not necessary.[63]

In a study done in South-Eastern Nigeria where community factors related to BPCR were assessed, it was discovered that a major component of birth preparedness which is the plan to save money for childbirth was significantly associated with an operational community financial support system. [39] However there was poor awareness among the women in the community on the availability of the existing community support system including the financial support system. This was the same finding in another study in Ebonyi state where the majority of the women surveyed were not aware that the community had a financial support system for community members and a transportation system for emergencies.[41,59] Another study identified that more than half of the women (55.3%) were not aware that their community or government could offer any form of support during pregnancy and childbirth and were not aware of any existing supportive system in place.[46]

4.2.4. Institutional level / Health provider and Facility level factors

i. Quality of Maternal care services

Health facilities in Nigeria especially at the primary level of care are not equipped with adequate resources such as essential drugs, skilled staff and are therefore not able to provide basic emergency obstetric care to enable them to offer quality maternal health care services.[76] This

makes them not ready for complications that could arise during pregnancy and childbirth and therefore causes a delay in accessing required services by the pregnant women. In four facilities assessed in South-East Nigeria, equipment and drugs were not available in quantities sufficient to provide maternal care services.[76–79]

A study carried out to evaluate women's perception of the quality of maternal care services they receive at secondary and tertiary facilities in the six geo-political zones of Nigeria revealed that most of the women were not satisfied with the quality of antenatal, delivery, and postnatal care services received at the facilities. The various reasons given for this dissatisfaction include long waiting times at the health facilities, poor attitude of healthcare workers, facilities which were below standard, high cost of services provided, and the poor and disrespectful treatment given to women in labour.[79] These were some of the drivers pushing women towards traditional birth attendants who are most times not skilled to handle pregnancy and delivery complications.[79]

ii. Distance to health facilities

In a study carried out in the Southeastern part of Nigeria, 50% of the mothers were found to reside in rural areas with the motorbike being the main mode of transportation. About a quarter (23%) of the mothers were aware of danger signs of pregnancy but they still made plans to deliver at home due to the distance to the nearest health facility.[39]

iii. Responsiveness of health facility

A study done to measure the responsiveness of the healthcare system in both private and public hospitals in Nigeria and to compare their performance showed that the private hospitals performed better in terms of experiences of the users and the satisfaction with the level of responsiveness. The study showed that the public/government hospitals were less responsive when it comes to the domain] of dignity, waiting time, prompt attention, and travel time. These are important in the delivery of quality maternal health care services to position such facilities in being complication-ready.[80]

A similar study identified quality of facilities (52%) dignity (54.1%) and communication (55.4%) as extremely important responsiveness domains.[81] In tertiary healthcare services in Southeast Nigeria, prompt attention (89%) and dignity (88%) were the highest-rated health system responsiveness domains by the users.[82] Responsiveness of the health facility, therefore, plays a huge role in ensuring that the providers and health facilities are properly positioned to respond to the needs of their users to avoid barriers in accessing care.

iv. Availability of skilled birth attendants

Women are more likely to utilize skilled birth attendants (SBA) if there is adequate availability of SBAs in the primary and secondary health centres. A major barrier to SBA utilization is the unavailability of skilled health care providers. This unavailability of SBAs reduces the level of BPCR of pregnant women and prevents the women from accessing quality maternal care.[83,84]

A survey of over 5000 women in the Northern part of Nigeria showed that over 90% of the women deliver at home with less than a third of them having adequate knowledge of danger signs of pregnancy and childbirth. The knowledge of danger signs was positively associated with SBA utilization.[85] An analysis of the NDHS data from 1999-2018 showed that the prevalence of traditional birth attendants (TBA) use has remained constant at between 20.5-23.7%) while that of other unskilled birth attendants declined significantly from 45.5% in 1999 to 36.2% in 2018. The odds of using unskilled birth attendants were higher in those residing in the rural areas, young maternal age (15-24 years), and a higher birth interval of greater than 2 years. The odds were however lower with the high educational level of the mother and father, high socio-economic status, higher maternal age (35-49years), close distance to the health facilities, and household with female autonomy.[86]

v. Knowledge and competence of providers

Provider competence is a determining factor of complication readiness from the supply side of the healthcare system i.e. the institutional level factors. A cross-sectional study to assess the existing knowledge and skills related to emergency obstetrics care (EMOC) among 341 health providers (doctors, nurses, and midwives across northern and southern Nigeria in eight referral hospitals was carried out. It showed that the providers scored less than 46% when their knowledge of EMOC was tested. The doctors scored higher than the nurses and midwives on both knowledge of EMOC and self-reporting of confidence in carrying out specific EMOC functions.[87] The referral facilities in Nigeria reported a lower than average score when the knowledge and self-reported skills on EMOC were compared with standard WHO recommendations.[87]

4.2.5. Policy level factors

Nigeria's reproductive health policy is currently included within the Nigerian health policy developed in 2016. The goal is to reduce the morbidity and mortality of pregnant women, neonates, and adolescents. It specifically mentions as an objective the need to reduce pregnancy and childbirth risks by ensuring comprehensive obstetric care is provided at all levels of healthcare.[9]

There is no current National Reproductive Health Strategic Framework in Nigeria as the last one was developed for a 5-year strategic period between 2002-2006. It had a goal of improving the quality of life of all men, women, and children in Nigeria through enhanced reproductive health. one of its key objectives was to reduce the maternal mortality rate by 90% and the perinatal mortality rate by 30% of the 1999 figures. Safe motherhood was highlighted as one of the priority areas.[88]

Other policy documents relevant to BPCR include the National reproductive health policy and strategy developed in 2001 to increase the access to qualitative and affordable maternal and child health services, The Nigeria National Blood Policy (2006) which aims to provide efficient National Blood Service and quality standards. There's also the Midwives Service Scheme (2009) which aims to help to address the critical shortage of skilled birth attendants in Northern Nigeria. Most of these policies are however outdated and need to be revisited and revised.

A study that reviewed all the maternal, newborn, and child health (MNCH) policy documents in Nigeria showed that of all the 19 policy documents developed between 2000-2015, a consultative process involving multiple stakeholders was employed. However, there was no reporting of a clear scientific process that involved the application of scientific evidence through the assessing, adapting, synthesizing of evidence-informed data and literature in the policy development process.[89]

4.3. BPCR interventions in low- and middle-income countries (LMIC)

A literature search was conducted to identify BPCR strategies that have been proven to be effective in Nigeria and other LMIC with a similar context as Nigeria. BPCR strategies in Sub-Saharan Africa, South-East Asia, and some parts of Central America were subsequently identified. Some of these interventions were supported by the John Hopkins University Centre and were implemented across different countries and subsequently evaluated.

The BPCR strategies found from the literature can be classified into different groups as follows: health education through home visits by volunteers of community health workers (CHW), integration of BPCR messages into routine ANC care at the health facility level, BPCR messages passed across at the community level (through the use of visual aids e.g. pictorial booklets, flipcharts), community mobilization and participation activities (with the use of folktales, dance drama, songs) and mass media campaigns (with the use of radio and television).[90] Some of the interventions used multiple strategies to include training of the TBAs, health care providers, and also the upgrading of health facilities.

The summary of the effective BPCR strategies and interventions can be found in the table below:

Table 2: Summary of BPCR strategies and interventions and their outcomes.

PROGRAMME NAME	AUTHOR /YEAR	STUDY OBJECTIVE	TARGET/ STUDY POPULATION	STUDY DESIGN	DESCRIPTION OF INTERVENTION	OUTCOME	LIMITATIONS	**QUALITY ASSESSMENT
1.Maternal and Child Health Integrated Program (MCHIP) by JHPIEGO	Gbenga Ishola, Funke Fayehun et al(2017)[72]	To evaluate the effect of Volunteer Household Counseling in Improving Knowledge of BPCR of Pregnant Women in Northwest Nigeria	women of reproductive age group and their spouses/partners and families	Interventional study (pre-post with control)	Trained volunteer household counsellors delivered health education to women and their families on BPCR in their homes in Northwest Nigeria	There was an increase in the mother's knowledge of BPCR in the intervention group i.e., mothers who received counselling (32.2%) compared to the control group (11.2%). The intervention group also had better odds of knowing about danger signs of pregnancy, delivery, and postpartum period compared to the control group (RR=1.69, 95%CI 1.22-2.32	The responses were based on self-reporting of events that could have occurred a year or two before delivery and therefore prone to recall bias.	Weak
2.Intervention Study	Muhammed Sani Ibrahim, Mu'awiyyah Bambale Sufiyan (2019)[63]	To evaluate the effect of a behavioral intervention on male involvement in BPCR in a rural community in Northern Nigerian	married men	Interventional study (pre-post with control)	Health education through workshop sessions, film shows, and discussions on BPCR, Health education materials on BPCR printed on Islamic calendars and given out in Northern Nigeria	There was no statistically significant increase in BPCR practice in both the study and control group. Male involvement in BPCR was not increased by the intervention due to strong religious beliefs	The assessment of BPCR was based on self-reporting leaving room for recall bias.	Weak

3.The Maternal and Neonatal Health Program of JHPIEGO: Skilled Birth Initiative	Allisyn C Moran 1, Gabriel Sangli, Rebecca Dineen, Barbara Rawlins, Mathias Yaméogo, Banza Baya (2008)[91]	To explore birth-preparedness for maternal health in Koupéla District, Burkina Faso	Women of reproductive age group (15-49years old)	Interventional study (Pre-post with control)	Behavioural change communication with community mobilization, Health education of community members with dance drama and songs, strengthening of health facilities by training health workers and providing essential equipment and supplies, Improving supervision at the health facilities by the District Health Management Team in Burkina Faso	There was an increase in SBA from 24% at baseline to 56% at the end line in the intervention group as compared to the control group which only had a slight increase from 32-36%. Pregnancy-related mortality also reduced over time in the intervention community (34% reduction) as compared to a 10% reduction in the control group.	The power of the study was inadequate due to the small sample size of 180 women	Moderate
4.Family Care International Skilled Care Initiative. CHANGE project.	M. Moore, R. Copeland, I. Chege, D. Pido, M. Griffiths (2007)[92]	To investigate a behavioural change approach to factors influencing women's use of skilled care in Homa Bay District Kenya	Recently delivered women (within 2 years of study)	Interventional study (Pre-post) with control	Behaviour change campaign to increase the use of skilled care with the uses of printed materials, BPCR messages through drama, strengthening of HFs, facility upgrade and improving provider skills in Kenya.	There was no significant difference in SBA utilization in the intervention and control group. There was however an increase from 35% at baseline to 84% at the end line in the BPCR counselling and information provided at ANC as compared to the control group which only had a slight increase from 32-36%	The validity and reliability of the study is questionable as it's prone to recall bias	Moderate

5. Intervention Study	Vishwajeet Kumar, Saroj Mohanty (2008)[93]	To measure the effect of community-based behaviour change management on neonatal mortality in Shivgarh, Uttar Pradesh, India	Recently delivered women (1 year prior to the study)	cluster-randomized controlled trial	Community mobilization, home visits through group meetings, Education of family members on BPCR, Education of pregnant women on danger signs of pregnancy, access to skilled care In India		validity and reliability of the study could be questionable due to recall bias	Moderate
6.Intervention Study	Britta C Mullany 1, S Becker, M J Hindin (2007)	To measure the impact of including husbands in antenatal health education services on maternal health practices in urban Nepal	pregnant women	Randomized clinical trial	Health education on pregnancy care, BPCR, danger signs of pregnancy, complication readiness was provided to the intervention group by health educators in Urban Nepal		The results of the study are not easily generalizable due to the eligibility criteria of selecting men who already accompany their wives to ANC	Weak
7.Intervention Study	Declare Mushi, Rose Mpembeni & Albrecht Jahn (2010)[94]	To evaluate the effectiveness of community-based safe motherhood promoters in improving the utilization of obstetric care in Mtwara Rural District in Tanzania	pregnant/nursing mothers and their partners/husbands	Interventional study (pre and post group)	Health education and awareness creation of pregnant women, their partners/husbands, and community members on BPCR by trained safe motherhood promoters in Rural Tanzania	In the intervention group, SBA increased from 34.1% at baseline to 51.4% at the end line. ANC visits in primips also increased from 18.7% to 56.9% after the intervention.	There was no control group making it difficult to eliminate confounders and establish causality.	Weak

8.UNFPA in collaboration with Eritrean MOH	Janet Molzan Turan, PhD, MPH, Mekonnen Tesfagiorghis, and Mary Lake Polan, MD, PhD, MPH (2010)[95]	To evaluate a community intervention for the promotion of safe motherhood in Eritrea.	Recently delivered women (1 year prior to study)	Interventional study (Pre-post with control)	male and female community members were trained to become maternal health volunteers who were responsible for leading participatory education sessions on BPCR in Eritrea	There was a great increase in facility births in the intervention group from 3.2%-46%as compared to the control group which had a slight increase from 3.6%-15.2%. There was also a significant increase in those who attended 4 or more ANC visits from 18.5-79.5% while there was a decrease in the control group. there was a significant increase in the women who talked about BPCR with their health providers in the intervention group.	The survey data was based on self-reporting of past experiences so prone to interviewer bias and recall bias	Weak

9. Newborn Care	Vishwajeet Kumar 1, Aarti Kumar, Vinita Das, Neeraj M Srivastava (2012)[93]	To assess the community-driven impact of a newborn-focused behavioral intervention on maternal health in Shivgarh, India	Recently delivered women (1 year prior to study)	cluster - RCT	The intervention group received home visits where they were educated about BPCR by community volunteers in India	There was an increase in SBA births from 14.3-26.9% and a slight increase in the control group (13.5-19.7%). The recognition of danger signs and birth preparedness practices also increased in the intervention group compared to the control group.	RCTs are usually considered the most valid design, however, in this study, a random effect occurred whereby clusters allocated to the intervention group had more households and therefore greater birth outcomes.	Moderate
10.Intervention study	Gary L. Darmstadt, Yuanjiang Choi, Shams E. Arifin (2010)[96]	To evaluate a Package of Community-Based Maternal and Newborn Interventions in Mirzapur, Bangladesh	Recently delivered women (3 years prior to study)	cluster - RCT	The intervention group received ANC and PNC home visits by trained CHWs who delivered a BPCR package to pregnant women in form of health education, counselling in Bangladesh	There was a huge increase from 12.1% to 20.2% in facility births in the intervention group and a slight increase in the control group (12.3-16.5%). There was also an increase in the knowledge of danger signs in pregnancy, delivery, postpartum, and neonatal danger signs in the intervention group. BPCR practice and ANC utilization also increased	Factors apart from the intervention were not considered therefore the lack of an impact of the intervention on mortality could not be explained	Moderate

11.Intervention study	Farid Midhet & Stan Becker (2010)[97]	To measure the Impact of community-based interventions on maternal and neonatal health indicators in rural Balochistan, Pakistan	Women of reproductive age group (15-49years old)	cluster - RCT	Trained facilitators delivered BPCR messages and sensitization with the use of pictorial booklets, cassettes with BPCR messages for the intervention group. The TBAs were also trained on clean home delivery. Local car owners were trained on prompt referrals, HCPs were also trained in Pakistan	The % of facility births increased in the intervention group (4.1%) compared to 2.9% in the control group. This led to significantly lower perinatal and early neonatal mortality in the intervention group. More women in the intervention group booked for ANC in their 1st and 2nd trimester compared to the control group.	It was difficult to control for external factors that could have a direct/indirect impact on the indicators of interest eg control group having access to the IEC materials	Weak

12.Dinjapur Safe Motherhood Initiative and UNICEF	J Hossain 1, S R Ross (2006)[98]	To assess the effect of addressing the demand for as well as supply of emergency obstetric care in Dinajpur, Bangladesh	Women of reproductive age group (15-49years old), their spouses/partners, community members	Interventional study (Pre-post with control)	BPCR messages were disseminated in the intervention community by trained TBAs, VHWs, village Drs with the use of visual aids during home visits, group discussions, clinics, and village meetings, Development of community support system, Training of HCPs in Bangladesh	There was an 8.1% increase in facility births in the intervention group. The met need for EMOC increased by 23.8% compared to the comparison group with just a 13% increase and a 1% increase in the control group. There was an increase in the knowledge of danger signs (45%) and control group (6%). An increase in knowledge of BPCR messages also increases in the intervention group.	It was not possible to disaggregate the effect of each intervention of the use of EMOC because of the design of the study and the way quality of care is interconnected	Weak

13.Integrated Nutrition and Health Program (INHP) and India MOH	Abdullahh Baqui 1, Emma K Williams (2008)[99]	To measure the Impact of an integrated nutrition and health programme on neonatal mortality in rural northern India	recently delivered women within 2 years)	Interventional study (Pre-post with control)	Counseling was provided through home visits by auxiliary nurses/midwives on BPCR and essential newborn care in rural Northern India	SBA utilization both at home and health facility increased to 22.5% from 16.3% in the intervention group. ANC visits also increased from 1 to >3 ANC visits in the intervention group. BPCR practices increased e.g. saving money for birth went from 14.8-50.4%)	The assessment of BPCR was based on self-reporting of past events which could have led to recall bias.	Weak
14.Rwanda Rapid SMS program	Hinda Ruton1,2,*, Angele Musabyimana1, Erick Gaju (2018)[100]	To measure the impact of a health monitoring system on health care utilization by mothers and children: an evaluation using routine health information in Rwanda	Pregnant women	Interventional study (pre-post with control)	Text messages (Rapid SMS) on BPCR, ANC utilization, SBA use were sent to pregnant mothers, Rapid SMS to link women with emergency obstetric care, Automatic SMS sent to CHWs for clinical appointments of the women to ensure follow up in Rwanda.	There was an increase from 72-92% in facility births by the end of the 12 months pilot phase. The use of m-health (rapid SMS) improved the health system responsiveness of emergency obstetric and neonatal care.	some of the data were not disaggregated eg separating neonatal deaths from infant deaths and separating pregnant women according to ANC visits attended. This limited the analysis of the data.	Moderate

*** The quality assessment was carried out using the Effective Public Health Practice Project (EPHPP) quality assessment tool with eight different criteria: selection process, study design, confounders, binding, data selection method, withdrawals/dropouts, intervention integrity, and analysis with an overall rate determined[101]. The results of the matrix have been attached to the annex.*[90]

Summary of the Table

The above interventions were carried out in Sub-Saharan Africa and Southeast Asia. The study designs varied from pre- and post-with control (8) without control groups (1) and cluster-randomized control studies (4). Different strategies were used by the various programmes. Some of them used home visits by CHW and other volunteers to pass BPCR messages across at the community level.[91,94,99,102–105] Some other programs focused on the facility level and integrated BPCR into health education provided during ANC visits.[91,106,107] A lot of the programs made use of visual aids such as flipcharts, pictorial booklets, and videos to help reinforce BPCR messages.[91,97,98,102,103,106,108] The last category of programs made use of community mobilization/participation activities like dance, drama, songs, and finally, mass media campaigns i.e. television and radio to create awareness and educate the public on BPCR.[91,92,95,100,106]

The outcome measure for most of the studies targeted the behaviour of the women and the number of facility births/SBA utilization rates as the primary outcome and pregnancy-related mortality as the secondary outcome. Some of the limitations to aggregating all the findings include the different definitions and components of BPCR used by the different authors. There were also several study populations targeted in the various programs e.g., currently pregnant women, recently delivered women with one to two years prior to study, men, community members, and the general public.

In terms of quality, seven of the studies were rated weak while six were rated moderate based on the quality assessment matrix. However, they all had strong study designs. The outcome measures in the studies varied from SBA and facility births without taking into consideration that not all facility births are attended to by skilled personnel.

CHAPTER FIVE

5. DISCUSSION

This descriptive literature review was carried out to explore the determining factors and barriers to BPCR in Nigeria. The specific objectives were to describe the scope of BPCR in Nigeria, identify and discuss the individual, family, community, and health service-related factors. Finally, the study sought to review and discuss BPCR strategies that have enhanced the use of SBA in Low- and middle-income countries.

Regarding the scope of BPCR in Nigeria, this review found inter-regional variations, with the knowledge, attitude, and practice of BPCR generally higher in the south compared to the northern part of Nigeria. BPCR was also significantly higher in the urban areas when compared to the rural areas. The most significant factors influencing BPCR as found by the review include the educational level of the mother, age of the mother, socioeconomic status, and parity at the individual level. Male involvement was a significant factor at the inter-personal level while the community-level factors were not thoroughly explored in the literature. The quality of maternal care services was a determining factor at the institutional level. The most effective strategies to ensure BPCR as found from literature involved a combination of several approaches ranging from individual health education for behavioural change, community mobilization/participation activities, and health services strengthening activities (e.g., training of health providers, upgrading of health facilities)

5.1. Scope of BPCR in Nigeria

In describing the scope of BPCR in Nigeria, it was discovered that it varied from region to region. The levels of BPCR were largely higher in the south as compared to the north. This was not surprising as there were a lot of religious and cultural practices identified in the north which stood as barriers to BPCR. An example of this was identified in a qualitative study where the male respondents see childbirth as an "act of God" and believe no major preparations should be made towards it.[49] Unassisted home delivery is also a cultural practice that has been passed down from generation to generation in the north and they, therefore, do not see the need for a SBA.

There were significant differences in BPCR levels when assessed at the community level i.e. community-based studies and when accessed at the facility level i.e. facility/hospital-based studies of women already attending ANC. The BPCR levels tend to be higher with the women already attending ANC at the health facilities and this was a form of selection bias therefore not fully representative of the pregnant women in that community and cannot be generalized among the general population of women of reproductive age.[41,46,59]

There was also a rural-urban variation in the BPCR levels with levels being higher in urban areas as compared to the rural areas. The likely reasons for this will be discussed when discussing the place of residence as determining factor for BPCR.

The different dimensions of BPCR were looked at in the literature to determine the level of BPCR i.e., the knowledge level of BPCR, the overall attitude towards BPCR, and the actual practice of BPCR. This brought about other interesting findings. For example, a study done in Lagos State showed the respondents had a high level of knowledge and a positive attitude towards BPCR but this did not translate to a high level of practice.[50] Financial constraint was identified as one of the barriers to the practice of BPCR in this study. Other barriers include low ANC utilization with few women attending up to the WHO recommended four visits, inadequate male involvement and partner support, poor community systems and support, and long distance to health facilities.

Other studies in the literature also found a discrepancy between the knowledge and attitude of BPCR and the eventual practice of BPCR which was mostly unsatisfactory.[61,64,69,71,74] Knowledge is a fundamental determinant of health behaviour but cannot lead to behavioural change on its own. Attitude on the other hand influences the intention to perform a particular behaviour but the actual practice depends on other factors.

Another major finding when the level of birth preparedness and the level of complication readiness were looked at as separate entities, was discovered that a high level of knowledge, attitude, or practice of birth preparedness does not automatically translate to complication readiness. A study in the Southeast of Nigeria discovered a high level of knowledge and awareness of birth preparedness but the knowledge of danger signs was very poor among the respondents hence reducing their complication readiness level.[39] This could be as a result of differing risk perception levels as it has been found that increased risk perception can help improve BPCR.[109,110] Therefore risk perception should be taken into consideration when designing behavioral change intervention.

5.2. Determining factors of BPCR

The main determining factors of BPCR identified from the literature cut across all the levels of the socio-ecological model. The level of education was identified as the most significant individual-level factor which was strongly associated and a major predictor of BPCR. The maternal and paternal educational levels were both identified to be key. Educational level was linked to birth preparedness, knowledge of danger signs, and complication readiness with their levels increasing as the educational level increased.[39,59,71] Closely linked to the educational level are the employment status and level of employment of both the father and mother with higher levels of employment being associated with greater financial stability and higher levels of BPCR. Female education is therefore key in improving BPCR.

Age was also found to be a major determinant and a predictor of BPCR. Those in the younger age group (25-29 years) were found to be better prepared than the older age groups. This was in keeping with the NDHS 2018 data which showed that young women (20-34 years) had higher rates of ANC attendance and SBA utilization compared to the women in the other age groups.[27] The father's age was also identified as a determinant in studies that explored male participation in BPCR where the men above 30 years of age were more birth prepared and complication ready. The increasing age as a predictor of BPCR also links with a higher level of education and

sometimes higher socio-economic status that is associated with increased age groups and are also directly related to BPCR.

Parity was also identified from the literature as a determining factor as the higher the number of pregnancies, the more the awareness of the danger signs of pregnancy.[39,46,51] Another factor that is linked to this is the obstetric history which was found as a contributory factor. The women with a poor obstetric history were more likely to be birth prepared and complication ready based on their past bad experiences and to prevent re-occurrence.[70]

There was however no evidence in the literature on the direct relationship between age and complication readiness. Other factors like parity and obstetric history were more linked with complication readiness. There was also no literature found on the adolescent age group specifically and their level of BPCR. Adolescents are a vulnerable group, and teenage mothers often deal with a lot of challenges that could further reduce their BPCR level.[111,112] It is therefore important that further studies explore BPCR among this age group so that specific interventions can be designed for them.

The place of residence was another intrapersonal level factor found to be associated with BPCR. BPCR was generally found to be higher in urban areas. A study in Lagos compared the BPCR level in both urban and rural parts of Lagos and found it significantly higher in the urban area.[50] Other studies carried out in other rural parts of Nigeria also recorded very low BPCR knowledge, awareness, and practice.[49,63,64] Associated factors to this include low socioeconomic status, low level of education, inadequate health facilities, and skilled personnel in rural areas.[21] Cultural practices that promote male dominance, patriarchy, the low decision-making power of women are deeply rooted more in the rural areas especially in the North thereby serving as barriers to adequate BPCR. BPCR programming should therefore prioritize rural areas when coming up with interventions.

Other significant intrapersonal levels determining factors of BPRC include marital status and this contributed greatly to one of the components of complication readiness (deciding for a blood donor) with more of the married women achieving this goal compared to single women.[46] This is most likely due to the ANC requirement in Nigeria which makes donation of blood by the spouse or family member of a pregnant woman a prerequisite for delivery in government health facilities.[113]

At the interpersonal level, male involvement/participation was found to have a positive impact on BPCR in a lot of the studies because the males are usually the decision-maker and financial providers in most homes.[49,63] Therefore future interventions should include men to increase their participation and improve BPCR. The role of other decision-makers e.g., the mother and mother-in-law of the pregnant women were not fully explored in the literature. In some cultures, they are known to play a major role and could be associated with BPCR.[49] Therefore, a future primary study should explore the roles of different decision-makers other than the husband/partner in BPCR.

There were not so many studies at the community level which looked at community-level factors associated with BPCR despite the important role community support plays in terms of having an organized system to identify and help pregnant women in an emergency state. It was mainly the northern studies that found an association between cultural beliefs/practices and BPCR.[49,63,64] Other studies that evaluated the community-level factors discovered that little or no community support structures existed to support pregnant women and where they existed, the majority of the pregnant women were not aware of them.[49] The community should be further studied and strengthened as they have a huge potential of eliminating religious and cultural barriers and also contributing to BPCR. The community also has a role to play in coming up with community finance schemes that can encourage women and their families to save money in preparation for birth.

At the institutional level, the quality of maternal care services, distance to health facilities, the responsiveness of the health facilities, availability of SBA, the knowledge and competence of health providers were the major health service-related factors that contributed towards BPCR. The readiness of the health facility to deliver the needed maternal services to pregnant women depends on these factors. Therefore, BPCR programming and interventions should not only focus on the demand side (i.e., individual, family, and community) but should also concentrate on the supply side (i.e., the health providers and health facilities).

The final level which was explored is the policy level factor. BPCR is in Nigeria's reproductive health policy which is captured in the Nigerian Health Policy developed in 2016. It has as one of its objectives, the reduction of pregnancy and childbirth risks by ensuring comprehensive obstetric care is provided at all levels of care. However, there is no evidence of the full implementation of the policy and no resultant impact on BPCR across Nigeria.

5.3. BPCR strategies and interventions in LMICs

Several strategies and interventions explored in the literature showed an increased BPCR and an eventual increase in SBA utilization. The BPCR interventions also led to a higher chance of pregnant women being adequately prepared for birth, deciding to use a skilled birth attendant, and being aware of danger signs of pregnancy, delivery, and postpartum period thereby making them complication ready. These were seen in the intervention studies carried out in Burkina Faso[91], Kenya,[92] and Tanzania.[94]

Some of the BPCR interventions also led to an increase in facility births. The increase in facility births in Burkina Faso was linked to the training of health providers especially the auxiliary midwives who were trained to assist the midwives in handling delivery cases. In Northern Nigeria however, there was no significant difference in the BPCR practices of the men despite health education interventions due to strong religious beliefs which stood as a barrier. Therefore, community interventions should include religious leaders as potential change agents.

Some of the interventions targeted multi-levels i.e., Individual, community, and health system levels, and subsequently achieved tremendous successes. A particular program included the

upgrading of health facilities as a form of intervention to improve the quality of maternal care. This was done in addition to the training of health providers as well as other community interventions targeted at the community members to ensure early detection of danger signs and prompt referral to the health facilities. This resulted in an 8.1% increase in the number of births taking place in the health facility. [98]

The knowledge of BPCR among women, couples, males, and community members increased significantly in most interventions where health education was done through counselling at-home visits. However, it was discovered that when counselling is offered to couples as opposed to the woman or the man alone, it was more effective.[107]

5.4. Limitations

1. The studies to assess the level of BPCR in the literature cuts across various target groups such as pregnant women, women of reproductive age group, males, community members, and recently delivered women. This served as a limitation in aggregating the results and drawing conclusions.
2. BPCR was defined and interpreted in different ways in the literature with different studies having different indicators for evaluating it. This made it difficult to aggregate the findings. Standard definitions which can be adapted to fit different contexts with internationally agreed indicators should therefore be considered to enhance further BPCR studies.
3. There was limited data on BPCR estimates in some specific parts of the country making it difficult to come up with a national estimate and average BPCR level in Nigeria. National surveys should therefore include BPCR when being carried out.

CHAPTER SIX

6. CONCLUSION AND RECOMMENDATION

6.1. CONCLUSION

The trend of the BPCR level in Nigeria has been found to have both regional and urban-rural variations. BPCR levels were generally higher in the south compared to the north. A great discrepancy also existed between the rural and urban parts of Nigeria with levels significantly lower in the rural areas. Good knowledge and attitude of BPCR did not always translate to high levels of BPCR practice. Also, high levels of knowledge attitude and practice of BPCR did not automatically translate to complication readiness. BPCR strategies should therefore target both birth preparedness and complication readiness. There must also be an emphasis placed on the health-service factors to increase their level of complication readiness to handle obstetric emergencies.

The age and educational level of the mother and father, socio-economic status, parity, and obstetric history were the main determining factors at the individual/intra-personal level. Other contributing factors at this level were the place of residence and marital status. Male involvement/participation and the decision-maker in the home were important determining factors at the interpersonal level. The level of male involvement in BPCR is still very low. Women who receive support from their male partners are significantly more birth-prepared and complication-ready. Cultural beliefs and practices at the community level play a significant role in BPCR especially in Northern Nigeria and often stand as a barrier to the practice of BPCR.

Community support systems towards BPCR are almost non-existent and when available, pregnant women and their family members are not aware of them and thereby do no benefit from them. The quality of maternal care services is an important health-service-related determining factor and this should be prioritized in planning interventions. At the policy level, reproductive health policies exist within the Nigeria health policy however, there is no evidence of the full implementation and the resultant impact on BPCR across Nigeria therefore continuous advocacy toward this should be carried out.

There should be a shift from targeting BPCR intervention mainly at the individual level as it has been shown that determining factors cut across multi-levels. BPCR programs are more effective in getting women prepared for birth and ready for complications when supplemented with programs targeting males, community-oriented programs, and health services intervention. The strategies when combined often lead to an increase in the knowledge, attitude, and practice of BPCR. This would lead to an increase in SBA utilizations and facility births in most cases with the potential of reducing obstetric complications and contributing to the reduction of maternal and neonatal morbidity and mortality.

6.2. RECOMMENDATIONS

6.2.1. For the Community:

1. Development of community support systems such as community financing schemes e.g. community health insurance which will ensure funds are always available to handle obstetric emergencies and reduce the catastrophic expenditure of families. Other community support systems that can be put in place include a community transport system in collaboration with local transport unions to transport pregnant women to health facilities especially during emergencies. Awareness should be raised on the community interventions so that community members are aware of their existence and know-how to access and utilize them.

2. Collaborative strategies between health facilities and the community using community health workers who can place home visits to those who do not utilize health facilities to ensure they are birth-prepared and complication-ready.

6.2.2. For Policymakers

3. Integration of BPCR into the current reproductive health policy of Nigeria to ensure its full integration in the maternal and child services of the country.

4. Implementation of human resources of health (HRH) policy that covers the staffing of rural health centres. This will ensure adequate staffing of skilled personnel at the health centres and increase the level of complication readiness at the facility level.

6.2.3. For Ministry of Health

5. Developing and implementing maternal health services and programs that are accessible and of high quality to reduce the huge disparities that exist in the urban and rural areas. This will help address inequities in access to maternal health information and healthcare services.

6. Training and re-training of healthcare providers with continuous medical education to improve their competence and skills and ultimately improve the quality of maternal care. This will enhance the responsiveness of the health system and increase the health service and SBA utilization

7. Developing and implementing BPCR strategies that specifically target males i.e. husbands/partners of pregnant women as they are often the main decision-makers in the home. These strategies can include the use of male counsellors, male mentors who can offer group meetings or home-based counselling sessions on BPCR. These sessions should also be extended to other family members and steps to be taken to be adequately birth-prepared and complication-ready should be highlighted.

6.2.4. For Non-Governmental Organisations / Civil Society Organisations

8. Continuous advocacy to strengthen the existing maternal/reproductive health policies to increase the resources for it.

9. Instituting BPCR programs/interventions that will target females to increase female autonomy, their decision-making power, and educational level through female

empowerment programs. This will increase their financial capability and reduce the first delay in seeking healthcare when there are obstetric emergencies.

10. Strengthening of health promotion activities with the use of mass media and other community sensitization activities where community members are educated on BPCR, danger signs of pregnancy, and SBA use. The ministry of health can collaborate with community-based organisations to deliver this to individuals in the community. Community participation should be encouraged and relevant key stakeholders e.g. religious and traditional leaders.

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ANNEXE

Appendix 1: Combination of keywords used

SEARCH TERMS	OBJECTIVE	KEYWORDS	GEOGRAPHICAL AREA
		AND	
-Birth preparedness	*To describe the level and scope of BPCR in Nigeria.*	Trend	Nigeria
-Complication readiness		Level	Sub-Saharan Africa
-Birth plan		Knowledge OR Awareness	Low-middle-income countries (LMIC)
-Skilled birth attendance		Attitude OR Perception	Urban Nigeria
-Skilled birth utilization		Practice OR Behaviour	Rural Nigeria
-Institutional birth		Scope	Northern Nigeria
-Facility birth	*To identify and discuss the individual, family, and community factors that influence BPCR in Nigeria.*	Age	Southern Nigeria
-Danger signs		Education OR Literacy	Western Nigeria
-Pregnancy		Unemployment OR Poverty	Eastern Nigeria
-Antenatal care		Parity	
-Childbirth		Obstetric history	
-Maternal healthcare		Male involvement OR Participation	
		Decision-maker	

	Factors OR Determinants OR Predictors OR Barriers
	Culture OR Tradition OR Ethnicity OR Religion
	Community factors OR Structure OR Support
To explore and discuss the health-service-related factors that influence BPCR in Nigeria.	Healthcare system OR services
	Health providers OR workers
	Health facility
	Skills OR competencies
	Quality of care
	Responsiveness
	Obstetric care
	Emergency obstetric care
To review and discuss BPCR strategies that have enhanced the use of Skilled Birth Attendants in Nigeria and other low-middle-income countries (LMIC)	Strategies

		Interventions	
		Programs	
	To make recommendations to the Ministry of Health and other relevant stakeholders on how to improve BPCR and ultimately utilization of skilled birth attendants.	Policy	

Appendix 2: Quality Assessment Scores

Study	Selection	Study Design	Confounders	Blinding	Data Collection methods	Withdrawals and dropouts	Intervention Integrity	Analysis	Overall rate
Ishola et al	Moderate	Strong	Weak	Weak	Moderate	Strong	Weak	Moderate	Weak
Sani et al	Moderate	Strong	Weak	Weak	Moderate	Strong	Weak	Moderate	Weak
Allisyn et al	Moderate	Strong	Strong	Weak	Strong	Strong	Moderate	Strong	Moderate
Moore et al	Moderate	Moderate	Moderate	Weak	Moderate	N/A	Moderate	Moderate	Moderate
Vishwajeet et al	Strong	Moderate	Moderate	Weak	Strong	N/A	Moderate	Moderate	Moderate
Britta et al	Strong	Moderate	Weak	Weak	Strong	Weak	Moderate	Moderate	Weak
Mushi et al	Moderate	Moderate	Strong	Weak	Moderate	Weak	Strong	Strong	Weak
Molzan et al	Moderate	Moderate	Weak	Weak	Weak	Strong	Weak	Moderate	Weak
Vishwajeet et al	Strong	Moderate	Moderate	Weak	Strong	N/A	Moderate	Moderate	Moderate
Gary et al	Moderate	Moderate	Moderate	Weak	Moderate	Moderate	Moderate	Moderate	Moderate
Midhet at al	Weak	Weak	Weak	Weak	Moderate	Weak	Moderate	Moderate	Weak
Hossain et al	Moderate	Moderate	Weak	Weak	Weak	NA	Moderate	Weak	Weak
Abdullahh et al	Strong	Moderate	Weak	Weak	Weak	Weak	Moderate	Moderate	Weak
Furaha et al	Moderate	Moderate	Weak	Weak	Weak	Strong	Weak	Moderate	Weak
Ruton et al	Moderate	Weak	Moderate	Strong	Moderate	Moderate	Strong	Strong	Moderate